National Aeronautics and
Space Administration
Langley Research Center

Scientific and Technical
Information Program Office

Scientific and Technical Aerospace Reports

STAR

Volume 45 Number 13

July 9, 2007

WHAT'S INSIDE

- NASA STI Program Overview
- Introduction
- NASA STI Availability Information
- Table of Contents
- Subject Term Index
- Personal Author Index

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.

The NASA STI program operates under the auspices of the Agency Chief Information Officer. It collects, organizes, provides for archiving, and disseminates NASA's STI. The NASA STI program provides access to the NASA Aeronautics and Space Database and its public interface, the NASA Technical Report Server, thus providing one of the largest collections of aeronautical and space science STI in the world. Results are published in both non-NASA channels and by NASA in the NASA STI Report Series, which includes the following report types:

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

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

- CONFERENCE PUBLICATION. Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or co-sponsored by NASA.

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

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

Specialized services also include creating custom thesauri, building customized databases, and organizing and publishing research results.

For more information about the NASA STI program, see the following:

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- Fax your question to the NASA STI Help Desk at (301) 621-0134

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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.

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NASA STI Availability Information

NASA Center for AeroSpace Information (CASI)

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

Each citation in *STAR* indicates a 'Source of Availability.' When CASI is indicated, the user can order this information directly from CASI using the STI Online Order Form, e-mail to help@sti.nasa.gov, or telephone the STI Help Desk at 301-621-0390. Before ordering you may access price code tables for STI documents and videos. When information is not available from CASI, the source of the information is indicated when known.

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

National Technical Information Service (NTIS)

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

The Federal Depository Library Program (FDLP)

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

Table of Contents

Subject Divisions/Categories

Document citations are grouped by division and then by category, according to the *NASA Scope and Subject Category Guide.*

Aeronautics

01 Aeronautics (General) 1
02 Aerodynamics 2
03 Air Transportation and Safety 3
04 Aircraft Communications and Navigation 5
05 Aircraft Design, Testing and Performance 5
07 Aircraft Propulsion and Power 7
08 Aircraft Stability and Control 7

Astronautics

12 Astronautics (General) 7
15 Launch Vehicles and Launch Operations 9
16 Space Transportation and Safety 10
17 Space Communications, Spacecraft Communications, Command and Tracking 11
18 Spacecraft Design, Testing and Performance 12
19 Spacecraft Instrumentation and Astrionics 15
20 Spacecraft Propulsion and Power 16

Chemistry and Materials

23 Chemistry and Materials (General) 17
24 Composite Materials 25
25 Inorganic, Organic and Physical Chemistry 28
26 Metals and Metallic Materials 34
27 Nonmetallic Materials 37
28 Propellants and Fuels 40

Engineering

32 Communications and Radar 41
33 Electronics and Electrical Engineering 46
34 Fluid Mechanics and Thermodynamics 56
35 Instrumentation and Photography 58
37 Mechanical Engineering 61
39 Structural Mechanics 64

Geosciences

42 Geosciences (General) 66
43 Earth Resources and Remote Sensing 67
44 Energy Production and Conversion 67
45 Environment Pollution 69

46 Geophysics 72
47 Meteorology and Climatology 76
48 Oceanography 80

Life Sciences

52 Aerospace Medicine 81
53 Behavioral Sciences 81
54 Man/System Technology and Life Support 82

Mathematical and Computer Sciences

59 Mathematical and Computer Sciences (General) 87
61 Computer Programming and Software 97
62 Computer Systems 98
63 Cybernetics, Artificial Intelligence and Robotics 99
64 Numerical Analysis 100
65 Statistics and Probability 100
66 Systems Analysis and Operations Research 101

Physics

70 Physics (General) 102
71 Acoustics 141
72 Atomic and Molecular Physics 141
74 Optics 142
75 Plasma Physics 147
76 Solid-State Physics 147
77 Physics of Elementary Particles and Fields 149

Social and Information Sciences

82 Documentation and Information Science 151
85 Technology Utilization and Surface Transportation 153

Space Sciences

88 Space Sciences (General) 154
89 Astronomy 157
90 Astrophysics 161
91 Lunar and Planetary Science and Exploration 165
92 Solar Physics 173

Indexes

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

Subject Term Index

Personal Author Index

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 45, NUMBER 13 JULY 9, 2007

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.

20070020284 Army Aviation and Missile Command, Redstone Arsenal, AL, USA
Dragless Flight Control System for Flying Objects
Lawless, D. F., Inventor; 28 Nov 03; 10 pp.; In English
Patent Info.: Filed Filed 28 Nov 03; US-Patent-Appl-SN-10-722 629
Report No.(s): PB2007-102432; No Copyright; Avail.: CASI: A02, Hardcopy

The Dragless Flight Control System for Flying Objects utilizes paired fins that are mounted to rotate in opposite directions. When no lift is desired during the object's flight, the fins are completely retractable into their housings recessed into the body of the object. This minimizes the drag. The fins are set to a maximum no-stall angle relative to the body axis of the flying object. To provide lift and other flight controls, such as roll and yaw, the fins are selectively exposed outside the exterior skin of the flying object by being rotated on their axes, the two fins in a pair always being rotated in opposite directions. Varying the amount of exposed area of the counter-rotating fins can generate lift effect that is proportional to the exposed area and similar to that produced by current permanently extended standard rotational fins.
NTIS
Flight Control; Missiles; Patent Applications

20070020346 NASA Dryden Flight Research Center, Edwards, CA, USA
The NASA Dryden Flight Research Center Unmanned Aircraft System Service Capabilities
Bauer, Jeff; May 2007; 13 pp.; In English; Original contains color illustrations
Report No.(s): NASA/TM-2007-214619; H-2703; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020346

Over 60 years of Unmanned Aircraft System (UAS) expertise at the NASA Dryden Flight Research Center are being leveraged to provide capability and expertise to the international UAS community. The DFRC brings together technical experts, UAS, and an operational environment to provide government and industry a broad capability to conduct research, perform operations, and mature systems, sensors, and regulation. The cornerstone of this effort is the acquisition of both a Global Hawk (Northrop Grumman Corporation, Los Angeles, California) and Predator B (General Atomics Aeronautical Systems, Inc., San Diego, California) unmanned aircraft system (UAS). In addition, a test range for small UAS will allow developers to conduct research and development flights without the need to obtain approval from civil authorities. Finally, experts are available to government and industry to provide safety assessments in support of operations in civil airspace. These services will allow developers to utilize limited resources to their maximum capability in a highly competitive environment.
Author
Pilotless Aircraft; Flight Tests; Safety; Airspace

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.

20070019926 Illinois Univ. at Urbana-Champaign, Urbana, IL, USA
Anti-Icing Pavement Coating Study at Chicago O'Hare International Airport
Carroll, N. M.; Dempsey, B. J.; Mar. 2007; 39 pp.; In English
Report No.(s): PB2007-107857; No Copyright; Avail.: CASI: A03, Hardcopy

Airports generally use two common strategies for keeping snow and ice buildup on aircraft movement areas to a minimum. The practice of anti-icing is primarily preventive, where the formation or development of bonded snow and ice is minimized by timely applications of a chemical freezing-point depressant (FPD) in advance and sometimes during each winter precipitation event. Deicing on the other hand is a primarily reactive practice because the FPD is not applied until snow or ice has already accumulated and formed a bond to the pavement surface. There are advantages and disadvantages to both practices. Anti-icing has the potential of lower costs due to less chemical being used than in deicing; however, a more systematic approach is often needed. Deicing may demand less upfront planning but usually requires a larger quantity of FPD to work its way through the snow pack to reach the snow/pavement interface and destroy or weaken the bond. A promising new pavement coating claims to offer unique anti-icing characteristics that have the potential to reduce the costs and environmental impact associated with airport pavement anti-icing. The coating claims to require the application of less quantity of FPD chemical over multiple winter storm events compared to amounts necessary for typical airport pavement surfaces. The coating is a permanent treatment consisting of epoxy adhesive and porous aggregate chips applied to existing pavement surfaces. Additionally, the durability and friction characteristics of the coating are claimed to be comparable to typical airport pavements. The purpose of this study was to evaluate the effectiveness of the anti-icing coating in terms of its anti-icing performance compared to adjacent pavement surfaces that did not have the coating. In addition, the durability and friction characteristics of the coating were measured and observed over the course of the evaluation.
NTIS
Airports; Coating; Deicers; Depressants; Ice Prevention; Melting Points; Pavements; Runways

20070019927 William J. Hughes Technical Center, Atlantic City, NJ, USA
High-Octane and Mid-Octane Detonation Performance of Leaded and Unleaded Fuels in Naturally Aspirated, Piston, Spark Ignition Aircraft Engines
Atwood, D.; Mar. 2007; 48 pp.; In English
Report No.(s): PB2007-107858; No Copyright; Avail.: National Technical Information Service (NTIS)

The full-scale engine detonation performance of mid-and high-octane leaded and unleaded fuels were compared at the onset of light detonation in a naturally aspirated Lycoming IO540-K and a naturally aspirated Lycoming IO320-B engine. The fuels were stressed by performing both mixture lean-outs and by increasing the manifold pressure. The high-octane fuels (100 motor octane number (MON) and above) were tested in the IO540-K engine, and the mid-octane (91 to 95 MON fuels) were tested in the IO320B engine. For this testing, the MON was determined by ASTM International (ASTM) specification D 2700 and the supercharge rich rating was determined by ASTM D 909. A specially blended 100 low-lead (100 LL) aviation gasoline was tested. The 100 LL blend contained the maximum amount of allowable lead, while meeting the minimum MON of 100 and the minimum supercharge rich rating of 130 (described as 100/130 lead (L)), and met all current ASTM aviation gasoline specification D 910.
NTIS
Detonation; Fuels; Internal Combustion Engines; Octane Number; Piston Engines; Spark Ignition

20070020061 National Aerospace Lab., Amsterdam, Netherlands, William J. Hughes Technical Center, Atlantic City, NJ, USA, Monroney (Mike) Aeronautical Center, Oklahoma City, OK, USA, Hi-Tec Systems, Egg Harbor, NJ, USA
Study of Normal Operational Landing Performance on Subsonic, Civil, Narrow-Body Jet Aircraft During Instrument Landing System Approaches
van Es, G. W. H.; van der Geest, P. J.; Cheng, A.; Hackler, L.; Dillard, A. E.; Mar. 2007; 96 pp.; In English
Report No.(s): PB2007-107855; No Copyright; Avail.: National Technical Information Service (NTIS)

The need for improved capacity at airports to accommodate the rapid growth of domestic air traffic in the USA has led to the investigation of Land and Hold Short Operations (LAHSO) as a safe and feasible means to increase the traffic

flow.While the capacity issue becomes important, it is imperative that the increase in capacity does not lead to a safety decline. A key task was to investigate the aircraft landing performance pertaining to operational safety guidelines for reducing the risks of incidents and accidents associated with LAHSO. For this, a clear knowledge of the day-to-day landing operations is required. Data from quick-access recorders can be used to analyze aircraft performance. Aircraft landing field performance is influenced by many variables. Some variables were found to have a more dominating influence than others. Variables found to have a strong influence are height above the threshold, speed loss from flare initiation to touchdown, and the available runway length for landing. However, there is not one single factor that dominates the landing field performance. This study used in-flight recorded data collected from day-to-day landing operations obtained from the quick-access recorders from two types of narrow-body jet aircraft.
NTIS
Air Traffic; Aircraft Landing; Aircraft Performance; Airports; Instrument Landing Systems; Jet Aircraft

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.

20070019799 NASA Ames Research Center, Moffett Field, CA, USA
Development of a Prototype Automation Simulation Scenario Generator for Air Traffic Management Software Simulations
Khambatta, Cyrus F.; April 16, 2007; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WU 411931-02-61-01-03
Report No.(s): NASA/TM-2007-214550; A-070005; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070019799

A technique for automated development of scenarios for use in the Multi-Center Traffic Management Advisor (McTMA) software simulations is described. The resulting software is designed and implemented to automate the generation of simulation scenarios with the intent of reducing the time it currently takes using an observational approach. The software program is effective in achieving this goal. The scenarios created for use in the McTMA simulations are based on data taken from data files from the McTMA system, and were manually edited before incorporation into the simulations to ensure accuracy. Despite the software s overall favorable performance, several key software issues are identified. Proposed solutions to these issues are discussed. Future enhancements to the scenario generator software may address the limitations identified in this paper.
Author
Air Traffic Control; Prototypes; Computerized Simulation; Software Engineering; Air Transportation

20070019912 Florida Agricultural and Mechanical Univ., Tallahassee, FL, USA
Evaluation of the Dynamic Complex Modulus Test and Indirect Diametral Test for Implementing the AASHTO 2002 Design Guide for Pavement Structures in Florida
Ping, W. V.; Xiao, Y.; Jan. 2007; 253 pp.; In English
Report No.(s): PB2007-107861; OMNI-008664; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this project is the evaluation of the dynamic complex modulus test and indirect diametral test for implementing the AASHTO 2002 design guide for pavement structures in Florida.
NTIS
Dynamic Tests; Highways; Modules; Pavements; Transportation

20070019929 Transportoekonomisk Inst., Oslo, Norway
Reisevaner pa Fly 2005. (Norwegian Air Travel Survey, 2005.)
Denstadli, J. M.; Rideng, A.; Lian, J. I.; January 2006; 81 pp.; In Norwegian
Report No.(s): PB2007-108191; TOI-828/2006; Copyright; Avail.: National Technical Information Service (NTIS)

The report presents results from the 2005 Norwegian Air Travel Survey (ATS). Information from 91,581 passengers traveling on scheduled international and domestic flights have been collected and analyzed. During recent years the number

of international passengers traveling to and from Norwegian airports has increased substantially. Results from the ATS show that approximately 1.4 million Norwegians made one or more international flights in 2005, an increase by 300,000 in two years. The growth has primarily taken place within the leisure market. Leisure travel constitutes 60 percent of the market, compared to 56 percent in 2003. Increased competition and fare reductions are important factors behind these changes. Passengers traveling on domestic flights have also experienced price reductions during recent years, in particular within the business segment.
NTIS
Air Transportation; Norway; Surveys

20070020425 Civil Aerospace Medical Inst., Oklahoma City, OK, USA
Voluntary Aviation Safety Information-Sharing Process: Preliminary Audit of Distributed FOQA and ASAP Archives Against Industry Statement of Requirements
Chidester, Thomas R.; April 2007; 14 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): AM-AHRR521
Report No.(s): DOT/FAA/AM-07/7; No Copyright; Avail.: CASI: A03, Hardcopy

The Voluntary Aviation Safety Information-Sharing Process (VASIP) is designed to provide a means for the commercial aviation industry and the Federal Aviation Administration (FAA) to collect, share safety-related information, and to use that information to proactively identify, analyze, and correct safety issues that affect commercial aviation. The key to VASIP is the development of a technical process to extract de-identified safety data from any participating airline Flight Operations Quality Assurance (FOQA) or Aviation Safety Action Program (ASAP), aggregate it through a distributed database, and make it accessible to appropriate industry stakeholders for analysis. In 2004, the ASAP and FOQA Aviation Rulemaking Committees (ARCs) identified the National Aeronautics and Space Administration (NASA) as having the institutional background, resources, and personnel capable of developing this technical aggregation framework, as well as the analytical tools to support the process. Beginning in June of 2004, NASA led a collaborative partnership of participating airlines, employee organizations, and FAA representatives to define key components of archives of FOQA and ASAP data. This defined a set of functional requirements for archive development that were approved by the FOQA and ASAP ARCs. In October 2004, at the request of and with partial funding by the FAA, NASA initiated an Information Sharing Initiative under the Aviation Safety and Security Program to provide funds and oversight to develop distributed archiving and analysis. The basic infrastructure was deployed in January 2006, and data archiving began at participating airlines. The current document audits the hardware, software, and networking infrastructure against the original functional specifications provided by the ARCs to NASA.
Author
Aircraft Safety; Airline Operations; Civil Aviation; Data Bases; Flight Safety; Information Dissemination; Information Retrieval; Safety Management

20070020450 NASA Johnson Space Center, Houston, TX, USA
Panel Resource Management (PRM) Implementation and Effects within Safety Review Panel Settings and Dynamics
Taylor, Robert W.; Nash, Sally K.; [2007]; 5 pp.; In English; IAASS Meeting, 14-16 May 2007, Chicago, IL, USA; Copyright; Avail.: CASI: A01, Hardcopy

While technical training and advanced degree's assure proficiency at specific tasks within engineering disciplines, they fail to address the potential for communication breakdown and decision making errors familiar to multicultural environments where language barriers, intimidating personalities and interdisciplinary misconceptions exist. In an effort to minimize these pitfalls to effective panel review, NASA's lead safety engineers to the ISS Safety Review Panel (SRP), and Payload Safety Review Panel (PSRP) initiated training with their engineers, in conjunction with the panel chairs, and began a Panel Resource Management (PRM) program. The intent of this program focuses on the ability to reduce the barriers inhibiting effective participation from all panel attendees by bolstering participants confidence levels through increased communication skills, situational awareness, debriefing, and a better technical understanding of requirements and systems.
Author
Resources Management; Flight Safety; Education; Air Transportation

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 06 Avionics and Aircraft Instrumentation; 17 Space Communications, Spacecraft Communications, Command and Tracking; and 32 Communications and Radar.

20070019698 NASA Glenn Research Center, Cleveland, OH, USA
Secure, Autonomous, Intelligent Controller for Integrating Distributed Sensor Webs
Ivancic, William D.; May 2007; 14 pp.; In English; IEEE 2007 Aerospace Conference, 3-10 Mar. 2007, Big Sky, MT, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 430728.02.04.02.01
Report No.(s): NASA/TM-2007-214807; Paper Number 6.1104; E-15962; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070019698

This paper describes the infrastructure and protocols necessary to enable near-real-time commanding, access to space-based assets, and the secure interoperation between sensor webs owned and controlled by various entities. Select terrestrial and aeronautics-base sensor webs will be used to demonstrate time-critical interoperability between integrated, intelligent sensor webs both terrestrial and between terrestrial and space-based assets. For this work, a Secure, Autonomous, Intelligent Controller and knowledge generation unit is implemented using Virtual Mission Operation Center technology.
Author
Autonomy; Controllers; Protocol (Computers); Sensors; Communication Networks; Distributed Processing; Systems Integration

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

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

20070019862
Laboratory-Scale and Full-Scale Fire Testing of Lightweight Aircraft Seat Cushion Materials
Marker, T. R.; Mar. 2007; 49 pp.; In English
Report No.(s): PB2007-107856; No Copyright; Avail.: National Technical Information Service (NTIS)

Laboratory- and full-scale fire tests were conducted on a number of different types of aircraft seat cushion materials to determine the applicability of the current weight loss criteria specified in Title 14 Code of Federal Regulations Part 25.853(c)Appendix F Part II (herein referred to as Appendix F Part II) to new, very lightweight cushion designs. Cushion samples were initially tested in accordance with the current standard, and if they exceeded the 10% weight loss criteria, they were evaluated under full-scale fire test conditions. The full-scale tests were conducted with a modified narrow-body fuselage test article exposed to an adjacent fuel pan fire to simulate a severe but survivable postimpact cabin fire. Four triple-seat frames used to mount the cushion samples were installed inside the test article. Aircraft-grade honeycomb sidewall, ceiling panels, and carpet were also installed in the vicinity of the seat frames to simulate a realistic aircraft cabin. Laboratory-scale tests were completed on one set of standard fire-blocked cushions that met the current Appendix F Part II requirement, in addition to four lightweight materials. The standard fire-blocked cushions were then run under full-scale conditions to provide a baseline of the current level of fire safety, followed by full-scale tests of the four lightweight materials. Results indicated that several of the lightweight seat materials that failed the weight loss criteria specified in Appendix F Part II did not result in greater fire hazards than the baseline materials when tested under realistic full-scale conditions. A conservative adjustment to the current weight loss criteria was developed to allow the use of very lightweight seat cushion materials that exhibit acceptable fire performance.
NTIS
Cushions; Fire Prevention; Fires; Seats

20070019872 William J. Hughes Technical Center, Atlantic City, NJ, USA
Evaluation of the Reproducibility of the FAA Oil Burner Fire Test for Aircraft Seat Cushions
Cahill, P.; Mar. 2007; 19 pp.; In English
Report No.(s): PB2007-107859; No Copyright; Avail.: CASI: A03, Hardcopy

The Federal Aviation Administration oil burner round-robin fire tests were conducted on aircraft seat cushions to

determine the status of the test facilities that perform the tests. Two sets of fire-hardened foam and one set of fire-blocked foam testseat cushions were evaluated. The data showed that the weight loss and burn lengths were generally consistent in each individual laboratory. The most significant difference among all the laboratories was seen in the weight loss and burn lengths of the fire-blocked foam seat cushion. For two of the cushions there were a significant number of the laboratories that passed and failed the 10% average weight loss criteria.
NTIS
Burners; Cushions; Fires; Oils; Seats

20070019873 William J. Hughes Technical Center, Atlantic City, NJ, USA
End-Around Taxiway Screen Evaluation
Patterson, J. W.; Mar. 2007; 53 pp.; In English
Report No.(s): PB2007-107860; No Copyright; Avail.: CASI: A04, Hardcopy

The Federal Aviation Administration (FAA) Airport Safety Technology Research and Development Section was tasked to design and evaluate an end-around taxiway (EAT) visual screen to mask aircraft using the EAT. This evaluation effort was conducted to investigate the most conspicuous material, configuration, pattern, color, and lighting methods that would make the EAT visual screen visible to pilots operating on a runway equipped with an EAT. The visual screen should be visible during both daytime and nighttime conditions and should be adaptable for use at airports that have already constructed, or are planning to construct, this type of taxiway.This report describes the research, development, and evaluation efforts that were performed to determine the best design characteristics for the visual screen. The evaluation was conducted through a series of comparative evaluations at the Atlantic City International Airport, including a final evaluation involving pilots of various aviation backgrounds.
NTIS
Airports; Display Devices

20070020282, Advanced Ceramics Research, Inc., Tucson, AZ, USA
Water Soluble Tooling Materials for Composite Structures
Artz, G. J., Inventor; Lomabrdi, J. L., Inventor; Vaidyanathan, K. R., Inventor; Walish, J., Inventor; 14 Oct 04; 9 pp.; In English
Contract(s)/Grant(s): N68335-01-C-0053
Patent Info.: Filed Filed 14 Oct 04; US-Patent-Appl-SN-10-965 650
Report No.(s): PB2007-102433; No Copyright; Avail.: CASI: A02, Hardcopy

The present invention relates to a low density, water-soluble coring and tooling material used for the fabrication of composite parts. One aspect of the present invention relates to a lightweight, strong composite coring material that can be easily shaped and removed from cured composite parts. Another aspect of the present invention relates to a lightweight, strong composite tooling material that is easily tailored to provide a specific coefficient of thermal expansion and thermal conductivity, thus providing a tooling material that can be matched to the composite structure and material being fabricated.
NTIS
Composite Structures; Cores; Fabrication; Patent Applications; Tooling; Water

20070020406 NASA Dryden Flight Research Center, Edwards, CA, USA
Gliding Experiments of the Wright Brothers: The Wrights and Flight Research 1899-1908
Bowers, Albion H.; Hansen, Jennifer; Martin, Cam; April 27, 2007; 60 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020406

Viewgraphs showing glider experiments of the Wright Brothers from 1899-1908 is presented.
CASI
Gliders; Flight Tests; Aerodynamics; Histories; Aircraft Design

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.

20070019934 BBWI, Idaho Falls, ID, USA, Honeywell International, Inc., Morristown, NJ, USA
Low Profile Tension Style Flexible Joint
Frost, C., Inventor; Kubher, D. D., Inventor; 26 Mar 04; 13 pp.; In English
Contract(s)/Grant(s): N0001902C3002
Patent Info.: Filed Filed 26 Mar 04; US-Patent-Appl-SN-10-810 456
Report No.(s): PB2007-105310; No Copyright; Avail.: CASI: A03, Hardcopy

A low profile tension style flexible joint for pneumatic ducting may be useful as, for example, a joint for aircraft engine pneumatic ducting. The joint of the present invention may be used at both ends of a duct that passes high temperature (up to about 1200.degree. F.) and high pressure (up to about 110 psia) compressor air to the combustor of a turbomachine. Some turbomachines, such as the turbo engine of a jet-powered aircraft, require a very short curved duct to fit into an unusually small aircraft installation envelope. Moreover, these installations also require those features found in conventional flex joints, including being able to support the axial load inherent in pressurized ducting systems. Unlike conventional flexible joints, such as ball joints, gimble joints and pressure compensated joints, the low profile tension style flexible joint of the present invention provides a low profile, low weight design with the ability to support the axial load inherent in pressurized ducting systems. NTIS

Ducts; Patent Applications; Pneumatics

08
AIRCRAFT STABILITY AND CONTROL

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

20070020410 Civil Aerospace Medical Inst., Oklahoma City, OK, USA
An Assessment of Pilot Control Interfaces for Unmanned Aircraft
Williams, Kevin W.; April 2007; 16 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): AM-AHRR521
Report No.(s): DOT/FAA/AM-07/8; No Copyright; Avail.: CASI: A03, Hardcopy

An inventory of control systems for unmanned aircraft was completed for 15 systems from nine separate manufacturers. To complete the inventory, a taxonomy of control architectures was developed. The taxonomy identified four levels of horizontal aircraft control, four levels of vertical control, and three levels of speed control. The most automated level of control was a waypoint-level that was found to be present in all of the systems inventoried. Implications of these levels of control on design are discussed.

Author

Aircraft Control; Pilotless Aircraft; Automatic Flight Control

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*.

20070020056 Shimokaji and Associates P.C., Irvine, CA, USA, Boeing Co., Downey, CA, USA
Variable Structure Diagnostics Approach Achieving Optimized Low-Frequency Data Sampling for EMA Motoring Systems
Chang, J., Inventor; Keller, K., Inventor; Wang, A., Inventor; Ziang, J., Inventor; 23 Mar 04; 13 pp.; In English
Contract(s)/Grant(s): F336150332306

Patent Info.: Filed Filed 23 Mar 04; US-Patent-Appl-SN-10-807 645
Report No.(s): PB2007-105308; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides a diagnostics methodology and embedded electronic system that allows optimized low-frequency data sampling for EMA motoring subsystems in an operating vehicle. Each of the EMA motoring subsystems includes: an EMA; at least one motor for driving the EMA; and power controls for operating the motor, wherein the power controls includes a DSP controller for sampling and processing data at low-frequency sampling rates. The diagnostic methodology includes a method that has the steps of: determining an operational mode of the EMA motoring subsystem; selecting a sampling rate optimized for the determined operational mode; acquiring and processing data at the selected sampling rate; and analyzing the processed data to identify and classify a fault of the EMA motoring subsystem.
NTIS
Actuators; Data Sampling; Diagnosis; Electric Motors; Electric Power Supplies; Low Frequencies; Patent Applications

20070020150 Botts (Baker), LLP, Dallas, TX, USA, Raytheon Co., Arlington, VA, USA
Data Monitoring and Recovery
Barnhart, R. C., Inventor; Schnaidt, D. V., Inventor; Milani, M. C., Inventor; Schreiler, J. B., Inventor; 12 Apr 04; 13 pp.; In English
Contract(s)/Grant(s): 097992CD8914
Patent Info.: Filed Filed 12 Apr 04; US-Patent-Appl-SN-10-822 606
Report No.(s): PB2007-105862; No Copyright; Avail.: CASI: A03, Hardcopy

In one embodiment, a method for DMR includes generating first tracking reports of first data units received at one or more receptors from one or more remote units, generating second tracking reports of first data units received at one of one or more centrals, and generating delivery reports of second data units extracted at the central from the first data units received at the central. The method includes, using the delivery reports, identifying missing second data units that should have been received at the central, but were not. The method includes, using one or more of the tracking reports, mapping the missing second data units to one or more first data units and determining a best source for retransmission of the first data units mapped to the missing second data units. The method includes generating a retransmit request for the first data units mapped to the missing second data units and communicating the retransmit request to the best source.
NTIS
Patent Applications; Data Structures; Communicating; Identifying

20070020343 Science Applications International Corp., Houston, TX, USA
EVA Hazards due to TPS Inspection and Repair
Stewart, Christine E.; May 16, 2007; 29 pp.; In English; 2nd IAASS Conference, 14-16 May 2007, Chicago, IL; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020343

Tile inspection and repair activities have implicit hazards associated with them. When an Extra Vehicular Activities (EVA) crewmember and associated hardware are added into the equation, additional hazards are introduced. Potential hazards to the Extravehicular Mobility Unit (EMU), the Orbiter or the crew member themselves are created. In order to accurately assess the risk of performing a TPS inspection or repair, an accurate evaluation of potential hazards and how adequately these hazards are controlled is essential. The EMU could become damaged due to sharp edges, protrusions, thermal extremes, molten metal or impact with the Orbiter. Tools, tethers and the presence of a crew member in the vicinity of the Orbiter Thermal Protection System (TPS) pose hazards to the Orbiter. Hazards such as additional tile or Reinforced Carbon-Carbon (RCC) damage from a loose tool, safety tethers, crewmember or arm impact are introduced. Additionally, there are hazards to the crew which should be addressed. Crew hazards include laser injury, electrical shock, inability to return to the airlock for EMU failures or Orbiter rapid safing scenarios, as well as the potential inadvertent release of a crew member from the arm/boom. The aforementioned hazards are controlled in various ways. Generally, these controls are addressed operationally versus by design, as the majority of the interfaces are to the Orbiter and the Orbiter design did not originally account for tile repair. The Shuttle Remote Manipulator System (SRMS), for instance, was originally designed to deploy experiments, and therefore has insufficient design controls for retention of the Orbiter Boom Sensor System (OBSS). Although multiple methods to repair the Orbiter TPS exist, the majority of the hazards are applicable no matter which specific repair method is being performed. TPS Inspection performed via EVA also presents some of the same hazards. Therefore, the hazards common to all TPS inspection or repair methods will be addressed.
Author
Extravehicular Activity; Hazards; Inspection; Thermal Protection; Tiles; Spacecraft Maintenance; Space Shuttle Orbiters

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*.

20070019775 NASA Marshall Space Flight Center, Huntsville, AL, USA
Ares V an Enabling Capability for Future Space Astrophysics Missions
Stahl, H. Philip; [2007]; 17 pp.; In English; Workshop on Science Associated with Lunar Exploration Architecture, 27 Feb. - 2 Mar. 2007, Tempe, AZ, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070019775

The potential capability offered by an Ares V launch vehicle completely changes the paradigm for future space astrophysics missions. This presentation examines some details of this capability and its impact on potential missions. A specific case study is presented: implementing a 6 to 8 meter class monolithic UV/Visible telescope at an L2 orbit. Additionally discussed is how to extend the mission life of such a telescope to 30 years or longer.
Author
Ares 5 Cargo Launch Vehicle; Astrophysics; Space Missions; Launch Vehicle Configurations; Telescopes

20070019778 NASA Marshall Space Flight Center, Huntsville, AL, USA
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies
Arnold William; Baysinger, Mike; Crane, Tracie; Capizzo, Pete; Sutherlin, Steven; Dankanich, John; Woodcock, Gordon; Edlin, George; Rushing, Johnny; Fabisinski, Leo; Jones, David; McKamey, Steve; Thomas, Scott; Maccone, Claudio; Matloff, Greg; Remo, John; [2007]; 35 pp.; In English; 2007 Planetary Defense Conference, 5-8 Mar. 2007, Washington, DC, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This work documents the advancements in MSFC threat modeling and mitigation technology research completed since our last major publication in this field. Most of the work enclosed here are refinements of our work documented in NASA TP-2004-213089. Very long development times from start of funding (10-20 years) can be expected for any mitigation system which suggests that delaying consideration of mitigation technologies could leave the Earth in an unprotected state for a significant period of time. Fortunately there is the potential for strong synergy between architecture requirements for some threat mitigators and crewed deep space exploration. Thus planetary defense has the potential to be integrated into the current U.S. space exploration effort. The number of possible options available for protection against the NEO threat was too numerous for them to all be addressed within the study; instead, a representative selection were modeled and evaluated. A summary of the major lessons learned during this study is presented, as are recommendations for future work.
Author
Near Earth Objects; Space Exploration; Technology Utilization; Avionics; Ares 1 Launch Vehicle; Ares 5 Cargo Launch Vehicle

20070020455 NASA Marshall Space Flight Center, Huntsville, AL, USA
From ESAS to Ares: A Chronology
Cook, Steven A.; February 06, 2007; 18 pp.; In English; NASA's Program Manager's Challenge, 5-7 Feb. 2007, Galveston, TX, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020455

This viewgraph presentation reviews the decision making that led to the choice of the Ares launch vehicle. There are charts that show comparisons of the features of the ESAS launch vehicles. There is discussion of the rationale of the choice of using a Evolved Expendable Launch Vehicle (EELV) as the launch vehicle for the future Crew Exploration Vehicle.
CASI
Decision Making; Launch Vehicles; Ares 1 Launch Vehicle; Spacecraft Launching

20070020526 NASA Langley Research Center, Hampton, VA, USA
On the Use of 3dB Qualification Margin for Structural Parts on Expendable Launch Vehicles
Yunis, Isam; [2007]; 9 pp.; In English; 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 23-26 Apr. 2007, Waikiki, HI, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 604746.02.06.04.04; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020526

The standard random vibration qualification test used for Expendable Launch Vehicle components is Maximum Predicted

Environment (MPE) + 6dB for a duration of 4 times the service life of the part. This can be a severe qualification test for these fatigue-sensitive structures. This paper uses flight data from several launch vehicles to establish that reducing the qualification approach to MPE+3dB for the duration of the peak environment (1x life) is valid for fatigue-sensitive structural components. Items that can be classified as fatigue-sensitive are probes, ducts, tubing, bellows, hoses, and any non-functional structure. Non-functional structure may be flight critical or carry fluid, but it cannot include any moving parts or electronics. This reduced qualification approach does not include primary or secondary structure which would be exclusively designed by peak loads, either transient or quasi-static, that are so large and of so few cycles as to make fatigue a moot point.
Author
Launch Vehicles; Random Vibration; Fatigue (Materials); Components; Structural Members

16
SPACE TRANSPORTATION AND SAFETY

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

20070019868 NASA Johnson Space Center, Houston, TX, USA
Comparison of the Exclusion Volume and Probability Threshold Methods of Debris Avoidance for the STS Orbiter
Foster, J. L.; Frisbee, J. H.; May 2007; 32 pp.; In English
Report No.(s): NASA/TP-2007-214751; S-1001; Copyright; Avail.: CASI: A03, Hardcopy

Both the 'exclusion volume' and 'maneuver threshold' methods have been carefully investigated by performing detailed calculations of debris risk over time and debris avoidance maneuver rate for the Space Transportation System Orbiter and the International Space Station. The underlying mathematics of the two methods is identical. Also, conjunction screening is based upon an exclusion volume; the efficiency of the screening exclusion volume is the limiting efficiency of the debris avoidance process, whether the threshold method or the exclusion box method is employed in the final decision process. This analysis shows the threshold method to have the advantages of somewhat better risk reduction and far fewer maneuvers. All computations are based on empirically determined covariance distributions for STS and the orbital debris population. The covariance of the ISS is assumed to be that of an orbital debris object, subject to the same atmospheric drag as the ISS. State vector covariances for STS were determined from recent tracking data for 2, 4, 8, and 12-hour propagation times for low, moderate, and high vehicle activity. These covariances were combined with the debris covariances, to determine the maneuver rate and fractional residual risk associated with different screening box shapes and sizes and different collision probability maneuver thresholds.
Author
International Space Station; Space Transportation System; Space Debris; Probability Theory; Space Shuttle Orbiters; Avoidance

20070020452 NASA White Sands Test Facility, NM, USA
Oxygen Concentration Flammability Threshold Tests for the Constellation Program
Williams, James H.; [2007]; 4 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020452

CEV atmosphere will likely change because craft will be used as LEO spacecraft, lunar spacecraft, orbital spacecraft. Possible O2 % increase and overall pressure decrease pressure vessel certs on spacecraft. Want 34% minimum threshold. Higher, better when atmosphere changes. WSTF suggests testing all materials/components to find flammability threshold, pressure and atmosphere.
Author
Oxygen; Flammability; Low Earth Orbits; Lunar Spacecraft

20070020498 NASA Johnson Space Center, Houston, TX, USA
Optical Studies of Space Debris at GEO: Survey and Follow-up with Two Telescopes
Seitzer, P.; Abercomby, K. J.; Rodriquez, H. M.; Barker, E. S.; [2007]; 2 pp.; In English; 2007 AMOS Technical Conference, 12-15 Sep. 2007, Maui, HI, USA; Copyright; Avail.: CASI: A01, Hardcopy

For 14 nights in March 2007, we used two telescopes at the Cerro Tololo Inter-American Observatory (CTIO) in Chile

to study the nature of space debris at Geosynchronous Earth Orbit (GEO). In this project one telescope was dedicated to survey operations, while a second telescope was used for follow-up observations for orbits and colors. The goal was to obtain orbital and photometric information on every faint object found with the survey telescope. Thus we concentrate on objects fainter than R = 15th magnitude.
Author
Geosynchronous Orbits; Space Debris; Surveys; Near Earth Objects

17
SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

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

20070019858 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Co-axial Joint Technology Applied to Antenna Backup Structures
Reynolds, Glenn A.; Feria, V. Alfonso; Curtis, Gary N.; Hackbarth, Dean R.; Sehic, Asim; June 21, 2004; 12 pp.; In English; Telescopes and Instrumentation, 21-25 Jun. 2004, Glasgow, Scotland, UK; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40001

The increasing demand to improve focusing accuracy and to accommodate higher frequencies in space communications and radio astronomy has created significant challenges for improving the capability of the constituent systems in radio antennas and telescopes. One important system is the radio antenna/telescope backup structure connections. The backup structure is a key element in providing a stable, precise and rigid support for the reflective surface. The ideal connection for these types of structures is rigid and concentric resulting in minimal deformation with stress/strain curves that are linear, repeatable and exhibiting no hysteresis over the entire service load range. Conceivably such a connection could be designed so that the stress/strain curve mimics the stress/strain characteristics of the connecting member in both tension and compression. When this is achieved then such joints can be said to be 'invisible' in the global behavior of the backup structure. At that point, overall reflector deflection becomes more linear and highly predictable. In conjunction with this advantage, optimized backup structure geometries, adaptive reflectors and compensating algorithms can best be applied in producing an instrument of unparalleled performance. This paper introduces Co-Axial Joint (CAJ) technology as the practical and economical means to produce an invisible connection.
Author
Antenna Arrays; Radio Antennas; Antenna Components; Connectors; Loads (Forces); Hysteresis; Space Communication

20070020010 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Use of the 37-38 GHz and 40-40.5 GHz Ka-bands for Deep Space Communications
Morabito, David; Hastrup, Rolf; September 30, 2004; 8 pp.; In English; 10th Ka and Broadband Communications Conference, 30 Sep. - 2 Oct. 2004, Vicenza, Italy; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39999

This paper covers a wide variety of issues associated with the implementation and use of these frequency bands for deep space communications. Performance issues, such as ground station pointing stability, ground antenna gain, antenna pattern, and propagation effects such as due to atmospheric, charged-particle and space loss at 37 GHz, will be addressed in comparison to the 32 GHz Ka-band deep space allocation. Issues with the use of and competition for this spectrum also will be covered. The state of the hardware developed (or proposed) for operating in this frequency band will be covered from the standpoint of the prospects for achieving higher data rates that could be accommodated in the available bandwidth. Hardware areas to be explored include modulators, digital-to-analog converters, filters, power amplifiers, receivers, and antennas. The potential users of the frequency band will be explored as well as their anticipated methods to achieve the potential high data rates and the implications of the competition for bandwidth.
Author
Space Communication; Extremely High Frequencies; Bandwidth; Deep Space; Antenna Gain; Antenna Radiation Patterns; Charged Particles

20070020013 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Real-time Sub-cm Differential Orbit Determination of two Low-Earth Orbiters with GPS Bias Fixing

Wu, Sien-Chong; Bar-Sever, Yoaz E.; September 26, 2006; 8 pp.; In English; Institute of Navigation GNSS 2006, 26-29 Sep. 2006, Fort Worth, TX, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources ONLINE: http://hdl.handle.net/2014/39903

An effective technique for real-time differential orbit determination with GPS bias fixing is formulated. With this technique, only real-time GPS orbits and clocks are needed (available from the NASA Global Differential GPS System with 10-20 cm accuracy). The onboard, realtime orbital states of user satellites (few meters in accuracy) are used for orbit initialization and integration. An extended Kalman filter is constructed for the estimation of the differential orbit between the two satellites as well as a reference orbit, together with their associating dynamics parameters. Due to close proximity of the two satellites and of similar body shapes, the differential dynamics are highly common and can be tightly constrained which, in turn, strengthens the orbit estimation. Without explicit differencing of GPS data, double-differenced phase biases are formed by a transformation matrix. Integer-valued fixing of these biases are then performed which greatly strengthens the orbit estimation. A 9-day demonstration between GRACE orbits with baselines of approx.200 km indicates that approx.80% of the double-differenced phase biases can successfully be fixed and the differential orbit can be determined to approx.7 mm as compared to the results of onboard K-band ranging.

Author

Global Positioning System; Geosynchronous Orbits; Real Time Operation; Orbit Determination; Earth Orbits

20070020345 NASA Johnson Space Center, Houston, TX, USA

NASA Bluetooth Wireless Communications

Miller, Robert D.; May 09, 2007; 18 pp.; In English; Symposium for Space Applications of Wireless and RFID, 8-9 May 2007, Houston, TX, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy ONLINE: http://hdl.handle.net/2060/20070020345

NASA has been interested in wireless communications for many years, especially when the crew size of the International Space Station (ISS) was reduced to two members. NASA began a study to find ways to improve crew efficiency to make sure the ISS could be maintained with limited crew capacity and still be a valuable research testbed in Low-Earth Orbit (LEO). Currently the ISS audio system requires astronauts to be tethered to the audio system, specifically a device called the Audio Terminal Unit (ATU). Wireless communications would remove the tether and allow astronauts to freely float from experiment to experiment without having to worry about moving and reconnecting the associated cabling or finding the space equivalent of an extension cord. A wireless communication system would also improve safety and reduce system susceptibility to Electromagnetic Interference (EMI). Safety would be improved because a crewmember could quickly escape a fire while maintaining communications with the ground and other crewmembers at any location. In addition, it would allow the crew to overcome the volume limitations of the ISS ATU. This is especially important to the Portable Breathing Apparatus (PBA). The next generation of space vehicles and habitats also demand wireless attention. Orion will carry up to six crewmembers in a relatively small cabin. Yet, wireless could become a driving factor to reduce launch weight and increase habitable volume. Six crewmembers, each tethered to a panel, could result in a wiring mess even in nominal operations. In addition to Orion, research is being conducted to determine if Bluetooth is appropriate for Lunar Habitat applications.

Author

Wireless Communication; International Space Station; Low Earth Orbits; Habitats; Breathing Apparatus; Audio Equipment

18
SPACECRAFT DESIGN, TESTING AND PERFORMANCE

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

20070019857 NASA Johnson Space Center, Houston, TX, USA

EXPRESS Pallet Payload Interface Requirements

Holt, Alan C.; August 19, 2004; 14 pp.; In English; X-ray Source Based Navigation Industry Day, 19 August 2004, Arlington, VA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy ONLINE: http://hdl.handle.net/2060/20070019857

A viewgraph presentation describing the EXPRESS Pallet Space Station payload interface requirements is shown. The

topics include: 1) External Payload Sites; 2) EXPRESS Pallet with Six Payload Envelopes; 3) EXPRESS Pallet in Payload Bay Representative Layout; 4) EXPRESS Pallet Installation SSRMS positions pallet for PAS mating on S3 truss; 5) EXPRESS Pallet Major Components; 6) EXPRESS Pallet Adapter; 7) EXPRESS Pallet Center Location Payload Envelope; 8) Envelope Restriction for EXPRESS Pallet Corner Payload Locations; 9) EXPRESS Pallet-PAS Truss Configuration; and 10) EXPRESS Pallet Payload Services and Specifications.
CASI
Payloads; Trusses; Requirements; Space Shuttles; International Space Station

20070020009 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mid-frequency Band Dynamics of Large Space Structures
Coppolino, Robert N.; Adams, Douglas S.; August 2, 2004; 12 pp.; In English; 49th International Symposium on Optical Science and Technology Annual Meeting, 2-6 Aug. 2004, Denver, CO, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39952

High and low intensity dynamic environments experienced by a spacecraft during launch and on-orbit operations, respectively, induce structural loads and motions, which are difficult to reliably predict. Structural dynamics in low- and mid-frequency bands are sensitive to component interface uncertainty and non-linearity as evidenced in laboratory testing and flight operations. Analytical tools for prediction of linear system response are not necessarily adequate for reliable prediction of mid-frequency band dynamics and analysis of measured laboratory and flight data. A new MATLAB toolbox, designed to address the key challenges of mid-frequency band dynamics, is introduced in this paper. Finite-element models of major subassemblies are defined following rational frequency-wavelength guidelines. For computational efficiency, these subassemblies are described as linear, component mode models. The complete structural system model is composed of component mode subassemblies and linear or non-linear joint descriptions. Computation and display of structural dynamic responses are accomplished employing well-established, stable numerical methods, modern signal processing procedures and descriptive graphical tools. Parametric sensitivity and Monte-Carlo based system identification tools are used to reconcile models with experimental data and investigate the effects of uncertainties. Models and dynamic responses are exported for employment in applications, such as detailed structural integrity and mechanical-optical-control performance analyses.
Author
Large Space Structures; Dynamic Structural Analysis; Prediction Analysis Techniques; Structural Failure; Spacecraft Launching; Linear Systems; Dynamic Response; Flight Tests; Optical Control; Low Frequencies

20070020335 Barrios Technology, Inc., Houston, TX, USA, NASA Johnson Space Center, Houston, TX, USA
Investigation of MMOD Impact on Shuttle Payload Bay Door Radiator
Hyde, J. L.; Christiansen, E. L.; Kerr, J. H.; Lear, D. M.; Bernhard, R. P.; Lyons, F.; [2007]; 1 pp.; In English; Hypervelocity Impact Symposium, 23-27 September 2007, Williamsburg, VA, USA; Copyright; Avail.: Other Sources; Abstract Only

Post flight inspections on the Space Shuttle Atlantis conducted after the STS-115 mission revealed a 0.11 inch (2.8 mm) hole in the outer facesheet of the starboard payload bay door radiator panel #4. This hole is the possible result of micrometeoroid/orbiting debris (MMOD) impact. The payload bay door radiators in this region are 0.5 inch (12.7 mm) thick aluminum honeycomb with 0.011 in (0.279 mm) thick aluminum facesheets topped with 0.005 in (0.127 mm) silver-Teflon tape. Inner facesheet damage included a 0.267 in (6.78 mm) long through crack with measurable deformation in the area of 0.2 in (5.1 mm). There was also a 0.031 in (0.787 mm) diameter hole in the rear facesheet. A large approximately 1 in (25 mm) diameter region of honeycomb was also destroyed. Since the radiators are located on the inside of the shuttle payload bay doors which are closed during ascent and reentry, the damage could only have occurred during the on-orbit portion of the mission. This paper will document the data collected from the impact site and will include results of the SEM/EDX analysis. Evidence will be presented that suggests a source of the impact as well as an analysis of the impact site features that indicate projectile directionality. Results of hypervelocity impact testing on representative samples in an attempt to simulate the impact event will be presented and discussed. Finally, the results of a study showing the regions of the orbiter vehicle that would be vulnerable to an equivalent projectile will be given.
Author
Honeycomb Structures; Impact Tests; Space Shuttles; Composite Structures

20070020416 NASA Johnson Space Center, Houston, TX, USA

Developing the Parachute System for NASA's Orion: An Overview at Inception

Machin, Ricardo; Taylor, Anthony P.; Royall, Paul; 2007; 16 pp.; In English; 19th AIAA Aerodynamic Decelerator Systems, 21-24 May 2007, Williamsburg, VA, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 644423.06.03.22.10; Copyright; Avail.: CASI: A03, Hardcopy

As the Crew Exploration Vehicle (CEV) program developed, NASA decided to provide the parachute portion of the landing system as Government Furnished Equipment (GFE) and designated NASA Johnson Space Center (JSC) as the responsible NASA center based on JSC s past experience with the X-38 program. JSC subsequently chose to have the Engineering Support contractor Jacobs Sverdrup to manage the overall program development. After a detailed source selection process Jacobs chose Irvin Aerospace Inc (Irvin) to provide the parachutes and mortars for the CEV Parachute Assembly System (CPAS). Thus the CPAS development team, including JSC, Jacobs and Irvin has been formed. While development flight testing will have just begun at the time this paper is submitted, a number of significant design decisions relative to the architecture for the manned spacecraft will have been completed. This paper will present an overview of the approach CPAS is taking to providing the parachute system for CEV, including: system requirements, the preliminary design solution, and the planned/completed flight testing.

Author

Crew Exploration Vehicle; Flight Tests; Landing Aids; X-38 Crew Return Vehicle

20070020422 NASA Glenn Research Center, Cleveland, OH, USA

An Overview of Space Power Systems for NASA Missions

Lyons, Valerie J.; Scott, John H.; [2007]; 16 pp.; In English; Energy Conversion Engineering Conference, 25-27, 2007, Saint Louis, MO, USA; Original contains color illustrations

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

ONLINE: http://hdl.handle.net/2060/20070020422

Power is a critical commodity for all engineering efforts and is especially challenging in the aerospace field. This paper will provide a broad brush overview of some of the immediate and important challenges to NASA missions in the field of aerospace power, for generation, energy conversion, distribution, and storage. NASA s newest vehicles which are currently in the design phase will have power systems that will be developed from current technology, but will have the challenges of being light-weight, energy-efficient, and space-qualified. Future lunar and Mars 'outposts' will need high power generation units for life support and energy-intensive exploration efforts. An overview of the progress in concepts for power systems and the status of the required technologies are discussed.

Author

Spacecraft Power Supplies; Life Support Systems; NASA Programs; Energy Conversion

20070020457 NASA Johnson Space Center, Houston, TX, USA

ISS Debris Avoidance Maneuver Threshold Analysis

Foster, J. L., Jr.; Wortham, M. B.; Frisbee, J. H., Jr.; May 2007; 48 pp.; In English

Report No.(s): NASA/TP-2007-214752; S-1002; Copyright; Avail.: CASI: A03, Hardcopy

The decision for the International Space Station to perform a maneuver to avoid orbital debris will be based upon a predicted collision probability. The collision probability will be calculated using real-time best estimates of the debris and ISS position state and position error covariance, propagated to the anticipated time of conjunction, or time of closest approach (TCA). If the computed collision probability exceeds a threshold value, the Red Threshold, a maneuver will be performed unless prevented by other operational considerations. The debris position and its uncertainty, propagated to TCA, will be supplied by USA Space Command, by processing observations from its Space Surveillance Network. Given the distribution of position errors for a space vehicle and the debris population, it is possible to calculate both the anticipated maneuver rate and the residual risk resulting from the choice of a maneuver threshold. The lower the probability threshold, the more maneuvers will be performed. However, no matter how many maneuvers are performed, risk can never be completely eliminated. Further, the performance of a debris avoidance maneuver disrupts the operation of the ISS micro-gravity laboratory and also complicates altitude management for ISS. Clearly the need is to achieve the maximum possible risk reduction while maintaining a sustainable maneuver rate.

Author

International Space Station; Space Debris; Spacecraft Maneuvers; Collision Avoidance; Numerical Analysis

19
SPACECRAFT INSTRUMENTATION AND ASTRIONICS

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

20070020193 NASA Langley Research Center, Hampton, VA, USA, College of William and Mary, Williamsburg, VA, USA
Automated On-board Terrain Analysis for Precision Landings
Rahman, Zia-ur; Jobson, Daniel J.; Woodell, Glenn A.; Hines, Glenn D.; Proceedings of SPIE; May 12, 2006; 6246, pp. 1-13; In English; Visual Information Processing XV, 18-19 April 2006, Kissimmee, FL, USA
Contract(s)/Grant(s): NNL04AA02A; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1117/12.664605

Advances in space robotics technology hinge to a large extent upon the development and deployment of sophisticated new vision-based methods for automated in-space mission operations and scientific survey. To this end, we have developed a new concept for automated terrain analysis that is based upon a generic image enhancement platform-multi-scale Retinex (MSR) and visual servo (VS) processing. This pre-conditioning with the MSR and the VS produces a 'canonical' visual representation that is largely independent of lighting variations, and exposure errors. Enhanced imagery is then processed with a biologically inspired two-channel edge detection process, followed by a smoothness based criteria for image segmentation. Landing sites can be automatically determined by examining the results of the smoothness-based segmentation which shows those areas in the image that surpass a minimum degree of smoothness. Though the MSR has proven to be a very strong enhancement engine, the other elements of the approach, the VS, terrain map generation, and smoothness-based segmentation, are in early stages of development. Experimental results on data from the Mars Global Surveyor show that the imagery can be processed to automatically obtain smooth landing sites. In this paper, we describe the method used to obtain these landing sites, and also examine the smoothness criteria in terms of the imager and scene characteristics. Several examples of applying this method to simulated and real imagery are shown.
Author
Robotics; Image Enhancement; Terrain Analysis; Imaging Techniques; Edge Detection; Landing Sites; Aerospace Engineering

20070020429 NASA Marshall Space Flight Center, Huntsville, AL, USA
Radiation-Hardened Electronics for the Space Environment
Keys, Andrew S.; Watson, Michael D.; March 22, 2007; 23 pp.; In English; Government Microcircuit Applications and Critical Technology Conference (GOMACTech)- US Citizen-only audience, 19-22 mar. 2007, Lake Buena Vista, FL, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020429

RHESE covers a broad range of technology areas and products. - Radiation Hardened Electronics - High Performance Processing - Reconfigurable Computing - Radiation Environmental Effects Modeling - Low Temperature Radiation Hardened Electronics. RHESE has aligned with currently defined customer needs. RHESE is leveraging/advancing SOA space electronics, not duplicating. - Awareness of radiation-related activities through out government and industry allow advancement rather than duplication of capabilities.
Derived from text
Aerospace Environments; Radiation Effects; Electronics; Low Temperature; Temperature Effects; Environment Effects

20070020432 Wyle Labs., Inc., Houston, TX, USA
Volatile Organic Analyzer (VOA) in 2006: Repair, Revalidation, and Restart of Elektron Even
Limero, Thomas; [2007]; 1 pp.; In English; 16th International Conference on Ion Mobility, 22-26 Jul. 2007, Mikkeli, Finland; No Copyright; Avail.: Other Sources; Abstract Only

The Volatile Organic Analyzer (VOA) had been providing valuable data on trace contaminants in the atmosphere of the International Space Station (ISS) from January 2002 through May 2003. Component temperature errors, detected by the VOA s software, shut down the unit in May 2003, but in early 2005 on orbit diagnostics verified fuse failures had disabled both VOA channels. An in-flight maintenance (IFM) session in December 2005 returned the VOA to an operational mode by January

2006. This paper will present the on-orbit data from 2006 that were used to revalidate the VOA, and provide an overview of the VOA's contributions during the Elecktron contingency event that occurred on ISS in September 2006.
Author
Trace Contaminants; International Space Station; Diagnosis; Errors

20
SPACECRAFT PROPULSION AND POWER

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

20070019829 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Development of New Modeling and Analysis Tools for Solar Sails
Lou, Michael; Fang, Houfei; Yang, Bingen; August 16, 2004; 9 pp.; In English; AIAA Guidance, Navigation and Control Conference, 16 Aug. 2004, Providence, RI, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39971

Existing finite-element-based structural analysis codes are ineffective in treating deployable gossamer space systems, including solar sails that are formed by long space-deployable booms and extremely large thin-film membrane apertures. Recognizing this, the NASA Space transportation Technology Program has initiated and sponsored a focused research effort to develop new and computationally efficient structural modeling and analysis tools for solar sails. The technical approach of this ongoing effort will be described. Two solution methods, the Distributed Transfer Function Method and the Parameter-Variation-Principle method, based on which the technical approach was formatted are also discussed.
Author
Solar Sails; Structural Analysis; Finite Element Method; Aerospace Systems

20070020444 NASA Johnson Space Center, Houston, TX, USA
Certification Process for Commercial Batteries for Payloads
Jeevarajan, Judith; May 2007; 31 pp.; In English; 2nd IAASS Conference, 14-17 May 2007, Chicago, IL, USA; Original contains color illustrations
Contract(s)/Grant(s): 667560.05.02; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020444

This viewgraph document reviews the use of electric batteries in space applications. Batteries are high energy devices that are used to power hardware for space applications The applications include IVA (Intra-Vehicular Activity) and EVA (Extra-Vehicular Activity) use. High energy batteries pose hazards such as cell/battery venting leading to electrolyte (liquid or gas) leakage, high temperatures, fire and explosion (shrapnel). It reviews the process of certifying of Commercial batteries for space applications in view of the multi-national purchasing for the International Space Station. The documentation used in the certification is reviewed.
CASI
Electric Batteries; Technology Utilization; Commercial Off-the-Shelf Products; Certification; Quality Control

20070020449 NASA Johnson Space Center, Houston, TX, USA
Propellant Analysis and Distillation Unit Design
Barragan, Michelle H.; Spangler, Cindy; Barrera, Louis K.; [2007]; 20 pp.; In English; 2nd IAASS Conference Space Safety in Global World, 14-16 May 2007, Chicago, IL, USA; Original contains color illustrations
Report No.(s): WSTF#PAP-07-0164; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020449

The NASA White Sands Test Facility (WSTF) routinely operates hypergolic propulsion systems. Some of the onsite activities include performing long duration studies on the operational life of these systems. A few of them have been in use for over twenty years. During this span of time contamination has built up in the propellant and some of the distribution

infrastructure. This study investigated the nature of this contamination, the pathology of its generation, and developed a process for removal of the contamination that was cost efficient with minimal waste generation.
Author
Hypergolic Rocket Propellants; Propellants; Systems Engineering; Fabrication; Distillation

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*.

20070019833 Lawrence Livermore National Lab., Livermore, CA USA
Kinetic Modeling of Slow Energy Release in Non-Ideal Carbon Rich Explosives
Vitello, P.; Fried, L.; Glaesemann, K.; Souers, C.; Jun. 21, 2006; 13 pp.; In English
Report No.(s): DE2007-897937; UCRL-CONF-222314; No Copyright; Avail.: Department of Energy Information Bridge

We present here the first self-consistent kinetic based model for long time-scale energy release in detonation waves in the non-ideal explosive LX-17. Non-ideal, insensitive carbon rich explosives, such as those based on TATB, are believed to have significant late-time slow release in energy. One proposed source of this energy is diffusion-limited growth of carbon clusters. In this paper we consider the late-time energy release problem in detonation waves using the thermochemical code CHEETAH linked to a multidimensional ALE hydrodynamics model. The linked CHEETAH-ALE model treats slowly reacting chemical species using kinetic rate laws, with chemical equilibrium assumed for species coupled via fast time-scale reactions. In the model presented here we include separate rate equations for the transformation of the un-reacted explosive to product gases and for the growth of a small particulate form of condensed graphite to a large particulate form. The small particulate graphite is assumed to be in chemical equilibrium with the gaseous species allowing for coupling between the instantaneous thermodynamic state and the production of graphite clusters. For the explosive burn rate a pressure dependent rate law was used. Low pressure freezing of the gas species mass fractions was also included to account for regions where the kinetic coupling rates become longer than the hydrodynamic time-scales. The model rate parameters were calibrated using cylinder and rate-stick experimental data. Excellent long time agreement and size effect results were achieved.
NTIS
Carbon; Explosives; Kinetic Energy

20070019845 Lawrence Livermore National Lab., Livermore, CA USA
Characterization of Damaged Materials
Hsu, P. C.; Dehaven, M.; McClelland, M.; Chidester, S.; Maienschein, J. L.; Jun. 23, 2006; 14 pp.; In English
Report No.(s): DE2007-897948; UCRL-CONF-222392; No Copyright; Avail.: National Technical Information Service (NTIS)

Thermal damage experiments were conducted on LX-04, LX-10, and LX-17 at high temperatures. Both pristine and damaged samples were characterized for their material properties. A pycnometer was used to determine sample true density and porosity. Gas permeability was measured in a newly procured system (diffusion permeameter). Burn rate was measured in the LLNL strand burner. Weight losses upon thermal exposure were insignificant. Damaged pressed parts expanded, resulting in a reduction of bulk density by up to 10%. Both gas permeabilities and burn rates of the damaged samples increased by several orders of magnitude due to higher porosity and lower density. Moduli of the damaged materials decreased significantly, an indication that the materials became weaker mechanically. Damaged materials were more sensitive to shock initiation at high temperatures. No significant sensitization was observed when the damaged samples were tested at room temperature.
NTIS
Characterization; Damage; High Temperature; Porosity

20070019861 Lawrence Livermore National Lab., Livermore, CA USA
Measurement and Prediction of Water Outgassing from TR55 Silicone by the Isoconversional Technique
Dinh, L. N.; Schildbach, M. A.; Burnham, A. K.; Maxwell, R. S.; Balazs, B.; May 10, 2006; 12 pp.; In English
Report No.(s): DE2007-897952; UCRL-CONF-221282; No Copyright; Avail.: National Technical Information Service (NTIS)

The objectives of this report are to measure the H(sub 2)O outgassing kinetics of TR55 silicone after a few hours of

vacuum pumping, and to make H(sub 2)O outgassing kinetic predictions for TR55 at low temperatures in a vacuum/dry environment.
NTIS
Outgassing; Silicones; Water

20070019864 Lawrence Livermore National Lab., Livermore, CA USA
Measurement and ALE3D Simulation of Violence in a Deflagration Experiment with LX-10 and Aermet-100 Alloy
Knap, J.; McClelland, M. A.; Maienschein, J. L.; Howard, W. M.; Nichols, A. L.; Jun. 27, 2006; 12 pp.; In English
Report No.(s): DE2007-897943; UCRL-CONF-222438; No Copyright; Avail.: National Technical Information Service (NTIS)

We describe the results of a Scaled-Thermal- Explosion-eXperiment (STEX) for LX-10 (94.7 % HMX, 5.3 % Viton A) confined in an AerMet 100 (iron-cobalt-nickel alloy) tube with reinforced end caps. The experimental measurements are compared with predictions of an Arbitrary-Lagrangian-Eulerian (ALE3D) computer model. ALE3D is a three-dimensional multi-physics computer code capable of solving coupledequations describing thermal, mechanical and chemical behavior of materials. In particular, we focus on the processes linked to fracture and fragmentation of the AerMet tube driven by the LX-10 deflagration.
NTIS
Deflagration; Explosions; Simulation; Violence

20070019962 Lawrence Livermore National Lab., Livermore, CA USA
Graded-density Reservoirs for Accessing High Pressure Low Temperature Material States
Smith, R.; Lorenz, K. T.; Ho, D.; Remington, B.; Hamza, A.; Apr. 24, 2006; 11 pp.; In English
Report No.(s): DE2007-897968; UCRL-CONF-220822; No Copyright; Avail.: Department of Energy Information Bridge

In recently developed laser-driven shockless compression experiments an ablatively driven shock in a primary target is transformed into a ramp compression wave in a secondary target via unloading followed by stagnation across an intermediate vacuum gap. Current limitations on the achievable peak pressures are limited by the ability of shaping the temporal profile of the ramp compression pulse. We report on new techniques using graded density reservoirs for shaping the loading profile and extending these techniques to high peak pressures.
NTIS
High Pressure; Low Temperature; Reservoirs

20070019966 Lawrence Livermore National Lab., Livermore, CA USA
Contact Interface Verification for DYNA3D. Scenario 2: Multi-Surface Contact
McMichael, L. D.; Mar. 31, 2006; 26 pp.; In English
Report No.(s): DE2007-898011; UCRL-TR-221292; No Copyright; Avail.: National Technical Information Service (NTIS)

A suite of test problems has been developed to examine contact behavior within the nonlinear, three-dimensional, explicit finite element analysis (FEA) code DYNA3D (Lin, 2005). The test problems use multiple interfaces and a combination of enforcement methods to assess the basic functionality of the contact algorithms. The results from the DYNA3D analyses are compared to closed form solutions to verify the contact behavior. This work was performed as part of the Verification and Validation efforts of LLNL W Program within the NNSA's Advanced Simulation and Computing (ASC) Program. DYNA3D models the transient dynamic response of solids and structures including the interactions between disjoint bodies (parts). A wide variety of contact surfaces are available to represent the diverse interactions possible during an analysis, including relative motion (sliding), separation and gap closure (voids), and fixed relative position (tied). The problem geometry may be defined using a combination of element formulations, including one-dimensional beam and truss elements, two-dimensional shell elements, and three-dimensional solid elements. Consequently, it is necessary to consider various element interactions during contact. This report and associated test problems examine the scenario where multiple bodies interact with each other via multiple interfaces. The test problems focus on whether any ordering issues exist in the contact logic by using a combination of interface types, contact enforcement options (i.e., penalty, Lagrange, and kinematic), and element interactions within each problem. The influence of rigid materials on interface behavior is also examined. The companion report (McMichael, 2006) and associated test problems address the basic contact scenario where one contact surface exists between two disjoint bodies. The test problems are analyzed using version 5.2 (compiled on 12/22/2005) of DYNA3D. The analytical results are used to form baseline solutions for subsequent regression testing. In section 2, the test problems are presented, and the static solution is developed for two idealized systems. Section 3 describes the finite element representation of the generic

problem, including the interface combinations considered. The verification criteria and expected results are presented next in section 4. Section 5 discusses the numerical results obtained from each test problem. Finally, section 6 summarizes the observed interface behavior.
NTIS
Finite Element Method; Algorithms; Transient Response; Kinematics; Proving

20070019969 Lawrence Livermore National Lab., Livermore, CA USA
Program Pu FUtures 2006
Fluss, M. J.; Jun. 22, 2006; 454 pp.; In English
Report No.(s): DE2007-898020; UCRL-PROC-222342; No Copyright; Avail.: National Technical Information Service (NTIS)

The coordination chemistry of plutonium remains relatively unexplored. Thus, the fundamental coordination chemistry of plutonium is being studied using simple multi-dentate ligands with the intention that the information gleaned from these studies may be used in the future to develop plutonium-specific sequestering agents. Towards this goal, hard Lewis-base donors are used as model ligands. Maltol, an inexpensive natural product used in the commercial food industry, is an ideal ligand because it is an all-oxygen bidentate donor, has a rigid structure, and is of small enough size to impose little steric strain, allowing the coordination preferences of plutonium to be the deciding geometric factor. Additionally, maltol is the synthetic precursor of 3,4-HOPO, a siderophore-inspired bidentate moiety tested by us previously as a possible sequestering agent for plutonium under acidic conditions. As comparisons to the plutonium structure, Ce(IV) complexes of the same and related ligands were examined as well. Cerium(IV) complexes serve as good models for plutonium(IV) structures because Ce(IV) has the same ionic radius as Pu(IV) (0.94 (angstrom)). Plutonium(IV) maltol crystals were grown out of a methanol/water solution by slow evaporation to afford red crystals that were evaluated at the Advanced Light Source at Lawrence Berkeley National Laboratory using single crystal X-ray diffraction. Cerium(IV) complexes with maltol and bromomaltol were crystallized via slow evaporation of the mother liquor to afford tetragonal, black crystals. All three complexes crystallize in space group I4(sub 1)/a. The Ce(IV) complex is isostructural with the Pu(IV) complex, in which donating oxygens adopt a trigonal dodecahedral geometry around the metal with the maltol rings parallel to the crystallographic S(sub 4) axis and lying in a non-crystallographic mirror plane of D(sub 2d) molecular symmetry (Fig 1). The metal-oxygen bonds in both maltol complexes are equal to within 0.04 (angstrom) for each oxygen type. In contrast to the maltol structures, the cerium(IV) bromomaltol complex arranges the maltol rings in a drastically different manner while maintaining the S(sub 4) crystallographic symmetry (Fig 2). The coordination geometry around the cerium remains a trigonal dodecahedron, but the chelating ligands span a different set of edges as in the maltol structures; the two-fold related bromomaltol ligands twist away from planarity, breaking the D(sub 2d) molecular symmetry. It is unlikely that steric interaction with a bromine on the same molecule would have caused the observed rearrangement, as there would be sufficient separation between them to accommodate their bulk in the geometry of the plutonium and cerium maltol complexes.
NTIS
Plutonium; Coordination; Chemical Elements

20070019997 Bozicevic, Field and Francis, LLP, Palo Alto, CA, USA
Methods and Compositions for Modulating Mitochondrial Aldehyde Dehydrogenase-2
Mochly-Rosen, D., Inventor; Chen, C. H., Inventor; 8 Dec 04; 26 pp.; In English
Contract(s)/Grant(s): NIH-AAA11147
Patent Info.: Filed Filed 8 Dec 04; US-Patent-Appl-SN-11-008 482
Report No.(s): PB2007-104253; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides screening methods for identifying agents that modulate the activity of mitochondrial aldehyde dehydrogenase-2 (AldDH2), as well as agents identified by the screening methods. The present invention further provides methods of reducing ischemic tissue damage or free-radical induced damage in an organ, the methods generally involving contacting the organ with an agent that increases AldDH2 levels and/or activity. The present invention further provides methods of treating solid tumors, the methods generally involving administering an agent that decreases AldDH2 levels and/or activity.
NTIS
Aldehydes; Mitochondria; Modulation

20070020050 National Inst. of Environmental Health Sciences, Research Triangle Park, NC, USA, Pacific Northwest National Lab., Richland, WA, USA

Simple Approach for Obtaining High Resolution, High Sensitivity 1H NMR Metabolite Spectra of Biofluids with Limited Mass Supply

Hu, J. Z.; Rommerein, D. N.; Wind, R. A.; Minard, K. R.; Sears, J. A.; Nov. 01, 2006; 7 pp.; In English

Contract(s)/Grant(s): AC06-76RL01830

Report No.(s): DE2007-899490; PNNL-SA-48823; No Copyright; Avail.: Department of Energy Information Bridge

A simple approach is reported that yields high resolution, high sensitivity 1H NMR spectra of biofluids with limited mass supply. This is achieved by spinning a capillary sample tube containing a biofluid at the magic angle at a frequency of about 80Hz. A 2D pulse sequence called 1H PASS is then used to produce a high-resolution 1H NMR spectrum that is free from magnetic susceptibility induced line broadening. With this new approach a high resolution 1H NMR spectrum of biofluids with a volume less than 1.0 ml can be easily achieved at a magnetic field strength as low as 7.05T. Furthermore, the methodology facilitates easy sample handling, i.e., the samples can be directly collected into inexpensive and disposable capillary tubes at the site of collection and subsequently used for NMR measurements. In addition, slow magic angle spinning improves magnetic field shimming and is especially suitable for high throughput investigations. In this paper first results are shown obtained in a magnetic field of 7.05T on urine samples collected from mice using a modified commercial NMR probe.

NTIS

High Resolution; Metabolites; Nuclear Magnetic Resonance; Sensitivity

20070020075 Lawrence Livermore National Lab., Livermore, CA USA

Comparative Corrosion Behavior of Two Palladium Containing Titanium Alloys

Lian, T.; Yashiki, T.; Nakayama, T.; Nakanishi, T.; Rebak, R. B.; Feb. 05, 2006; 11 pp.; In English

Contract(s)/Grant(s): W-7405-ENG-48

Report No.(s): DE2007-894773; UCRL-PROC-218716; No Copyright; Avail.: Department of Energy Information Bridge

The ASTM standard B 265 provides the requirements for the chemical composition of titanium (Ti) alloys. It is planned to use corrosion resistant and high strength titanium alloys to fabricate the drip shield at the proposed Yucca Mountain Repository. Titanium grade (Gr) 7 (R52400) and other Ti alloys are currently being characterized for this application. Ti Gr 7 contains 0.15% Palladium (Pd) to increase its corrosion performance. In this article we report results on the comparative short term corrosion behavior of Ti Gr 7 and a Ruthenium (Ru) containing alloy (Ti Gr 33). Ti Gr 33 also contains a small amount of Pd. Limited electrochemical testing such as polarization resistance and cyclic potentiodynamic curves showed that both alloys have a similar corrosion behavior in the tested environments.

NTIS

Corrosion; Palladium; Titanium Alloys

20070020076 Lawrence Livermore National Lab., Livermore, CA USA

Long-Term Corrosion Behavior of Alloy 22 in 5 M CaCl2 at 120 C

Estill, J. C.; Hust, G. A.; Evans, K. J.; Stuart, M. L.; Rebak, R. B.; Feb. 05, 2006; 11 pp.; In English

Contract(s)/Grant(s): W-7405-ENG-48

Report No.(s): DE2007-894776; UCRL-PROC-218719; No Copyright; Avail.: Department of Energy Information Bridge

In conditions where tight crevices exist in hot chloride containing solutions Alloy 22 may suffer crevice corrosion. The occurrence (or not) of crevice corrosion in a given environment (e.g. salt concentration and temperature), is governed by the values of the critical potential (E(sub crit)) for crevice corrosion and the corrosion potential (E(sub corr)). This paper discusses the evolution of E(sub corr) and corrosion rate (CR) of creviced Alloy 22 specimens in 5 M calcium chloride (CaCl(sub 2)) at 120 C. Tested specimens included non-creviced rods and multiple creviced assemblies (MCA) both non-welded (wrought) and welded. Results show that Alloy 22 suffers crevice corrosion under the open circuit conditions in the aerated hot CaCl(sub 2) brine. However, after more than a year immersion the propagation of crevice corrosion was not significant. The general corrosion rate decreased or remained unchanged as the immersion time increased. For rods and MCA specimens, the corrosion rate was lower than 100 nm/year after more than a year immersion time.

NTIS

Corrosion; Calcium Chlorides; Alloys

20070020127 Saliwanchik Lloyd and Saliwanchik, Gainesville, FL, USA

Biomimetic Organic/Inorganic Composites, Processes for Their Production, and Methods of Use, PAT-APPL-11-432-941

Gower, L. B., Inventor; Olszta, M. J., Inventor; Douglas, E. P., Inventor; Munisamy, S., Inventor; Wheeler, D. L., Inventor; 12 May 06; 30 pp.; In English

Contract(s)/Grant(s): ECS-9986333

Patent Info.: Filed Filed 12 May 06; US-Patent-Appl-SN-11-432 941

Report No.(s): PB2007-101774; No Copyright; Avail.: CASI: A03, Hardcopy

The subject invention concerns a composite comprising an organic fluid-swellable, fibrous matrix, such as collagen, and a mineral phase, such as calcium carbonate or phosphate mineral phase, for use as a biomimetic of bone. In another aspect, the subject invention concerns a process for making a composite involving the inclusion of acidic polymers to a supersaturated mineralizing solution, in order to induce an amorphous liquid-phase precursor to the inorganic mineral, which is then absorbed (pulled by capillary action) into the organic matrix. Advantageously, once solidified, a high mineral content can be achieved, with the inorganic mineral crystals embedded within the collagen fibers (intrafibrillarly) and oriented such that they are aligned along the long axes of the fibers of the organic matrix, thereby closely mimicking the natural structure of bone. The present invention further concerns a method of treating a patient suffering from a bone defect by applying a biomimetic composite to the bone defect site.

NTIS

Biometrics; Biomimetics; Patent Applications; Production Engineering

20070020129 Colburn (Cantor), LLP, Bloomfield, CT, USA

Coatings, Coated Articles and Methods of Manufacture Thereof, PAT-APPL-11-418-871

Zhang, Z., Inventor; Xiao, T. D., Inventor; 5 May 06; 20 pp.; In English

Contract(s)/Grant(s): NIH 1R43AR47278-02

Patent Info.: Filed Filed 5 May 06; US-Patent-Appl-SN-11-418 871

Report No.(s): PB2007-101773; No Copyright; Avail.: CASI: A03, Hardcopy

A multi-layer coating is particularly useful for the coating of implants such as orthopedic and dental implants, particularly metallic implants. The multi-layer coating has both high bond strength to implants and excellent bioactivity with the surrounding body tissue. A method of making a coated implant includes depositing a first layer on a metallic substrate, wherein the first layer comprises a material selected from the group consisting of nitride compounds, boride compounds, carbide compounds, and mixtures of two or more of the foregoing materials; forming at least one slurry comprising an apatite and a binder, wherein the apatite has greater than about 90% crystallinity, and wherein the binder is inert in body fluids; depositing the slurry on the first layer to form a green coating; and sintering the green coating to form a second layer.

NTIS

Coatings; Manufacturing; Patent Applications; Multilayer Insulation

20070020131 Colburn (Cantor), LLP, Bloomfield, CT, USA

Coatings, Coated Articles and Methods of Manufacture Thereof, PAT-APPL-11-418-626

Ahang, Z., Inventor; Xiao, T. D., Inventor; 5 May 06; 21 pp.; In English

Contract(s)/Grant(s): NIH 1RAR47278-02

Patent Info.: Filed Filed 5 May 06; US-Patent-Appl-SN-11-418 626

Report No.(s): PB2007-101772; No Copyright; Avail.: CASI: A03, Hardcopy

A multi-layer coating is particularly useful for the coating of implants such as orthopedic and dental implants, particularly metallic implants. The first layer comprises a dense material insoluble and inert in body fluids. The second layer comprises apatite and a binder. The first layer protects the metallic implants from corrosion, apatite dissolution, and interfacial reaction with apatite and the binder. The binder allows adjustment of the thermal expansion coefficient between the coating and the metallic substrate. This multi-layer coating has both high bond strength to implants and excellent bioactivity with the surrounding body tissue.

NTIS

Coatings; Manufacturing; Patent Applications; Multilayer Insulation

20070020141 Boyle Fredrickson Newholm Stein and Gratz, SC, USA

Apparatus for Transport and Analysis of Particles Using Dielectrophoresis

Hamers, R. J., Inventor; Beck, J. D., Inventor; 9 Mar 05; 8 pp.; In English

Contract(s)/Grant(s): 021080G

Patent Info.: Filed Filed 9 Mar 05; US-Patent-Appl-SN-11-075 615
Report No.(s): PB2007-101760; No Copyright; Avail.: CASI: A02, Hardcopy

Dielectrophoresis is used to attract particles to an electrode edge then to controllably allow the transport of particles along that edge under a fluid flow to a particular region. The particles may be bacteria which may be maintained in this process in a live state through capture, transport and release.

NTIS

Electrophoresis; Patent Applications

20070020173 Texas A&M Univ., College Station, TX USA

Repair/Retrofit Anchorage Designs for Bridge Rails

Williams, W. F.; Buth, C. E.; Menges, W. L.; Mar. 2007; 161 pp.; In English

Report No.(s): PB2007-107848; REPT-0-4823-T1-1; No Copyright; Avail.: National Technical Information Service (NTIS)

This project focused on developing alternative rail anchorage systems for the T501 and T203 bridge rail systems. The project considered only epoxy adhesive anchoring systems for each of these railings, for use in repair and retrofit situations. Strength data on the existing T501R bolt-through retrofit design is not well-defined. A tested retrofit design for the T203 did not exist at the time of starting this project. During this project, documented data on the strength characteristics of the conventionally anchored T501 and T203 bridge rail systems were obtained. These data were analyzed and used to develop alternate rail anchorage systems for both the T501 and T203 bridge rails. Long-term durability of epoxy anchoring systems was also considered based on information provided by the epoxy adhesive manufacturer. The retrofit/repair strengths from the dynamic and static testing for both the T501 and the T203 compared very closely to the dynamic and static strengths of the conventionally anchored (As-Is) strengths capacities. In summary, the strengths of the retrofit designs were very close and in some tests exceeded the calculated capacities of the bridge rails. The static strengths were very close to the dynamic 50 millisecond average strengths recorded from the dynamic tests. The new retrofit/repair designs developed and tested for this project are recommended for implementation for use on any new or existing bridge projects. The use of commercial adhesive anchor systems (Hilti RE 500 Adhesive Anchoring System) was very successful in achieving the strengths needed to adequately anchor the retrofit/repair reinforcement for both the T501 and the T203 bridge rails. The information learned from this project can be used to retrofit and repair other bridge rail designs in the future.

NTIS

Rails; Bridges; Static Tests; Anchors (Fasteners)

20070020175 Texas A&M Univ., College Station, TX USA

Adhesive Anchors for Retrofit/Repair of Bridge Rails: Summary Report

Williams, W. F.; Oct. 2006; 4 pp.; In English

Report No.(s): PB2007-107849; REPT-0-4823-T1-S; No Copyright; Avail.: CASI: A01, Hardcopy

This project focused on determining the magnitude and location of force to the rail anchorage reinforcement for two current TxDOT bridge rail systems, the T501 and the T203 concrete bridge rails under severe loading conditions. These rails were studied so that an acceptable structural repair using adhesive anchors could be made to rails damaged due to impacts. The project explored the ultimate strengths of the T501 and T203 bridge rails and the transfer of these forces to the rail anchorage systems for both the T501 and T203 bridge rails with the intent to develop suitable repair and/or retrofit designs.

NTIS

Adhesives; Anchors (Fasteners); Rails

20070020244 Swedish Defence Research Establishment, Linkoeping, Sweden

Camouflage Creams with New Properties

Nilsson, C.; Kariis, H.; Nov. 2005; 20 pp.; In Swedish

Report No.(s): PB2007-105527; FOI-R-1760-SE; No Copyright; Avail.: CASI: A03, Hardcopy

A literature survey concerning camouflage paint for faces has been conducted. In the thermal infrared wavelength region, 8-12 (micro), the signature from unprotected human skin is a problem. With improved signature management of clothes and other equipment, the skin will give a significant contrast to the background. Traditional camouflage creams for faces (green, brown and black) are not design to give protection in the thermal region. Searches have been performed on the Internet, in journals, books, and patent data bases. The trend, both military and civilian, is towards multi-functional products. Visual camouflage, thermal camouflage, sun protection, heat protection, insect repulsion, and moisturizing functions are examples of properties to be integrated. Also medical aspects have to be accounted for. The study shows that products for use on skin have

been developed in several countries. No products that fulfill all military requirements have, however, been found. This report makes recommendations for future research and development.
NTIS
Camouflage; Paints; Surveys

20070020266 Nixon and Vanderhye, P.C., Arlington, VA, USA
Cyanine Dyes as Labeling Reagents for Detection of Biological and Other Materials by Luminescence Methods
Waggoner, A. S., Inventor; 4 Aug 05; 21 pp.; In English
Contract(s)/Grant(s): 54R01NS19353-02
Patent Info.: Filed Filed 4 Aug 05; US-Patent-Appl-SN-11-196 263
Report No.(s): PB2007-101741; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention pertains to luminescent dyes and methods for covalently attaching the dyes to a component or mixture of components so that the components may be detected and/or quantified by luminescence detection methods. The dyes are cyanine and cyanine-type dyes that contain or are derivatized to contain a reactive group. The reactive group is covalently reactive with amine, hydroxy and/or sulfhydryl groups on the component so that the dye can be covalently bound to the component. In addition, the dyes are preferably soluble in aqueous or other medium in which the component is contained. The components to be labeled can be either biological materials, such as antibodies, antigens, peptides, nucleotides, hormones, drugs, or non-biological materials, such as polymers, glass, or other surfaces. Any luminescent or light absorbing detecting step can be employed in the method of the invention.
NTIS
Dyes; Luminescence; Patent Applications; Reagents

20070020270 Savannah River National Lab., Aiken, SC, USA
Properties of Fiberboard Overpack Material in the 9975 Shipping Package Following Thermal Aging
Daugherty, W. L.; Jan. 10, 2007; 12 pp.; In English
Contract(s)/Grant(s): DE-AC09-96SR18500
Report No.(s): DE2007-897540; WSRC-STI-2006-00304; No Copyright; Avail.: National Technical Information Service (NTIS)

Many radioactive material shipping packages incorporate cane fiberboard overpacks for thermal insulation and impact resistance. Mechanical, thermal and physical properties have been measured on cane fiberboard following thermal aging in several temperature/humidity environments. Several of the measured properties change significantly over time in the more severe environments, while other properties are relatively constant. These properties continue to be tracked, with the goal of developing a model for predicting a service life under long-term storage conditions.
NTIS
Aging (Materials); Boards (Paper); Temperature Effects

20070020273 Saliwanchik Lloyd and Saliwanchik, Gainesville, FL, USA
Biomimetic Organic/Inorganic Composite Processes for Their Production and Methods of Use, PAT-APPL-11-433-725
Gower, L. B., Inventor; Olszta, J. J., Inventor; Douglas, E. P., Inventor; Munisamy, S., Inventor; Wheeler, D. L., Inventor; 12 May 06; 29 pp.; In English
Contract(s)/Grant(s): ECS-9986333
Patent Info.: Filed Filed 12 May 06; US-Patent-Appl-SN-11-433 725
Report No.(s): PB2007-101775; No Copyright; Avail.: CASI: A03, Hardcopy

The subject invention concerns a composite comprising an organic fluid-swellable, fibrous matrix, such as collagen, and a mineral phase, such as calcium carbonate or phosphate mineral phase, for use as a biomimetic of bone. In another aspect, the subject invention concerns a process for making a composite involving the inclusion of acidic polymers to a supersaturated mineralizing solution, in order to induce an amorphous liquid-phase precursor to the inorganic mineral, which is then absorbed (pulled by capillary action) into the organic matrix. Advantageously, once solidified, a high mineral content can be achieved, with the inorganic mineral crystals embedded within the collagen fibers (intrafibrillarly) and oriented such that they are aligned along the long axes of the fibers of the organic matrix, thereby closely mimicking the natural structure of bone. The present invention further concerns a method of treating a patient suffering from a bone defect by applying a biomimetic composite to the bone defect site.The subject invention concerns a composite comprising an organic fluid-swellable, fibrous matrix, such as collagen, and a mineral phase, such as calcium carbonate or phosphate mineral phase, for use as a biomimetic of bone. In

another aspect, the subject invention concerns a process for making a composite involving the inclusion of acidic polymers to a supersaturated mineralizing solution, in order to induce an amorphous liquid-phase precursor to the inorganic mineral, which is then absorbed (pulled by capillary action) into the organic matrix. Advantageously, once solidified, a high mineral content can be achieved, with the inorganic mineral crystals embedded within the collagen fibers (intrafibrillarly) and oriented such that they are aligned along the long axes of the fibers of the organic matrix, thereby closely mimicking the natural structure of bone. The present invention further concerns a method of treating a patient suffering from a bone defect by applying a biomimetic composite to the bone defect site.
NTIS
Biometrics; Biomimetics; Patent Applications; Production Engineering

20070020375 Steptoe and Johnson LLP, Washington, DC, USA
Method of Preparing Nanocrystals
Jensen, K. E., Inventor; Bawendi, M. G., Inventor; Yen, B. K. H., Inventor; 19 Aug 04; 17 pp.; In English
Contract(s)/Grant(s): DNR-0213282; CHE-0209898
Patent Info.: Filed Filed 19 Aug 04; US-Patent-Appl-SN-10-921 306
Report No.(s): PB2007-102394; No Copyright; Avail.: CASI: A03, Hardcopy
A population of nanocrystals having a narrow and controllable size distribution and can be prepared by a continuous flow method.
NTIS
Manufacturing; Nanocrystals; Patent Applications

20070020376 Fulbright and Jaworski, LLP, Austin, TX, USA
Technique for Measuring Cell-Membrane Properties in Cultured Cells Grown on Biomaterials in an Ussing Chamber
Moy, A., Inventor; Fotedar, S., Inventor; English, A., Inventor; 17 Feb 06; 25 pp.; In English
Contract(s)/Grant(s): GM61732; BES-0238905
Patent Info.: Filed Filed 17 Feb 06; US-Patent-Appl-SN-11-357 444
Report No.(s): PB2007-101778; No Copyright; Avail.: CASI: A03, Hardcopy
The present invention is directed to a system and method which measures transcellular parameters in which cells are cultured in a monolayer on a biomaterial. The parameters measured are indicative of in vivo values such as cell-cell and cell-matrix adhesion parameters.
NTIS
Cells (Biology); Membranes; Patent Applications

20070020379 Wells Saint John, P.S, Spokane, WA, USA
Methods of Making Monolayers
Alford, K. L., Inventor; Simmons, K. L., Inventor; Samuels, W. D., Inventor; Zemanian, T. S., Inventor; Liu, J., Inventor; 11 May 06; 17 pp.; In English
Contract(s)/Grant(s): DE-AC0676RLO1830
Patent Info.: Filed Filed 11 May 06; US-Patent-Appl-SN-11-433 315
Report No.(s): PB2007-101776; No Copyright; Avail.: CASI: A03, Hardcopy
The invention pertains to methods of forming monolayers on various surfaces. The surfaces can be selected from a wide array of materials, including, for example, aluminum dioxide, silicon dioxide, carbon and SiC. The substrates can be planar or porous. The monolayer is formed under enhanced pressure conditions. The monolayer contains functionalized molecules, and accordingly functionalizes a surface of the substrate. The properties of the functionalized substrate can enhance the substrate's applicability for numerous purposes including, for example, utilization in extracting contaminants, or incorporation into a polymeric matrix.
NTIS
Patent Applications; Silicon Dioxide; Carbon

24
COMPOSITE MATERIALS

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

20070019695 NASA Marshall Space Flight Center, Huntsville, AL, USA
Strain Measurement Using FBG on COPV in Stress Rupture Test
Banks, Curtis; Grant, Joseph; [2007]; 24 pp.; In English; Smart Structures/NDE 2007, 18-23 Mar. 2007, San Diego, CA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070019695

White Sands Test Facility (WSTF) was requested to perform ambient temperature hydrostatic pressurization testing of a Space Transportation System (STS) 40-in. Kevlar Composite Overwrapped Pressure Vessel (COPV). The 40-in. vessel was of the same design and approximate age as the STS Main Propulsion System (MPS) and Orbiter Maneuvering System (OMS) vessels. The NASA Engineering Safety Center (NESC) assembled a team of experts and conducted an assessment that involved a review of national Kevlar COPY data. During the review, the STS COPVs were found to be beyond their original certification of ten years. The team observed that the likelihood of STS COPV Stress rupture, a catastrophic burst before leak failure mode, was greater than previously believed. Consequently, a detailed assessment of remaining stress rupture life became necessary. Prior to STS-114, a certification deviation was written for two flights of OV-103 (Discovery) and OV-104 (Atlantis) per rationale that was based on an extensive review of the Lawrence Livermore National Laboratories, COPV data, and revisions to the STS COPV stress levels. In order to obtain flight rationale to extend the certification deviation through the end of the Program, the Orbiter Project Office has directed an interagency COPV team to conduct further testing and analysis to investigate conservatism in the stress rupture model and evaluate material age degradation. Additional analysis of stress rupture life requires understanding the fiber stresses including stress that occurs due to thru-wall composite compression in COPV components. Data must be obtained at both zero gauge pressure (pre-stress) and at the component operating pressure so that this phenomenon can be properly evaluated. The zero gauge pressure stresses are predominantly a result of the autofrettage process used during vessel manufacture. Determining these pre-stresses and the constitutive behavior of the overwrap at pressure will provide necessary information to better predict the remaining life of the STS COPVs. The primary test objective is obtaining data to verify the hypothesis of a radially oriented thru-thickness stress-riser in the COPV composite whose magnitude is a function of the applied pressure and the load history. The anticipated load dependent response follows from the constitutive behavior of the composite overwrap so data to quantify its nonlinear and time dependent response will be sought. The objective of the Fiber Braggs Gratings (FBGs) were to advance the state-of-the-art by developing techniques using FBG sensors that are capable of assessing stress-rupture degradation in Kevlar COPVs in a health monitoring mode (1). Moreover, they sought to answer questions of how embedded sensors affect overall integrity of the structure. And lastly, they sought to provide an important link in the overall stress rupture study that will help close the loop on the COPV fabrication process. NDE inspection methods will be used from start to finish and FBG will be an integral link within the overall chain. Author

Composite Wrapping; Fabrication; Pressure Vessels; Strain Measurement; Stress Analysis; Rupturing; Bragg Gratings

20070019696 NASA Glenn Research Center, Cleveland, OH, USA
A Framework for Performing Multiscale Stochastic Progressive Failure Analysis of Composite Structures
Bednarcyk, Brett A.; Arnold, Steven M.; May 2007; 22 pp.; In English; 2006 ABAQUS Users' Conference, 23-25 May 2006, Boston, MA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNC05AA19A; WBS 645846.02.07.03.03.02
Report No.(s): NASA/TM-2007-214694; E-15602-1; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070019696

A framework is presented that enables coupled multiscale analysis of composite structures. The recently developed, free, Finite Element Analysis-Micromechanics Analysis Code (FEAMAC) software couples the Micromechanics Analysis Code with Generalized Method of Cells (MAC/GMC) with ABAQUS to perform micromechanics based FEA such that the nonlinear composite material response at each integration point is modeled at each increment by MAC/GMC. As a result, the stochastic nature of fiber breakage in composites can be simulated through incorporation of an appropriate damage and failure model that operates within MAC/GMC on the level of the fiber. Results are presented for the progressive failure analysis of a titanium matrix composite tensile specimen that illustrate the power and utility of the framework and address the techniques needed to model the statistical nature of the problem properly. In particular, it is shown that incorporating fiber strength

randomness on multiple scales improves the quality of the simulation by enabling failure at locations other than those associated with structural level stress risers.
Author
Composite Structures; Failure Analysis; Mechanical Properties; Micromechanics; Stochastic Processes; Mathematical Models; Metal Matrix Composites

20070019983 Morrison and Foerster LLP, Palo Alto, CA, USA
Stabilization of Self-Assembled Monolayers
Liu, G. Y., Inventor; Amro, N. A., Inventor; Yung, G., Inventor; 17 May 05; 34 pp.; In English
Contract(s)/Grant(s): EHE0244830; CHE0240807
Patent Info.: Filed Filed 17 May 05; US-Patent-Appl-SN-11-083 739
Report No.(s): PB2007-105833; No Copyright; Avail.: CASI: A03, Hardcopy

A composite includes substrate fibers, and an organosilica coating including a structure-directing template, on the substrate fibers. The composite may be formed by coating substrate fibers with an organosilica sol containing a structure-directing template, and curing the organosilica sol to form an organosilica coating. A nanoporous chelating fiber includes a substrate fiber and a nanoporous chelating coating, on the substrate fiber. Nanoporous chelating fibers may be formed by removing the structure-directing template from a composite to form a nanoporous chelating coating on the substrate fibers. Contaminants may be removed from a fluid by contacting nanoporous chelating fibers with a fluid containing at least one contaminant. A composite includes substrate fibers, and an organosilica coating including a structure-directing template, on the substrate fibers. The composite may be formed by coating substrate fibers with an organosilica sol containing a structure-directing template, and curing the organosilica sol to form an organosilica coating. A nanoporous chelating fiber includes a substrate fiber and a nanoporous chelating coating, on the substrate fiber. Nanoporous chelating fibers may be formed by removing the structure-directing template from a composite to form a nanoporous chelating coating on the substrate fibers. Contaminants may be removed from a fluid by contacting nanoporous chelating fibers with a fluid containing at least one contaminant.
NTIS
Chelation; Composite Materials; Patent Applications; Self Assembly; Layers

20070019985 Evan Law Group, LLC, Chicago, IL, USA
Nanoporous Chelating Fibers
Economy, J., Inventor; Liu, C., Inventor; 14 Feb 05; 19 pp.; In English
Contract(s)/Grant(s): GTS020978
Patent Info.: Filed Filed 14 Feb 05; US-Patent-Appl-SN-11-057 698
Report No.(s): PB2007-105832; No Copyright; Avail.: CASI: A03, Hardcopy

A composite includes substrate fibers, and an organosilica coating including a structure-directing template, on the substrate fibers. The composite may be formed by coating substrate fibers with an organosilica sol containing a structure-directing template, and curing the organosilica sol to form an organosilica coating. A nanoporous chelating fiber includes a substrate fiber and a nanoporous chelating coating, on the substrate fiber. Nanoporous chelating fibers may be formed by removing the structure-directing template from a composite to form a nanoporous chelating coating on the substrate fibers. Contaminants may be removed from a fluid by contacting nanoporous chelating fibers with a fluid containing at least one contaminant.
NTIS
Chelation; Composite Materials; Patent Applications

20070020334 NASA Johnson Space Center, Houston, TX, USA
Interrelationship of Nondestructive Evaluation Methodologies Applied to Testing of Composite Overwrapped Pressure Vessels
Leifeste, Mark R.; May 14, 2007; 7 pp.; In English; Second IAASS Conference - Space Safety in a Global World, 14-16 May 2007, Chicago, IL, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020334

Composite Overwrapped Pressure Vessels (COPVs) are commonly used in spacecraft for containment of pressurized gases and fluids, incorporating strength and weight savings. The energy stored is capable of extensive spacecraft damage and personal injury in the event of sudden failure. These apparently simple structures, composed of a metallic media impermeable

liner and fiber/resin composite overwrap are really complex structures with numerous material and structural phenomena interacting during pressurized use which requires multiple, interrelated monitoring methodologies to monitor and understand subtle changes critical to safe use. Testing of COPVs at NASA Johnson Space Center White Sands Test Facility (WSTF) has employed multiple in-situ, real-time nondestructive evaluation (NDE) methodologies as well as pre- and post-test comparative techniques to monitor changes in material and structural parameters during advanced pressurized testing. The use of NDE methodologies and their relationship to monitoring changes is discussed based on testing of real-world spacecraft COPVs. Lessons learned are used to present recommendations for use in testing, as well as a discussion of potential applications to vessel health monitoring in future applications.
Author
Composite Wrapping; Filament Winding; Nondestructive Tests; Pressure Vessels; Materials Selection; Linings

20070020503 NASA Glenn Research Center, Cleveland, OH, USA
Composite Nanomechanics: A Mechanistic Properties Prediction
Chamis, Christos C.; Handler, Louis M.; Manderscheid, Jane M.; May 16, 2007; 8 pp.; In English; COMP 2007' 6th International Symposium on Advanced Composites, 16-18 May 2007, Corfu, Greece; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 561.581.02.08.03.15.03
Report No.(s): COMP2007-002; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020503

A unique mechanistic theory is described to predict the properties of nanocomposites. The theory is based on composite micromechanics with progressive substructuring down to a nanoscale slice of a nanofiber where all the governing equations are formulated. These equations have been programmed in a computer code. That computer code is used to predict 25 properties of a mononanofiber laminate. The results are presented graphically and discussed with respect to their practical significance. Most of the results show smooth distributions. Results for matrix-dependent properties show bimodal through-the-thickness distribution with discontinuous changes from mode to mode.
Author
Computer Programs; Micromechanics; Nanocomposites; Mechanical Properties; Predictions

20070020524 NASA Langley Research Center, Hampton, VA, USA
The Effect of Delamination on Damage Path and Failure Load Prediction for Notched Composite Laminates
Satyanarayana, Arunkumar; Bogert, Philip B.; Chunchu, Prasad B.; [2007]; 16 pp.; In English; 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 23-26 Apr. 2007, Waikiki, HI, USA
Contract(s)/Grant(s): WBS 645846.02.07.07; Copyright; Avail.: CASI: A03, Hardcopy

The influence of delamination on the progressing damage path and initial failure load in composite laminates is investigated. Results are presented from a numerical and an experimental study of center-notched tensile-loaded coupons. The numerical study includes two approaches. The first approach considers only intralaminar (fiber breakage and matrix cracking) damage modes in calculating the progression of the damage path. In the second approach, the model is extended to consider the effect of interlaminar (delamination) damage modes in addition to the intralaminar damage modes. The intralaminar damage is modeled using progressive damage analysis (PDA) methodology implemented with the VUMAT subroutine in the ABAQUS finite element code. The interlaminar damage mode has been simulated using cohesive elements in ABAQUS. In the experimental study, 2-3 specimens each of two different stacking sequences of center-notched laminates are tensile loaded. The numerical results from the two different modeling approaches are compared with each other and the experimentally observed results for both laminate types. The comparisons reveal that the second modeling approach, where the delamination damage mode is included together with the intralaminar damage modes, better simulates the experimentally observed damage modes and damage paths, which were characterized by splitting failures perpendicular to the notch tips in one or more layers. Additionally, the inclusion of the delamination mode resulted in a better prediction of the loads at which the failure took place, which were higher than those predicted by the first modeling approach which did not include delaminations.
Author
Delaminating; Failure Analysis; Laminates; Loads (Forces); Composite Materials; Notches; Damage Assessment

20070020525 NASA Langley Research Center, Hampton, VA, USA

Three Dimensional Constraint Effects on the Estimated (Delta)CTOD during the Numerical Simulation of Different Fatigue Threshold Testing Techniques

Seshadri, Banavara R.; Smith, Stephen W.; [2007]; 12 pp.; In English; 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 23-26 Apr. 2007, Waikiki, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 732759.07.09

Report No.(s): AIAA Paper 2007-2344; Copyright; Avail.: CASI: A03, Hardcopy

Variation in constraint through the thickness of a specimen effects the cyclic crack-tip-opening displacement (DELTA CTOD). DELTA CTOD is a valuable measure of crack growth behavior, indicating closure development, constraint variations and load history effects. Fatigue loading with a continual load reduction was used to simulate the load history associated with fatigue crack growth threshold measurements. The constraint effect on the estimated DELTA CTOD is studied by carrying out three-dimensional elastic-plastic finite element simulations. The analysis involves numerical simulation of different standard fatigue threshold test schemes to determine how each test scheme affects DELTA CTOD. The American Society for Testing and Materials (ASTM) prescribes standard load reduction procedures for threshold testing using either the constant stress ratio (R) or constant maximum stress intensity (K(sub max)) methods. Different specimen types defined in the standard, namely the compact tension, C(T), and middle cracked tension, M(T), specimens were used in this simulation. The threshold simulations were conducted with different initial K(sub max) values to study its effect on estimated DELTA CTOD. During each simulation, the DELTA CTOD was estimated at every load increment during the load reduction procedure. Previous numerical simulation results indicate that the constant R load reduction method generates a plastic wake resulting in remote crack closure during unloading. Upon reloading, this remote contact location was observed to remain in contact well after the crack tip was fully open. The final region to open is located at the point at which the load reduction was initiated and at the free surface of the specimen. However, simulations carried out using the constant Kmax load reduction procedure did not indicate remote crack closure. Previous analysis results using various starting K(sub max) values and different load reduction rates have indicated DELTA CTOD is independent of specimen size. A study of the effect of specimen thickness and geometry on the measured DELTA CTOD for various load reduction procedures and its implication in the estimation of fatigue crack growth threshold values is discussed.

Author

Fatigue (Materials); Simulation; Three Dimensional Models; Direct Numerical Simulation; Constraints; Crack Opening Displacement

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\fAstrophysics*.

20070019703 Massachusetts Inst. of Tech., Cambridge, MA USA

Qualitative Process Theory

Forbus, Kenneth D; Jan 1984; 85 pp.; In English

Report No.(s): AD-A465743; No Copyright; Avail.: CASI: A05, Hardcopy

Objects move, collide, flow, bend, heat up, cool down, stretch, compress and boil. These and other things that cause changes in objects over time are intuitively characterized as processes. To understand common sense physical reasoning and make programs that interact with the physical world as well as people do we must understand qualitative reasoning about processes, when they will occur, their effects, and when they will stop. Qualitative process theory defines a simple notion of physical process that appears useful as a language in which to write dynamical theories. Reasoning about processes also motivates a new qualitative representation for quantity in terms of inequalities, called the quantity space. This paper describes the basic concepts of qualitative process theory, several different kinds of reasoning that can be performed with them, and discusses its implications for causal reasoning. Several extended examples illustrate the utility of the theory, including figuring out that a boiler can blow up, that an oscillator with friction will eventually stop, and how to say that you can pull with a string, but not push with it.

DTIC

Qualitative Analysis; Inequalities

20070019828 Indiana Univ., Bloomington, IN, USA, Minnesota Univ., Minneapolis, MN, USA, Indiana Univ., Bloomington, IN, USA

Novel Approach to Experimental Studies of Mineral Dissolution Kinetics. Annual Technical Progress Report. Period September 1, 2005 through August 31, 2006

Zhu, C.; Seyfried, W. E.; Nov. 29, 2006; 40 pp.; In English

Contract(s)/Grant(s): DE-FG26-04NT42125

Report No.(s): DE2007-897647; No Copyright; Avail.: Department of Energy Information Bridge

Currently, DOE is conducting pilot CO(sub 2) injection tests to evaluate the concept of geological sequestration. One strategy that potentially enhances CO(sub 2) solubility and reduces the risk of CO(sub 2) leak back to the surface is dissolution of indigenous minerals in the geological formation and precipitation of secondary carbonate phases, which increases the brine pH and immobilizes CO(sub 2). Clearly, the rates at which these dissolution and precipitation reactions occur directly determine the efficiency of this strategy. However, one of the fundamental problems in modern geochemistry is the persistent two to five orders of magnitude discrepancy between laboratorymeasured and field derived feldspar dissolution rates. To date, there is no real guidance as to how to predict silicate reaction rates for use in quantitative models. Current models for assessment of geological carbon sequestration have generally opted to use laboratory rates, in spite of the dearth of such data for compositionally complex systems, and the persistent disconnect between laboratory and field applications. Therefore, a firm scientific basis for predicting silicate reaction kinetics in CO(sub 2) injected geological formations is urgently needed to assure the reliability of the geochemical models used for the assessments of carbon sequestration strategies. The funded experimental and theoretical study attempts to resolve this outstanding scientific issue by novel experimental design and theoretical interpretation to measure silicate dissolution rates and iron carbonate precipitation rates at conditions pertinent to geological carbon sequestration.

NTIS

Chemical Reactions; Dissolving; Fractures (Materials); Kinetics; Minerals; Reaction Kinetics

20070019918 Florida Univ., Gainesville, FL, USA

Development of a Standard Accelerated Corrosion Test for Acceptance of Post-Tensioning Grouts in Florida

Pacheco, A. R.; Schokker, A. J.; Hamilton, H. R.; Nov. 2006; 108 pp.; In English

Contract(s)/Grant(s): BD535

Report No.(s): PB2007-107870; UF-00026900; No Copyright; Avail.: CASI: A06, Hardcopy

Recent corrosion grouting problems found in Florida's post-tensioned bridges has shown how important quality grouting materials and proper grouting techniques can be to the longevity of bridges. This problem is not concentrated in Florida, but has captured national and even international attention due to problems encountered in Florida and abroad. Portland cement grout is commonly used to fill the voids in post-tensioning ducts after the tendon is stressed. Portland cement grout provides a protective barrier, high alkaline environment, and bonds the tendon to the duct to allow higher tendon stresses to be developed. The Post-Tensioning Institute has recently published a guide specification for grouting of post-tensioning tendons that calls for the use of an accelerated corrosion test (ACT). Florida is considering including the ACT as part of its grouting specification. The ACT, however, has not been fully evaluated and warrants further investigation. Another potential issue with the PTI specification is bleed. Therefore, in addition to evaluating the ACT, researchers will also conduct bleed tests: specifically, they will develop a better correlation between the Schupack pressure bleed test and the actual bleed that occurs on sloped tendons of varying lengths.

NTIS

Accelerated Life Tests; Corrosion Tests; Grout

20070019946 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, California Univ., Berkeley, CA, USA

Solid State Electrochemical Composite

Viisco, S., Inventor; Jacobson, C. P., Inventor; DeJonghe, L. C., Inventor; 24 Jan 05; 12 pp.; In English

Contract(s)/Grant(s): DEAC03765F00098

Patent Info.: Filed Filed 24 Jan 05; US-Patent-Appl-SN-11-042 788

Report No.(s): PB2007-105815; No Copyright; Avail.: CASI: A03, Hardcopy

Provided is a composite electrochemical device fabricated from highly electronically conductive materials such as metals, metal alloys, or electronically conductive ceramics. The electronic conductivity of the electrode substrate is maximized. The invention allows for an electrode with high electronic conductivity and sufficient catalytic activity to achieve high power

density in ionic (electrochemical) devices such as fuel cells and electrolytic gas separation systems including oxygen generation system.
NTIS
Composite Structures; Electrochemistry; Patent Applications; Solid State

20070019984 Fish and Richardson, San Diego, CA, USA
Microelectronic Arrays for Cell-Based Functional Genomics/ High Throughput Phenotyping by Electrokinetic Assembly
Barlow, C., Inventor; Bhata, S. N., Inventor; Ozkan, M., Inventor; Esener, S., Inventor; 8 Dec 01; 13 pp.; In English
Contract(s)/Grant(s): MDA 972-98-1-0001
Patent Info.: Filed Filed 8 Dec 01; US-Patent-Appl-SN-10-450 085
Report No.(s): PB2007-104265; No Copyright; Avail.: CASI: A03, Hardcopy

An electrochemical apparatus 1 permits electric-field-assisted fluidic assembly of objects 2 on a patterned silicon substrate 11 by means of electrical addressing. Charged objects 2 such as beads and live cells are moved electrokinetically, like as in electrophoresis, through a solution, typically water 3, towards a micro-patterned charged semiconductor electrode, such as a silicon electrode 11 patterned with silicon dioxide, silicon nitride or agarose gel. The charged objects 2 are thus localized to and assembled, most typically into arrays of multiple or single particles, in accordance with the patterning of the electrode 11. Correlating with theoretical predictions, negatively charged polystyrene beads of 20 .mu.m diameter, or live mammalian cells of 20-30 .mu.m diameter, can be assembled and disassembled on 100 .mu.m feature size micro-patterned substrates by means of electrical addressing. The apparatus 1 has applications in creation of active cellular arrays for cell biology research, drug discovery and tissue engineering.
NTIS
Electrokinetics; Microelectronics; Genome; Phenotype

20070019991 Snell and Wilmer, Phoenix, AZ, USA
Mass Spectrometric Immunoassay
Nelson, R. W., Inventor; 11 Nov 04; 30 pp.; In English
Contract(s)/Grant(s): DEFG02-91-ER61127
Patent Info.: Filed Filed 11 Nov 04; US-Patent-Appl-SN-10-904 467
Report No.(s): PB2007-104260; No Copyright; Avail.: CASI: A03, Hardcopy

Rapid mass spectrometric immunoassay methods for detecting and/or quantifying antibody and antigen analytes utilizing affinity capture to isolate the analytes and internal reference species (for quantification) followed by mass spectrometric analysis of the isolated analyte/internal reference species. Quantification is obtained by normalizing and calibrating obtained mass spectrum against the mass spectrum obtained for an antibody/antigen of known concentration.
NTIS
Immunoassay; Mass Spectroscopy; Chemical Analysis

20070019996 Wolf, Greenfield and Sacks, PC, Boston, MA, USA, Iowa Univ., Iowa City, IA, USA, Coley Pharmaceutical Group, Inc., Wellesley, MA, USA
Immunostimulatory Nucleic Acid Molecules
Krieg, A. M., Inventor; Klinman, D., Inventor; Steinberg, A. D., Inventor; 14 Jan 05; 53 pp.; In English
Contract(s)/Grant(s): NIH-R29-AR42556-01
Patent Info.: Filed Filed 14 Jan 05; US-Patent-Appl-SN-11-036 527
Report No.(s): PB2007-104251; No Copyright; Avail.: CASI: A04, Hardcopy

Nucleic acids containing unmethylated CpG dinucleotides and therapeutic utilities based on their ability to stimulate an immune response and to redirect a Th2 response to a Th1 response in a subject are disclosed. Methods for treating atopic diseases, including atopic dermatitis, are disclosed.
NTIS
Molecules; Nucleic Acids

20070019999 Myers Bigel Sibley and Sajovec, Raleigh, NC, USA
Flavone Acetic Acid Analogs and Methods of Use Thereof
Lee, K. H., Inventor; Xia, Y., Inventor; Yang, Z. Y., Inventor; Bastow, K. F., Inventor; Kuo, S. C., Inventor; 28 Mar 05; 9 pp.; In English
Contract(s)/Grant(s): NIH-CA-17625

Patent Info.: Filed Filed 28 Mar 05; US-Patent-Appl-SN-11-091 054
Report No.(s): PB2007-104249; No Copyright; Avail.: CASI: A02, Hardcopy

Compounds are described having a structure according to Formula I or Formula II: 1 wherein: X is selected from the group consisting of O, NH,and S; Y is selected from the group consisting of O and S; m is from 1 to 3; n is from 1 to 5; R.sub.1 and R.sub.3 are each independently selected from the group consisting of H, hydroxy, lower alkyl, lower alkoxy, halo, amino, aminoalkyl, nitro, heteroaryl, --OC(.dbd.O)R.sub. 6,--O(C.dbd.O)OR.sub.6; and --O(C.dbd.O)N(R.sub.6).sub.2; and R.sub.2 is side chain such as an acetic acid side chain, where p is O to 4, R.sub.5is hydroxy, alkoxy or amino, and R.sub.6 is H or lower alkyl, or a pharmaceutically acceptable salt thereof. The compounds are useful for the treatment of cancer.
NTIS
Acetic Acid; Cancer; Analogs

20070020054 Drapkin (Micheal L.), Boulder, CO, USA
High Frequency Magnetic Thin Film Filter
Celinski, Z. J., Inventor; Camley, R. E., Inventor; 9 Mar 05; 20 pp.; In English
Contract(s)/Grant(s): DAAD190010146; DAAD1902I0174
Patent Info.: Filed Filed 9 Mar 05; US-Patent-Appl-SN-11-076 132
Report No.(s): PB2007-105304; No Copyright; Avail.: CASI: A03, Hardcopy

A layered microstrip device is described, in which at least two layers of different high internal field/high resonance frequency materials serve as the active elements of the device. The device is designed to filter ranges of high frequency electromagnetic waves, and is on a small scale to enable integration with high frequency electronics. The ranges of frequencies to be filtered depend on the active elements and device geometry selected for the device. The tradeoffs regarding active material and device geometry choices are explored in detail. The ranges of frequencies to be filtered can be modified in real time with the application of an external magnetic field. A variety of the devices were fabricated, and a number of experimental and theoretical studies were carried out.
NTIS
Electromagnetic Radiation; High Frequencies; Magnetic Films; Microstrip Devices; Patent Applications; Thin Films

20070020112 Stanford Linear Accelerator Center, CA, USA, Stanford Univ., CA, USA
Biogenic UO-2- Characterization and Surface Reactivity
Singer, D. M.; Brown, G. E.; Jan. 03, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2007-896938; SLAC-PUB-12230; No Copyright; Avail.: Department of Energy Information Bridge

Nano-scale biogenic UO(sub 2) is easier to oxidize and more reactive to aqueous metal ions than bulk UO(sub 2). In an attempt to understand these differences in properties, we have used a suite of bulk and surface characterization techniques to examine differences in the reactivity of biogenic UO(sub 2) versus bulk UO(sub 2) with respect to aqueous Zn(II). Precipitation of biogenic UO(sub 2) was mediated by Shewanella putrefaciens CN32, and the precipitates were washed using two protocols: (1) 5% NaOH, followed by 4 mM KHCO(sub 3)/KCl (NA-wash; 'NAUO2', to remove surface organic matter), and (2) 4 mM KHCO(sub 3)-KCl (BI-wash; 'BIUO2'', to remove soluble uranyl species). BET surface areas of biogenic-UO(sub 2) prepared using the two protocols are 128.63 m(sup 2)g(sup -1) and 92.56 m(sup 2)g(sup -1), respectively; particle sizes range from 2-10 nm as determined by FEG-SEM. Surface composition was probed using XPS, which showed a strong carbon 1s signal for the BI-washed samples; surface uranium is \g 90% U(IV) for both washing protocols. U L(sub III)-edge XANES spectra also indicate that U(IV) is the dominant oxidation state in the biogenic UO(sub 2) samples. Fits of the EXAFS spectra of these samples yielded half the number of uranium second-shell neighbors relative to bulk UO(sub 2), and no detectable oxygen neighbors beyond the first shell. At pH 7, the sorption of Zn(II) onto both biogenic and bulk UO(sub 2) is independent of electrolyte concentration, suggesting that Zn(II) sorption complexes are dominantly inner-sphere. Fits of Zn K-edge EXAFS spectra for biogenic UO(sub 2) indicate that Zn(II) sorption is dependent on the washing protocol. Zn-U pair correlations are observed for the NA-washed samples, but not for the BI-washed ones, suggesting that Zn(II) sorbs directly to the UO(sub 2) surface in the first case, and possibly to organic matter in the latter. Further work is required to elucidate the binding mechanism of Zn(II) to bulk UO(sub 2).
NTIS
Characterization; Dioxides; Reactivity; Uranium

20070020171 Cornell Univ., Ithaca, NY, USA
Report on Bioavailability of Chemical Wastes with Respect to the Potential for Soil Bioremediation
Madsen, E. L.; Oct. 2003; 131 pp.; In English
Contract(s)/Grant(s): EPA-QT-DC-99-003260
Report No.(s): PB2007-107556; No Copyright; Avail.: CASI: A07, Hardcopy

Based on conservative, reasonably thorough and careful evaluation of scientific studies described in this report, there is no doubt that chemical wastes in soil can be, and often are, in a state of reduced bioavailability. An analysis of the literature on bioremediation research concludes that bioremediation of chemical wastes in soils and sediments is rarely 100 percent efficient, due at least in part to the reduced bioavailability of the chemical. Reduced bioavailability simply means that a chemical wastes diminished effective concentration is proportionately balanced by a lingering reservoir of the chemical waste in soil and sediments. This lingering reservoir remains in the soil habitat regardless of which combinations of conceptual or actual sequestration mechanisms (e.g., complexation into bound residues, diffusion into soil pores, NAPL partitioning) apply.
NTIS
Soils; Bioavailability

20070020219 Fermi National Accelerator Lab., Batavia, IL, USA, Michigan State Univ., East Lansing, MI, USA
Efficiency and Lifetime of Carbon Foils
Chou, W.; Kostin, M.; Tang, Z.; Nov. 2006; 23 pp.; In English
Report No.(s): DE2007-897239; FERMILAB-CONF-06-425-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Charge-exchange injection by means of carbon foils is a widely used method in accelerators. This paper discusses two critical issues concerning the use of carbon foils: efficiency and lifetime. An energy scaling of stripping efficiency was suggested and compared with measurements. Several factors that determine the foil lifetime--energy deposition, heating, stress and buckling--were studied by using the simulation codes MARS and ANSYS.
NTIS
Carbon; Foils (Materials); Particle Accelerators; Simulation; Life (Durability)

20070020271 Oregon State Univ., Corvallis, OR, USA, Microbial Insights, Inc., Rockford, TN, USA
Detecting and Quantifying Reductive Dechlorination During Monitored Natural attenuation at the Savannah River CBRP Site
Istok, J. D.; Field, J. A.; Raes, E.; Millings, M. R.; Peacock, A. D.; Jan. 02, 2006; 50 pp.; In English
Contract(s)/Grant(s): DEAC09-96-SR18500
Report No.(s): DE2007-897536; WSRC-STI-2006-00340 REV 0; No Copyright; Avail.: National Technical Information Service (NTIS)

Various attenuation mechanisms control the destruction, stabilization, and/or removal of contaminants from contaminated subsurface systems. Measuring the rates of the controlling attenuation mechanisms is a key to employing mass balance as a means to evaluate and monitor the expansion, stability and subsequent shrinkage of a contaminant plume. A team of researchers investigated the use of push-pull tests for measuring reductive dechlorination rates in situ at sites with low chlorinated solvent concentrations (\h1 ppm). The field research also examined the synergistic use of a suite of geochemical and microbial assays. Previous push-pull tests applied to environmental remediation objectives focused on general hydrological characterization or on designing bioremediation systems by examining the response of the subsurface to stimulation. In this research, the push-pull technique was tested to determine its 'low-range' sensitivity and uncertainty. Can these tests quantify relatively low attenuation rates representative of natural attenuation. The results of this research indicate that push-pull testing will be useful for measurement of in situ reductive dechlorination rates for chlorinated solvents at 'Monitored Natural Attenuation' (MNA) sites.
NTIS
Detection; Grasslands; Pollution Control; Rivers; Water Pollution

20070020428 Iowa State Univ. of Science and Technology, Ames, IA USA
Oxidations of Organic and Inorganic Substrates by Superoxo-, Hydroperoxo-, and Oxo-Compounds of the Transition Metals
Vasbinder, M. J.; Dec. 12, 2006; 97 pp.; In English
Contract(s)/Grant(s): DE-AC02-07CH11358
Report No.(s): DE2007-897378; IS-T 2327; No Copyright; Avail.: Department of Energy Information Bridge

Chapters 1 and 2 dealt with the chemistry of superoxo-, hydroperoxo-, and oxo- complexes of chromium, rhodium and

cobalt. Chapter 3 dealt with the mechanism of oxygen-atom transfer catalyzed by an oxo-complex of rhenium. In Chapter 1, it was shown that hydroperoxometal complexes of cobalt and rhodium react with superoxochromium and chromyl ions, generating reduced chromium species while oxidizing the hydroperoxometal ions to their corresponding superoxometal ions. It was shown that the chromyl and superoxochromium ions are the more powerful oxidants. Evidence supports hydrogen atom transfer from the hydroperoxometal ion to the oxidizing superoxochromium or chromyl ion as the reaction mechanism. There is a significant H/D kinetic isotope effect. Comparisons to the rate constants of other known hydrogen atom transfer reactions show the expected correlation with bond dissociation energies. In Chapter 2, it was found that the superoxometal complexes Cr(sub aq)OO(sup 2+) and Rh(NH(sub 3))(sub 4)(H(sub 2)O)OO(sup 2+) oxidize stable nitroxyl radicals of the TEMPO series with rate constants that correlate with the redox potentials of both the oxidant and reductant. These reactions fit the Marcus equation for electron transfer near the theoretical value. Acid catalysis is important to the reaction, especially the thermodynamically limited cases involving Rh(NH(sub 3))(sub 4)(H(sub 2)O)OO(sup 2+) as the oxidant. The rate constants are notably less than those measured in the reaction between the same nitroxyl radicals and other strong free-radical oxidants, an illustration of the delocalized and stabilized nature of the superoxometal ions. Chapter 3 showed that oxo-rhenium catalysts needed a nucleophile to complete the catalytic oxygen-atom transfer from substituted pyridine-N-oxides to triphenylphosphine. The reaction was studied by introducing various pyridine-derived nucleophiles and monitoring their effect on the rate, then fitting the observed rate constants to the Hammett correlation.
NTIS
Organic Compounds; Oxidizers; Substrates; Transition Metals

20070020431 Iowa State Univ. of Science and Technology, Ames, IA USA
Single Molecule Screening of Disease DNA without Amplification
Lee, J. Y.; Dec. 12, 2006; 80 pp.; In English
Contract(s)/Grant(s): DE-AC02-07CH11358
Report No.(s): DE2007-897373; IS-T 2092; No Copyright; Avail.: Department of Energy Information Bridge

The potential of single molecule detection as an analysis tool in biological and medical fields is well recognized today. This fast evolving technique will provide fundamental sensitivity to pick up individual pathogen molecules, and therefore contribute to a more accurate diagnosis and a better chance for a complete cure. Many studies are being carried out to successfully apply this technique in real screening fields. In this dissertation, several attempts are shown that have been made to test and refine the application of the single molecule technique as a clinical screening method. A basic applicability was tested with a 100% target content sample, using electrophoretic mobility and multiple colors as identification tools. Both electrophoretic and spectral information of individual molecule were collected within a second, while the molecule travels along the flow in a capillary. Insertion of a transmission grating made the recording of the whole spectrum of a dye-stained molecule possible without adding complicated instrumental components. Collecting two kinds of information simultaneously and combining them allowed more thorough identification, up to 98.8% accuracy. Probing mRNA molecules with fluorescently labeled cDNA via hybridization was also carried out.
NTIS
Amplification; Deoxyribonucleic Acid; Diseases; Molecules

20070020438 Iowa State Univ. of Science and Technology, Ames, IA USA
Novel Aryne Chemistry in Organic Synthesis
Liu, Z.; Dec. 12, 2006; 185 pp.; In English
Contract(s)/Grant(s): DE-AC02-07CH11358
Report No.(s): DE2007-897369; IS-T 2563; No Copyright; Avail.: Department of Energy Information Bridge

Arynes are among the most intensively studied systems in chemistry. However, many aspects of the chemistry of these reactive intermediates are not well understood yet and their use as reagents in synthetic organic chemistry has been somewhat limited, due to the harsh conditions needed to generate arynes and the often uncontrolled reactivity exhibited by these species. Recently, o-silylaryl triflates, which can generate the corresponding arynes under very mild reaction conditions, have been found very useful in organic synthesis. This thesis describes several novel and useful methodologies by employing arynes, which generate from o-silylaryl triflates, in organic synthesis. An efficient, reliable method for the N-arylation of amines, sulfonamides and carbamates, and the O-arylation of phenols and carboxylic acids is described. Amines, sulfonamides, phenols, and carboxylic acids are good nucleophiles, which can react with arynes generated from a-silylaryl triflates to afford the corresponding N- and O-arylated products in very high yields. The regioselectivity of unsymmetrical arynes has also been studied. A lot of useful, functional groups can tolerate our reaction conditions. Carbazoles and dibenzofurans are important heteroaromatic compounds, which have a variety of biological activities. A variety of substituted carbazoles and dibenzofwans

are readily prepared in good to excellent yields starting with the corresponding o-iodoanilines or o-iodophenols and o-silylaryl triflates by a treatment with CsF, followed by a Pd-catalyzed cyclization, which overall provides a one-pot, two-step process. By using this methodology, the carbazole alkaloid mukonine has been concisely synthesized in a very good yield.
NTIS
Organic Chemistry; Organic Compounds; Synthesis

20070020483 Stanford Linear Accelerator Center, CA, USA, Stanford Univ., CA, USA, Paris Univ., France, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Study of Interactions Between Microbes and Minerals by Scanning Transmission X-Ray Microscopy (STXM)
Benzerara, K.; Tyliszczak, T.; Brown, G. E.; Jan. 03, 2007; 5 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2007-896937; SLAC-PUB-12231; No Copyright; Avail.: Department of Energy Information Bridge

Scanning Transmission X-ray Microscopy (STXM) and Transmission Electron Microscopy (TEM) were combined to characterize various samples of geomicrobiological interest down to the nanometer scale. An approach based on energy-filtered imaging was used to examine microbe-mineral interactions and the resulting biominerals, as well as biosignatures in simplified laboratory samples. This approach was then applied to natural samples, including natural biofilms entombed in calcium carbonate precipitates and bioweathered silicates and facilitated location of bacterial cells and provided unique insights about their biogeochemical interactions with minerals at the 30-40 nm scale.
NTIS
Biogeochemistry; Microorganisms; Microscopy; Minerals; Scanners; Transmission Electron Microscopy

20070020491 Lawrence Livermore National Lab., Livermore, CA USA
Understanding the Mechanism of Human P450 CYP1A2 Using Coupled Qunatum-Classical Simulations in a Dynamical Environment
Draeger, E. W.; BEnnion, B.; Gygi, F.; Lightstone, F.; Feb. 15, 2006; 22 pp.; In English
Report No.(s): DE2007-899113; UCRL-TR-219003; No Copyright; Avail.: National Technical Information Service (NTIS)

The reaction mechanism of the human P450 CYP1A2 enzyme plays a fundamental role in understanding the effects of environmental carcinogens and mutagens on humans. Despite extensive experimental research on this enzyme system, key questions regarding its catalytic cycle and oxygen activation mechanism remain unanswered. In order to elucidate the reaction mechanism in human P450, new computational methods are needed to accurately represent this system. To enable us to perform computational simulations of unprecedented accuracy on these systems, we developed a dynamic quantum-classical (QM/MM) hybrid method, in which ab initio molecular dynamics are coupled with classical molecular mechanics. This will provide the accuracy needed to address such a complex, large biological system in a fully dynamic environment. We also present detailed calculations of the P450 active site, including the relative charge transfer between iron porphine and tetraphenyl porphyrin.
NTIS
Enzymes; Molecular Biology; Simulation

26
METALS AND METALLIC MATERIALS

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

20070019697 NASA Glenn Research Center, Cleveland, OH, USA
Oxidation Kinetics of a NiPtTi High Temperature Shape Memory Alloy
Smialek, James L.; Humphrey, Donald L.; Noebe, Ronald D.; April 17, 2007; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.15.03
Report No.(s): NASA/TM-2007-214697; E-15898; Copyright; Avail.: CASI: A03, Hardcopy

A high temperature shape memory alloy (HTSMA), Ni30Pt50Ti, with an M(sub s) near 600 C, was isothermally oxidized in air for 100 hr over the temperature range of 500 to 900 C. Parabolic kinetics were confirmed by log-log and parabolic plots and showed no indication of fast transient oxidation. The overall behavior could be best described by the Arrhenius relationship: k(sub p) = 1.64 x 10(exp 12)[(-250 kJ/mole)/RT] mg(sup 2)/cm(sup 4)hr. This is about a factor of 4 reduction compared to values measured here for a binary Ni47Ti commercial SMA. The activation energy agreed with most literature

values for TiO2 scale growth measured for elemental Ti and other NiTi alloys. Assuming uniform alloy depletion of a 20 mil (0.5 mm) dia. HTSMA wire, approx. 1 percent Ti reduction is predicted after 20,000 hr oxidation at 500 C, but becomes much more serious at higher temperatures.
Author
Kinetics; Nickel Alloys; Oxidation; Titanium Alloys; Shape Memory Alloys; Platinum Alloys; Heat Resistant Alloys

20070020053 Lawrence Livermore National Lab., Livermore, CA USA, California Univ., Berkeley, CA, USA
Shape Memory System With Integrated Actuation Using Embedded Particles
Buckley, P. R., Inventor; Maitland, D. J., Inventor; 26 Mar 04; 20 pp.; In English
Contract(s)/Grant(s): WA7405ENG48
Patent Info.: Filed Filed 26 Mar 04; US-Patent-Appl-SN-10-810 422
Report No.(s): PB2007-105303; No Copyright; Avail.: CASI: A03, Hardcopy

A shape memory material with integrated actuation using embedded particles. One embodiment provides a shape memory material apparatus comprising a shape memory material body and magnetic pieces in the shape memory material body. Another embodiment provides a method of actuating a device to perform an activity on a subject comprising the steps of positioning a shape memory material body in a desired position with regard to the subject, the shape memory material body capable of being formed in a specific primary shape, reformed into a secondary stable shape, and controllably actuated to recover the specific primary shape; including pieces in the shape memory material body; and actuating the shape memory material body using the pieces causing the shape memory material body to be controllably actuated to recover the specific primary shape and perform the activity on the subject.
NTIS
Embedding; Magnetic Materials; Memory (Computers); Patent Applications; Shapes; Shape Memory Alloys

20070020080 Worcester Polytechnic Inst., MA, USA
Energy Saving Model for the Heat Treatment of Castings
January 2006; 232 pp.; In English
Report No.(s): DE2007-897010; No Copyright; Avail.: National Technical Information Service (NTIS)

An integrated system of software, databases, and design rules have been developed, verified, and to be marketed to enable quantitative prediction and optimization of the heat treatment of aluminum castings to increase quality, increase productivity, reduce heat treatment cycle times and reduce energy consumption. The software predicts the thermal cycle in critical locations of individual components in a furnace, the evolution of microstructure, and the attainment of properties in heat treatable aluminum alloy castings. The model takes into account the prior casting process and the specific composition of the component. The heat treatment simulation modules can be used in conjunction with software packages for simulation of the casting process. The system is built upon a quantitative understanding of the kinetics of microstructure evolution in complex multicomponent alloys, on a quantitative understanding of the interdependence of microstructure and properties, on validated kinetic and thermodynamic databases, and validated quantitative models.
NTIS
Aluminum Alloys; Castings; Energy Conservation; Heat Treatment

20070020109 Sampson (Richard L.), Boston, MA, USA
Powder Metallurgy Crucible for Alluminum Nitride Crystal Growth
Schowalter, L. J., Inventor; Slack, G. A., Inventor; 12 Apr 04; 10 pp.; In English
Contract(s)/Grant(s): N000001497C0362
Patent Info.: Filed Filed 12 Apr 04; US-Patent-Appl-SN-10-822 336
Report No.(s): PB2007-105849; No Copyright; Avail.: CASI: A02, Hardcopy

A crucible for growing III-nitride (e.g., aluminum nitride) single crystals is provided. The crucible includes an elongated wall structure defining an interior crystal growth cavity. Embodiments include a plurality of grains and a wall thickness of at least about 1.5 times the average grain size. In particular embodiments, the crucible includes first and second layers of grains the first layer including grains forming an inside surface thereof and the second layer being superposed with the first layer. The crucible may be fabricated from tungsten-rhenium (W--Re) alloys; rhenium (Re); tantalum monocarbide (TaC); tantalum nitride (Ta(sub 2)N); hafnium nitride (HfN); a mixture of tungsten and tantalum (W--Ta); tungsten (W); and combinations thereof.
NTIS
Aluminum Nitrides; Crucibles; Crystal Growth; Nitrides; Patent Applications; Powder Metallurgy

20070020430 Iowa State Univ. of Science and Technology, Ames, IA USA
Phase Transformation in Cast Superaustenitic Stainless Steels
Phillips, N. S. L.; Dec. 12, 2006; 81 pp.; In English
Contract(s)/Grant(s): DE-AC02-07CH11358
Report No.(s): DE2007-897374; IS-T 2662; No Copyright; Avail.: Department of Energy Information Bridge

Superaustenitic stainless steels constitute a group of Fe-based alloys that are compositionally balanced to have a purely austenitic matrix and exhibit favorable pitting and crevice corrosion resistant properties and mechanical strength. However, intermetallic precipitates such as sigma and Laves can form during casting or exposure to high-temperature processing, which degrade the corrosion and mechanical properties of the material. The goal of this study was to accurately characterize the solid-solid phase transformations seen in cast superaustenitic stainless steels. Heat treatments were performed to understand the time and temperature ranges for intermetallic phase formations in alloys CN3MN and CK3MCuN. Microstructures were characterized using scanning electron microscopy (SEM), transmission electron microscopy (TEM), and energy and wavelength dispersive spectroscopy (EDS, WDS). The equilibrium microstructures, composed primarily of sigma and Laves within purely austenitic matrices, showed slow transformation kinetics. Factors that determine the extent of transformation, including diffusion, nucleation, and growth, are discussed.
NTIS
Cast Alloys; Phase Transformations; Stainless Steels

20070020439 Iowa State Univ. of Science and Technology, Ames, IA USA
Mechanistic Selection and Growth of Twinned Bicrysalline Primary Si in near Eutectic Al-Si Alloys
Jung, C.; Dec. 12, 2006; 195 pp.; In English
Contract(s)/Grant(s): DE-AC02-07CH11358
Report No.(s): DE2007-897368; IS-T 2475; No Copyright; Avail.: Department of Energy Information Bridge

Morphological evolution and selection of angular primary silicon is investigated in near-eutectic Al-Si alloys. Angular silicon arrays are grown directionally in a Bridgman furnace at velocities in the regime of 10(sup -3) m/sec and with a temperature gradient of 7.5 x 10(sup 3) K/m. Under these conditions, the primary Si phase grows as an array of twinned bicrystalline dendrites, where the twinning gives rise to a characteristic 8-pointed star-shaped primary morphology. While this primary Si remains largely faceted at the growth front, a complex structure of coherent symmetric twin boundaries enables various adjustment mechanisms which operate to optimize the characteristic spacings within the primary array. In the work presented here, this primary silicon growth morphology is examined in detail. In particular, this thesis describes the investigation of: (1) morphological selection of the twinned bicrystalline primary starshape morphology; (2) primary array behavior, including the lateral propagation of the starshape grains and the associated evolution of a strong \h100\g texture; (3) the detailed structure of the 8-pointed star-shaped primary morphology, including the twin boundary configuration within the central core; (4) the mechanisms of lateral propagation and spacing adjustment during array evolution; and (5) the thermosolutal conditions (i.e. operating state) at the primary growth front.
NTIS
Aluminum Alloys; Eutectic Alloys; Eutectics; Silicon Alloys

20070020496 Lawrence Livermore National Lab., Livermore, CA USA
Joining of Beryllium
Goldberg, A.; Sep. 26, 2006; 49 pp.; In English
Report No.(s): DE2007-899099; UCRL-TR-224718; No Copyright; Avail.: Department of Energy Information Bridge

A handbook dealing with the many aspects of beryllium that would be important for the users of this metal is currently being prepared. With an introduction on the applications, advantages and limitations in the use of this metal the following topics will be discussed in this handbook: physical, thermal, and nuclear properties; extraction from the ores; purification and casting of ingots; production and types of beryllium powders; consolidation methods, grades, and properties; mechanical properties with emphasis on the various factors affecting these properties; forming and mechanical working; welding, brazing, bonding, and fastening; machining; powder deposition; corrosion; health aspects; and examples of production of components. This report consists of 'Section X--Joining' from the handbook. The prefix X is maintained here for the figures, tables and references. In this section the different methods used for joining beryllium and the advantages, disadvantages and limitations of each are presented. The methods discussed are fusion welding, brazing, solid state bonding (diffusion bonding and

deformation bonding), soldering, and mechanical fastening. Since beryllium has a high affinity for oxygen and nitrogen with the formation of oxides and nitrides, considerable care must be taken on heating the metal, to protect it from the ambient atmosphere.
NTIS
Beryllium; Bonding

27
NONMETALLIC MATERIALS

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

20070019801 Cleveland Tool and Machine, Brook Park, OH, USA
Advanced Pattern Material for Investment Casting Applications
Neece, D.; Feb. 08, 2006; 13 pp.; In English
Contract(s)/Grant(s): DE-FG36-04GO14332
Report No.(s): DE2007-897812; No Copyright; Avail.: National Technical Information Service (NTIS)

Cleveland Tool and Machine (CTM) of Cleveland, Ohio in conjunction with Harrington Product Development Center (HPDC) of Cincinnati, Ohio have developed an advanced, dimensionally accurate, temperature-stable, energy-efficient and cost-effective material and process to manufacture patterns for the investment casting industry. In the proposed technology, FOPAT (aFOam PATtern material) has been developed which is especially compatible with the investment casting process and offers the following advantages: increased dimensional accuracy; increased temperature stability; lower cost per pattern; less energy consumption per pattern; decreased cost of pattern making equipment; decreased tooling cost; increased casting yield. The present method for investment casting is 'the lost wax' process, which is exactly that, the use of wax as a pattern material, which is then melted out or 'lost' from the ceramic shell. The molten metal is then poured into the ceramic shell to produce a metal casting. This process goes back thousands of years and while there have been improvements in the wax and processing technology, the material is basically the same, wax. The proposed technology is based upon an established industrial process of 'Reaction Injection Molding' (RIM) where two components react when mixed and then 'molded' to form a part. The proposed technology has been modified and improved with the needs of investment casting in mind. A proprietary mix of components has been formulated which react and expand to form a foam-like product. The result is an investment casting pattern with smooth surface finish and excellent dimensional predictability along with the other key benefits listed above.
NTIS
Investment Casting; Injection Molding

20070019813 Sandia National Labs., Albuquerque, NM USA, PPF Industries, Pittsburgh, PA, USA
On-Line Coating of Glass with Tin Oxide by Atmospheric Pressure Chemical Vapor Deposition
Allendorf, M.; Houf, W. G.; McDaniel, A. H.; Chae, Y.; Li, M.; Nov. 01, 2006; 137 pp.; In English
Report No.(s): DE2007-897642; SAND2006-6225; No Copyright; Avail.: Department of Energy Information Bridge

Atmospheric pressure chemical vapor deposition (APCVD) of tin oxide is a very important manufacturing technique used in the production of low-emissivity glass. It is also the primary method used to provide wear-resistant coatings on glass containers. The complexity of these systems, which involve chemical reactions in both the gas phase and on the deposition surface, as well as complex fluid dynamics, makes process optimization and design of new coating reactors a very difficult task. In 2001 the U.S. Dept. of Energy Industrial Technologies Program Glass Industry of the Future Team funded a project to address the need for more accurate data concerning the tin oxide APCVD process. This report presents a case study of on-line APCVD using organometallic precursors, which are the primary reactants used in industrial coating processes. Research staff at Sandia National Laboratories in Livermore, CA, and the PPG Industries Glass Technology Center in Pittsburgh, PA collaborated to produce this work. In this report, we describe a detailed investigation of the factors controlling the growth of tin oxide films. The report begins with a discussion of the basic elements of the deposition chemistry, including gas-phase thermochemistry of tin species and mechanisms of chemical reactions involved in the decomposition of tin precursors. These results provide the basis for experimental investigations in which tin oxide growth rates were measured as a function of all major process variables. The experiments focused on growth from monobutyltintrichloride (MBTC) since this is one of the two primary precursors used industrially. There are almost no reliable growth-rate data available for this precursor. Robust models describing the growth rate as a function of these variables are derived from modeling of these data. Finally, the results are used to conduct computational fluid dynamic simulations of both pilot- and full-scale coating reactors.

As a result, general conclusions are reached concerning the factors affecting the growth rate in on-line APCVD reactors. In addition, a substantial body of data was generated that can be used to model many different industrial tin oxide coating processes. These data include the most extensive compilation of thermochemistry for gas-phase tin-containing species as well as kinetic expressions describing tin oxide growth rates over a wide range of temperatures, pressures, and reactant concentrations.
NTIS
Atmospheric Pressure; Coating; Glass; On-Line Systems; Tin Oxides; Vapor Deposition

20070019816 Sandia National Labs., Albuquerque, NM USA
Thermal Properties of PZT95/5(1.8Nb) and PSZT Ceramics
Yang, P.; DiAntonio, C.; Burns, G. R.; Rae, D. F.; Corelis, D. J.; Nov. 01, 2006; 38 pp.; In English
Report No.(s): DE2007-897640; SAND2006-5437; No Copyright; Avail.: National Technical Information Service (NTIS)
Thermal properties of niobium-modified PZT95/5(1.8Nb) and PSZT ceramics used for the ferroelectric power supply have been studied from -100 C to 375 C. Within this temperature range, these materials exhibit ferroelectric-ferroelectric and ferroelectric-paraelectric phase transformations. The thermal expansion coefficient, heat capacity, and thermal diffusivity of different phases were measured. Thermal conductivity and Grueneisen constant were calculated at several selected temperatures between -60 C and 100 C. Results show that thermal properties of these two solid solutions are very similar. Phase transformations in these ceramics possess first order transformation characteristics including thermal hysteresis, transformational strain, and enthalpy change. The thermal strain in the high temperature rhombohedral phase region is extremely anisotropic. The heat capacity for both materials approaches to 3R (or 5.938 cal/(g-mole*K)) near room temperature. The thermal diffusivity and the thermal conductivity are quite low in comparison to common oxide ceramics, and are comparable to amorphous silicate glass. Furthermore, the thermal conductivity of these materials between -60 C and 100 C becomes independent of temperature and is sensitive to the structural phase transformation. These phenomena suggest that the phonon mean free path governing the thermal conductivity in this temperature range is limited by the lattice dimensions, which is in good agreement with calculated values. Effects of small compositional changes and density/porosity variations in these ceramics on their thermal properties are also discussed. The implications of these transformation characteristics and unusual thermal properties are important in guiding processing and handling procedures for these materials.
NTIS
Ceramics; Thermal Expansion; Thermodynamic Properties

20070019871 NASA Johnson Space Center, Houston, TX, USA
Technical Note: Some Issues Related to the Selection of Polymers for Aerospace Oxygen Systems
Hirsch, David; Beeson, Harold; [2004]; 6 pp.; In English; Copyright; Avail.: CASI: A02, Hardcopy
Materials intended for use in aerospace oxygen systems are commonly screened for oxygen compatibility following NASA STD 6001. This standard allows qualification of materials based on results provided by only one test method. Potential issues related to this practice are reviewed and recommendations are proposed that would lead to improved aerospace oxygen systems safety.
Author
Oxygen Supply Equipment; Polymers; Performance Tests; Spacecraft Construction Materials

20070019949 Bell and Associates, San Francisco, CA, USA
Glycodendrimers having Biological Activity
Shaunak, S., Inventor; Gianasi, E., Inventor; Duncan, R., Inventor; 18 Mar 03; 82 pp.; In English
Contract(s)/Grant(s): 1R21A1446901
Patent Info.: Filed Filed 18 Mar 03; US-Patent-Appl-SN-10-511 317
Report No.(s): PB2007-105327; No Copyright; Avail.: CASI: A05, Hardcopy
The present invention relates to new anionic glycodendrimers having new biological activity, processes for preparing them and their use in medicine including veterinary medicine.
NTIS
Activity (Biology); Dendrimers; Patent Applications

20070019977 Sandia National Labs., Albuquerque, NM USA
Protection of Alodine Coatings from Thermal Aging by Removable Polymer Coatings
Bradshaw, R. W.; Wagstaff, B. R.; Whinnery, L. L.; Dec. 01, 2006; 29 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-897634; SAND2006-6582; No Copyright; Avail.: National Technical Information Service (NTIS)

Removable polymer coatings were evaluated as a means to suppress dehydration of Alodine chromate conversion coatings during thermal aging and thereby retain the corrosion protection afforded by Alodine. Two types of polymer coatings were applied to Alodine-treated panels of aluminum alloys 7075-T73 and 6061-T6 that were subsequently aged for 15 to 50 hours at temperatures between 135 F to 200 F. The corrosion resistance of the thermally aged panels was evaluated, after stripping the polymer coatings, by exposure to a standard salt-fog corrosion test and the extent of pitting of the polymer-coated and untreated panels compared. Removable polymer coatings mitigated the loss of corrosion resistance due to thermal aging experienced by the untreated alloys. An epoxide coating was more effective than a fluorosilicone coating as a dehydration barrier.
NTIS
Aging (Materials); Aluminum Alloys; Heat Treatment; Protection; Surface Finishing; Temperature Effects

20070019987 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Spray Shadowing for Stress Relief and Mechanical Locking in Thick Protective Coatings
Rollis, K., Inventor; Bartram, B., Inventor; 27 May 05; 9 pp.; In English
Contract(s)/Grant(s): W7405ENG36
Patent Info.: Filed Filed 27 May 05; US-Patent-Appl-SN-11-140 661
Report No.(s): PB2007-105834; No Copyright; Avail.: CASI: A02, Hardcopy

A method for applying a protective coating on an article, comprising the following steps: selecting an article with a surface for applying a coating thickness; creating undercut grooves on the article, where the grooves depend beneath the surface to a bottom portion with the grooves having an upper width on the surface and a lower width on the bottom portion connected by side walls, where at least one of the side walls connects the upper width and the lower width to form an undercut angle with the surface less than 90 degrees; and, applying the protective coating onto the article to fill the undercut grooves and cover the surface, thereby forming weak paths within the protective coating.
NTIS
Locking; Patent Applications; Protective Coatings; Shadows; Sprayers

20070020106 Stanford Univ., CA, USA, National Museum of Natural History, Washington, DC, USA
Durability of Silicate Glasses: An Historical Approach
Forges, F.; Pirre-Etcheverry, M.; Haddi, A.; Trocellier, P.; Brown, G. E.; Jan. 02, 2007; 7 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2007-896945; SLAC-PUB-12221; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors present a short review of current theories of glass weathering, including glass dissolution, and hydrolysis of nuclear waste glasses, and leaching of historical glasses from an XAFS perspective. The results of various laboratory leaching experiments at different timescales (30 days to 12 years) are compared with results for historical glasses that were weathered by atmospheric gases and soil waters over 500 to 3000 years. Good agreement is found between laboratory experiments and slowly leached historical glasses, with a strong enrichment of metals at the water/gel interface. Depending on the nature of the transition elements originally dissolved in the melt, increasing elemental distributions are expected to increase with time for a given glass durability context.
NTIS
Durability; Glass; Histories; Silicates

20070020221 Foley and Lardner, LLP, Washington, DC, USA, Northwestern Univ., Chicago, IL, USA
Methods Utilizing Scanning Probe Microscope Tips and Products Thereof or Produced Thereby
Mirkin, C. A., Inventor; Piner, R., Inventor; Hong, S., Inventor; 28 Sep 04; 55 pp.; In English
Contract(s)/Grant(s): F49620-96-1-055
Patent Info.: Filed Filed 28 Sep 04; US-Patent-Appl-SN-10-951 031
Report No.(s): PB2007-104270; No Copyright; Avail.: CASI: A04, Hardcopy

The invention provides a lithographic method referred to as ‘dip pen’ nanolithography (DPN). DPN utilizes a scanning

probe microscope (SPM) tip (e.g., an atomic force microscope (AFM) tip) as a 'pen,' a solid-state substrate (e.g., gold) as 'paper,' and molecules with a chemical affinity for the solid-state substrate as 'ink.' Capillary transport of molecules from the SPM tip to the solid substrate is used in DPN to directly write patterns consisting of a relatively small collection of molecules in submicrometer dimensions, making DPN useful in the fabrication of a variety of microscale and nanoscale devices. The invention also provides substrates patterned by DPN, including submicrometer combinatorial arrays, and kits, devices and software for performing DPN. The invention further provides a method of performing AFM imaging in air. The method comprises coating an AFM tip with a hydrophobic compound, the hydrophobic compound being selected so that AFM imaging performed using the coated AFM tip is improved compared to AFM imaging performed using an uncoated AFM tip. Finally, the invention provides AFM tips coated with the hydrophobic compounds.
NTIS
Lithography; Nanofabrication; Nanotechnology; Microscopy

20070020371 Fluidigm Corp., San Francisco, CA, USA, California Inst. of Tech., Pasadena, CA USA
Microfabricated Elastomeric Valve and Pump Systems
Unger, M. A., Inventor; Chou, H. P., Inventor; Thorsen, T. A., Inventor; Scherer, A., Inventor; Quake, S. R., Inventor; 20 Sep 04; 65 pp.; In English
Contract(s)/Grant(s): HG-01642-02
Patent Info.: Filed Filed 20 Sep 04; US-Patent-Appl-SN-10-945 737
Report No.(s): PB2007-102396; No Copyright; Avail.: CASI: A04, Hardcopy

A method of fabricating an elastomeric structure, comprising: forming a first elastomeric layer on top of a first micromachined mold, the first micromachined mold having a first raised protrusion which forms a first recess extending along a bottom surface of the first elastomeric layer; forming a second elastomeric layer on top of a second micromachined mold, the second micromachined mold having a second raised protrusion which forms a second recess extending along a bottom surface of the second elastomeric layer; bonding the bottom surface of the second elastomeric layer onto a top surface of the first elastomeric layer such that a control channel forms in the second recess between the first and second elastomeric layers; and positioning the first elastomeric layer on top of a planar substrate such that a flow channel forms in the first recess between the first elastomeric layer and the planar substrate.
NTIS
Elastomers; Micromachining; Patent Applications; Pumps; Valves

28
PROPELLANTS AND FUELS

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

20070020160 NASA Johnson Space Center, Houston, TX, USA
NASA Hydrogen Peroxide Propellant Hazards Technical Manual
Baker, David L.; Greene, Ben; Frazier, Wayne; June 13, 2005; 5 pp.; In English; 4th JANNAF Modeling & Simulation Subcommittee (MSS) Meeting, 13-17 June 2005, Charleston, SC, USA; Copyright; Avail.: CASI: A01, Hardcopy

The Fire, Explosion, Compatibility and Safety Hazards of Hydrogen Peroxide NASA technical manual was developed at the NASA Johnson Space Center White Sands Test Facility. NASA Technical Memorandum TM-2004-213151 covers topics concerning high concentration hydrogen peroxide including fire and explosion hazards, material and fluid reactivity, materials selection information, personnel and environmental hazards, physical and chemical properties, analytical spectroscopy, specifications, analytical methods, and material compatibility data. A summary of hydrogen peroxide-related accidents, incidents, dose calls, mishaps and lessons learned is included. The manual draws from art extensive literature base and includes recent applicable regulatory compliance documentation. The manual may be obtained by USA government agencies from NASA Johnson Space Center and used as a reference source for hazards and safe handling of hydrogen peroxide.
Author
Hydrogen Peroxide; Chemical Properties; Hazardous Materials; Materials Selection

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*.

20070019769 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Compact, Lightweight Dual- Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions
Yueh, Simon H.; Wilson, William J.; Njoku, Eni; Hunter, Don; Dinardo, Steve; Kona, Keerti S.; Manteghi, Majid; Gies, Dennis; Rahmat-Samii, Yahya; June 22, 2004; 4 pp.; In English; Earth Science Technology Conference, 22-24 Jun. 2004, Palo Alto, CA, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39944

The development of a compact, lightweight, dual frequency antenna feed for future soil moisture and sea surface salinity (SSS) missions is described. The design is based on the microstrip stacked-patch array (MSPA) to be used to feed a large lightweight deployable rotating mesh antenna for spaceborne L-band (approx. 1 GHz) passive and active sensing systems. The design features will also enable applications to airborne sensors operating on small aircrafts. This paper describes the design of stacked patch elements, 16-element array configuration and power-divider beam forming network The test results from the fabrication of stacked patches and power divider were also described.
Author
Antenna Feeds; Microstrip Antennas; Ocean Surface; Salinity; Soil Moisture; Ultrahigh Frequencies; Fabrication

20070019815 National Telecommunications and Information Administration, Washington, DC, USA
Institute for Telecommunication Sciences Technical Progress Report, 2006
Jan. 2007; 100 pp.; In English
Report No.(s): PB2007-108529; No Copyright; Avail.: National Technical Information Service (NTIS)

The Institute for Telecommunication Sciences (ITS), located in Boulder, Colorado, is the research and engineering arm of the National Telecommunications and Information Administration (NTIA), of the U.S. Department of Commerce (DOC). The Institutes staff of Federal employees provides strong engineering and scientific skills and experience to our technical programs. The majority of employees are electronics engineers, but the staff also includes mathematicians, physicists, computer scientists, and specialists in other fields. ITS support during Fiscal Year 2006 consisted of $6 million of direct funding from the DOC and approximately $8 million for work sponsored by other Federal agencies and U.S. industry.
NTIS
Communication Satellites; Telecommunication

20070019820
Institute for Telecommunication Sciences Technical Progress Report, 2004
Feb. 2005; 96 pp.; In English
Report No.(s): PB2007-108528; No Copyright; Avail.: National Technical Information Service (NTIS)

The Institute for Telecommunication Sciences (ITS), located in Boulder, Colorado, is the research and engineering arm of the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce. The Institutes staff, all of whom are Federal employees, provide strong engineering and scientific skills and experience to our technical programs. The majority of our employees are electronics engineers, but the staff also includes mathematicians, physicists, computer scientists, and specialists in other fields. ITS support during Fiscal Year 2004 consisted of $6 million of direct funding from the Department of Commerce and approximately $8 million for work sponsored by other Federal agencies and U.S. industry.
NTIS
Communication Satellites; Telecommunication

20070019825 National Telecommunications and Information Administration, Washington, DC, USA
Institute for Telecommunication Sciences Technical Progress Report, 2003
Dec. 2003; 108 pp.; In English
Report No.(s): PB2007-108527; No Copyright; Avail.: National Technical Information Service (NTIS)

The Institute for Telecommunication Sciences (ITS), located in Boulder, Colorado, is the research and engineering arm

of the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce. The Institutes staff, all of whom are Federal employees, provide strong engineering and scientific skills and experience to our technical programs. The majority of our employees are electronics engineers, but the staff also includes mathematicians, physicists, computer scientists, and specialists in other fields. ITS support during Fiscal Year 2003 consisted of $6.0 million of direct funding from the Department of Commerce and approximately $4.7 million for work sponsored by other Federal agencies and U.S. industry.
NTIS
Communication Satellites; Telecommunication

20070019932 National Telecommunications and Information Administration, Washington, DC, USA, National Telecommunications and Information Administration, Washington, DC, USA
Institute for Telecommunication Sciences Technical Progress Report, 2000
Jan. 2001; 118 pp.; In English
Report No.(s): PB2007-108525; No Copyright; Avail.: National Technical Information Service (NTIS)

The Institute for Telecommunication Sciences (ITS), located in Boulder, Colorado, is the research and engineering arm of the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce. ITS employs individuals, all of whom are Federal employees, with strong engineering and scientific skills and experience to support our technical programs. The majority of our employees are electronics engineers, with a complement of mathematicians, physicists, and computer scientists. ITS support during Fiscal Year 2000 consisted of $3.6 million of direct funding from the Department of Commerce and approximately $5.4 million for work sponsored by other Federal agencies and U.S. industry.
NTIS
Communication Satellites; Telecommunication

20070019954 Fish and Neave IP Group, Ropes, Boston, MA, USA, BBNT Solutions, LLC, Cambridge, MA, USA
Methods for Providing Prioritized Communications Using a Carrier Sense Multiple Access Protocol
Redi, J. K., Inventor; 24 May 05; 13 pp.; In English
Contract(s)/Grant(s): W911NF04C0025
Patent Info.: Filed Filed 24 May 05; US-Patent-Appl-SN-11-088 431
Report No.(s): PB2007-105333; No Copyright; Avail.: CASI: A03, Hardcopy

A method of communication is provided in which a node maintains a condition table which includes at least one condition unrelated to network traffic conditions, which if met triggers the node to reserve a set of time windows for receiving communications. During those time windows, the node refrains from initiating transmission of communication.
NTIS
Carrier Sense Multiple Access; Patent Applications; Protocol (Computers)

20070019955 Banier (Gregory) Law Office, Wall-Township, NJ, USA, New Jersey Inst. of Tech., Newark, NJ, USA
Combined Frequency-Time Domain Power Adaptation for CDMA Communication System
Bar-Ness, Y., Inventor; Hoon, Y., Inventor; 10 Mar 05; 19 pp.; In English
Contract(s)/Grant(s): ANS03338788
Patent Info.: Filed Filed 10 Mar 05; US-Patent-Appl-SN-11-077 435
Report No.(s): PB2007-105334; No Copyright; Avail.: CASI: A03, Hardcopy

Practical transmission power adaptation in multicarrier code division multiple access (MC-CDMA) communications is using either a frequency domain technique or a time domain technique or a combined frequency and time domain technique in response to channel variations. With frequency domain power adaptation, the transmission power is allocated over the N' strongest subcarriers rather than over all possible N subcarriers, where the strongest subcarriers are understood to exhibit the highest channel gains. A substantially optimal N' can be chosen so that the average bit error rate (BER) is minimized. In the time domain power adaptation technique, transmission power is adapted so that the desired signal strength at the receiver output is maintained at a fixed level. In the combined time and frequency domain adaptation technique, the transmission power is first allocated over the N' strongest subcarriers rather than over all possible N subcarriers and then it is adapted so that the desired signal strength at the receiver output is maintained at a fixed level.
NTIS
Code Division Multiple Access; Communication Satellites; Frequencies; Mobile Communication Systems; Patent Applications

20070019979 Sandia National Labs., Albuquerque, NM USA
Reduced-Volume Antennas with Integrated High-Impedance Electromagnetic Surfaces
Forman, M. A.; Nov. 01, 2006; 22 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-897637; SAND2006-6950; No Copyright; Avail.: National Technical Information Service (NTIS)

Several antennas with integrated high-impedance surfaces are presented. The high-impedance surface is implemented as a composite right/left-handed (CRLH) metamaterial fabricated from a periodic structure characterized by a substrate, filled with an array of vertical vias and capped by capacitive patches. Omnidirectional antennas placed in close proximity to the high-impedance surface radiate hemispherically with an increase in boresight far-field pattern gain of up to 10 dB and a front-to-back ratio as high as 13 dB at 2.45 GHz. Several TEM rectangular horn antennas are realized by replacing conductor walls with high-impedance surfaces. The TEM horn antennas are capable of operating below the TE(sub 1,0) cutoff frequency of a standard all-metal horn antenna, enabling a reduction in antenna volume. Above the cutoff frequency the TEM horn antennas function similarly to standard rectangular horn antennas.
NTIS
Impedance; Fabrication; Antenna Design; Omnidirectional Antennas; Electromagnetism

20070020029 Idaho Univ., Moscow, ID, USA
Modeling Urban Surface Transportation Network Dependability and Security
Rahim, A. A.; Oman, P.; Johnson, B.; Benke, M.; Sutapati, S.; Mar. 2007; 74 pp.; In English
Report No.(s): PB2007-107335; N07-02; No Copyright; Avail.: CASI: A04, Hardcopy

This report is based on six publications and submissions to various conferences and journals related to security, survivability, and critical infrastructures. Section 2 gives a background on existing literature related to the study of performance maintenance for transportation systems. Sections 3-5 describe an extension of Survivable Systems Analysis designed for analysis of critical infrastructures, and summarizes a case study performed on the Moscow ITS. Section 6 establishes a correlation between micro simulation and cut-set analysis in determining critical components of a transportation network, by applying these techniques to the Moscow ITS. Sections 7-8 describe multilayered quantitative analyses of transportation systems, which account for the other critical infrastructures upon which transportation systems rely, and demonstrates these analyses with more case studies on the Moscow ITS. Section 9 summarizes our strategies and results, and suggests potential extensions to this research. The writings in Sections 3-8 are presented here as they were published except that introductions were added and the reference lists were removed from the chapters and compiled together into the report bibliography.
NTIS
Security; Surface Vehicles; Transportation; Transportation Networks; Urban Transportation

20070020119 National Telecommunications and Information Administration, Washington, DC, USA
Institute for Telecommunication Sciences Technical Progress Report, 2001
Jan. 2002; 112 pp.; In English
Report No.(s): PB2007-108526; No Copyright; Avail.: National Technical Information Service (NTIS)

The Institute for Telecommunication Sciences (ITS), located in Boulder, Colorado, is the research and engineering arm of the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce. ITS employs individuals, all of whom are Federal employees, with strong engineering and scientific skills and experience to support our technical programs. The majority of our employees are electronics engineers, with a complement of mathematicians, physicists, and computer scientists. ITS support during Fiscal Year 2001 consisted of $3.9 million of direct funding from the Department of Commerce and approximately $4.6 million for work sponsored by other Federal agencies and U.S. industry.
NTIS
Communication Satellites; Telecommunication; Industries; Organizations

20070020120 Howrey, LLP, Falls Church, VA, USA, General Dynamics Advanced Information Systems, Chantilly, VA, USA
System and Method for Multi-Perspective Collaborative Modeling
Sickels, S., Inventor; Humprhey, M., Inventor; Moskowitz, B., Inventor; 14 May 04; 25 pp.; In English
Contract(s)/Grant(s): F3060203C0001

Patent Info.: Filed Filed 14 May 04; US-Patent-Appl-SN-10-845 528
Report No.(s): PB2007-105859; No Copyright; Avail.: CASI: A03, Hardcopy

One method according to the present invention may include defining a first object. The first object may have a unique object identifier. The method may also include defining a second object. The second object may also have a unique object identifier. After the objects have been identified, the method may include receiving a first value and a second value associated with the first object. The method may also include representing either an agreement and a lack of agreement associated with the first object based on a relationship between the first value and the second value. In an alternative embodiment, both an agreement and a disagreement may be represented based on the first value and the second value. In one embodiment of the invention, the representation of an agreement and/or a disagreement may be performed internally, using, for example, hexadecimal or binary representations of agreement or a lack of agreement. In yet another embodiment of the invention, a first single-perspective model and a second single-perspective model may be compared to form a multi-perspective model. Intentions of the parties within the collaborative community may be maintained throughout the modeling process.
NTIS

Interprocessor Communication; Patent Applications; Concurrent Engineering; Models

20070020152 Swedish Defence Research Establishment, Linkoeping, Sweden

Security Problems in Mobile ad hoc Networks

Hansson, E.; May 2005; 40 pp.; In Swedish
Report No.(s): PB2007-106439; FOI-R-1633-SE; No Copyright; Avail.: CASI: A03, Hardcopy

A mobile ad hoc network consists of wireless nodes that form a radio network without any pre-existing infrastructure or centralized servers. One main challenge in design of these networks is their vulnerability to security attacks in a hostile environment. The mobile ad hoc-network is particularly vulnerable due to its features of open architecture, cooperative distributed algorithms, poor physical protection, and self organizing network. These features also result in that many existing security solutions for wired networks and traditional tactical radio networks are not applicable to mobile ad hoc networks. Furthermore, the unique characteristics of mobile ad hoc networks such as resource constraints and dynamic network topology result in a number of challenges to security design. In this report we focus on the fundamental security problems of mobile ad hoc networks. Vulnerabilities of mobile ad hoc networks are first described. Thus, IT-attacks against mobile ad hoc networks are described. We then describe challenges to security design and security problems that need further research.
NTIS

Communication Networks; Mobile Communication Systems; Security

20070020340 Engineering Research and Consulting, Inc., Houston, TX, USA

Applications of Time-Reversal Processing for Planetary Surface Communications

Barton, Richard J.; May 9, 2007; 42 pp.; In English; Symposium for Space Applications of Wireless and RFID, 8-9 May 2007, Houston, TX, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020340

Due to the power constraints imposed on wireless sensor and communication networks deployed on a planetary surface during exploration, energy efficient transfer of data becomes a critical issue. In situations where groups of nodes within a network are located in relatively close proximity, cooperative communication techniques can be utilized to improve the range, data rate, power efficiency, and lifetime of the network. In particular, if the point-to-point communication channels on the network are well modeled as frequency non-selective, distributed or cooperative beamforming can employed. For frequency-selective channels, beamforming itself is not generally appropriate, but a natural generalization of it, time-reversal communication (TRC), can still be effective. Time-reversal processing has been proposed and studied previously for other applications, including acoustical imaging, electromagnetic imaging, underwater acoustic communication, and wireless communication channels. In this paper, we study both the theoretical advantages and the experimental performance of cooperative TRC for wireless communication on planetary surfaces. We give a brief introduction to TRC and present several scenarios where TRC could be profitably employed during planetary exploration. We also present simulation results illustrating the performance of cooperative TRC employed in a complex multipath environment and discuss the optimality of cooperative TRC for data aggregation in wireless sensor networks
Author

Planetary Surfaces; Communication Networks; Power Efficiency; Point to Point Communication; Channels (Data Transmission); Space Exploration; Multipath Transmission; Wireless Communication; Underwater Acoustics

20070020366 Fish and Neave IP Group, Ropes, Boston, MA, USA
Systems and Methods for Automatically Placing Nodes in an Ad Hoc Network
Basu, P., Inventor; Redi, J. K., Inventor; 29 Aug 03; 32 pp.; In English
Contract(s)/Grant(s): DASG60-02-C-0060
Patent Info.: Filed Filed 29 Aug 03; US-Patent-Appl-SN-10-652 255
Report No.(s): PB2007-102419; No Copyright; Avail.: CASI: A03, Hardcopy

A system may place nodes (110) within a non-biconnected network (100) that includes multiple interconnected nodes (110) to achieve biconnectivity within the network (100) and transform the network (100) from a non-biconnected one to a biconnected one. A non-biconnected network is one that necessarily becomes partitioned into two or more disconnected networks if a node in a critical position (termed a 'cutvertex' node) should fail or otherwise become unavailable. A biconnected network is one that includes at least one additional network link (sometimes termed an 'edge') between nodes belonging to each of the otherwise potentially disconnected networks for the purpose of maintaining network communication therebetween if and when the cutvertex node fails or otherwise becomes unavailable. To achieve biconnectivity, the system may identify one or more nodes (110) to move and determine the direction and distance to move the one or more nodes (110). The system may then move the one or more nodes (110) in the determined direction and distance to transform the non-biconnected network (100) to a biconnected one.
NTIS
Communication Networks; Patent Applications; Robotics; Wireless Communication

20070020367 Telscordia Technologies, Inc., Piscataway, NJ, USA
Scalable and Dynamic Quality of Service Control
Ghetie, A., Inventor; Tanna, H., Inventor; Unger, J., Inventor; Kiss, G., Inventor; Massa, V., Inventor; 12 Nov 03; 22 pp.; In English
Contract(s)/Grant(s): T30602-00-C-0009; DASG60-01-C-0058
Patent Info.: Filed Filed 12 Nov 03; US-Patent-Appl-SN-10-706 796
Report No.(s): PB2007-102418; No Copyright; Avail.: CASI: A03, Hardcopy

Applications and users dynamically make QoS provisioning requests for individual traffic flows traversing client and server hosts. A traffic flow provisioning request is conveyed to a services manager, which determines a set of traffic attributes for the flow and determines the networks the flow traverses between the client and server hosts. The services manger then oversees the admission of the flow to appropriate traffic classes in each determined network and the obtaining of a DSCP value for each network. Lastly, the services manger conveys the DSCP value of the first network traversed back to the client or server host, depending on the direction of the flow, which host is then configured to appropriately mark the DSCP field of the traffic flow packets. In a further embodiment, the services manager also instructs the client or server host to perform packet policing and shaping for the flow.
NTIS
Computer Networks; Data Transmission; Dynamic Control; Patent Applications; Quality Control

20070020369 Smith (Perkins) and Cohen, LLP, Boston, MA, USA
Method and Systems for Cooperative Transmission in Multi-Hop Ad-Hoc Networks
Scaglione, S., Inventor; Hong, Y. W., Inventor; 21 Sep 04; 21 pp.; In English
Contract(s)/Grant(s): N00014-00-1-0564; CCR-022767
Patent Info.: Filed Filed 21 Sep 04; US-Patent-Appl-SN-10-946 439
Report No.(s): PB2007-102398; No Copyright; Avail.: CASI: A03, Hardcopy

Methods and systems that enable a cooperative form of transmission performed by a set of asynchronous transceivers operating as a distributed joint communication system. In an embodiment of the method of this invention, information is transmitted from one or more predetermined nodes (the source nodes) in the network. The information is received at the other nodes (the receiving nodes) in the network. For every information symbol/codeword each of the receiving nodes receives an accumulation of signals from nodes transmitting an earlier stage. At each of the receiving nodes a predetermined criterion is utilized to decide whether to retransmit the received information. If retransmission is indicated, the signal modulating the information symbol is retransmitted from the receiving nodes and delivered to an increasing number of downstream nodes.
NTIS
Patent Applications; Wireless Communication

20070020370 Senterfitt (Akerman), West Palm Beach, FL, USA
Single Chip Radio with Integrated Antenna
Kyongyop, K. O., Inventor; 2 Oct 03; 19 pp.; In English
Contract(s)/Grant(s): N66001-03-1-8901
Patent Info.: Filed Filed 2 Oct 03; US-Patent-Appl-SN-10-677 704
Report No.(s): PB2007-102397; No Copyright; Avail.: CASI: A03, Hardcopy

A true single-chip radio for bidirectional wireless communications includes a bulk substrate, at least one integrated antenna, at least one transceiver, baseband circuitry and at least one filter all integrally formed in or on the substrate. The radio preferably includes a low-loss dielectric propagating layer disposed beneath the substrate to improve antenna gain. The integrated antenna can be an adaptive array for beamforming.
NTIS
Chips; Chips (Electronics); Patent Applications; Radio Equipment

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*.

20070019772 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Reliability of Cascaded THz Frequency Chains with Planar GaAs Circuits
Maiwald, Frank; Schlecht, Erich; Lin, Robert; Ward, John; Pearson, John; Siegel, Peter; Mehdi, Imran; April 27, 2004; 7 pp.; In English; 15th International Symposium on Space TeraHertz Technology (STT), 27-29 Apr. 2004, Amherst, MA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40005

Planar GaAs Schottky diodes will be utilized for all of the LO chains on the HIPI instrument for the Herschel Space Observatory. A better understanding of device degradation mechanisms is desirable in order to specify environmental and operational conditions that do not reduce device life times. Failures and degradation associated with ESD (Electrostatic Discharge), high temperatures, DC currents and RF induced current and heating have been investigated. The goal is to establish a procedure to obtain the safe operating range for a given frequency multiplier.
Author
Schottky Diodes; Degradation; Electrostatics; High Temperature; Radio Frequencies; Frequency Multipliers

20070019923 Swedish Defence Research Establishment, Linkoeping, Sweden
Pulsed Power 3 GHz Feasibility Study in FOI 36.7 m3 Mode Stirred Reverberation Chamber
Lunden, O.; Backstrom, M.; May 2006; 25 pp.; In English
Report No.(s): PB2007-108178; FOI-R-2029-SE; Copyright; Avail.: National Technical Information Service (NTIS)

A feasibility study was conducted to investigate the field build p process in a 36.7 m(sup 3) reverberation chamber. The time to get a steady field state in the unloaded chamber will normally be about 10-20 micro s. However, it is of great interest to investigate which field-levels that can be expected for an ordinary radar source. The particular 700 kW S-band radar we have to our disposal has typical pulse duration of 1 micro s. The report provides a basis on how to conduct and interpret equipment HPM testing in reverberation chambers.
NTIS
Feasibility; Magnetrons; Reverberation Chambers

20070019940 Trench (G. Morgan), Camarillo, CA, USA
Method and Device and for Ultra Sonic Vibration Detection During High-Performance Machining
Klein, M., Inventor; Pouet, B., Inventor; Elehberger, J., Inventor; 23 Mar 04; 20 pp.; In English
Contract(s)/Grant(s): DAS66002P0059; DASG6003C0072
Patent Info.: Filed Filed 23 Mar 04; US-Patent-Appl-SN-10-807 754
Report No.(s): PB2007-105317; No Copyright; Avail.: CASI: A03, Hardcopy

Dynamic vibration monitoring of a cutting tool or workpiece is provided by propagating an ultrasonic carrier beam in a stream of fluid flowing from a probe chamber, which includes a transducer, to the cutting tool or workpiece target area. The

modulated ultrasonic beam reflected from the target is detected via a transducer in the chamber, and is demodulated to provide measurements of vibrational surface displacement and velocity. The method is insensitive to the target surface roughness and can be used for dynamic characterization prior to machining, and for monitoring during the machining operation. The device is inexpensive and robust to the machining environment, and can be applied to small cutting tools.
NTIS
Detection; Machining; Patent Applications; Vibration Tests

20070019953 O'Banion and Ritchey, LLP, Sacramento, CA, USA
Wavelength-Selective 1XN2 Switches with Two Dimensional Input Output Fiber Arrays
Wu, M. C., Inventor; Tsai, J. C., Inventor; 7 Mar 05; 13 pp.; In English
Patent Info.: Filed Filed 7 Mar 05; US-Patent-Appl-SN-11-053 182
Report No.(s): PB2007-105331; No Copyright; Avail.: CASI: A03, Hardcopy

A 1(times N(sup 2)) wavelength selective switch (WSS) configuration in which switch elements are configured in a way that enables the input or output fibers to be arranged in a two-dimensional (2D) array. By employing 2D arrays of input/output channels, the channel count is increased from N to N(sup 2) for wavelength selective switches. In one embodiment, in which the components are arranged as a 2-f imaging system, a one-dimensional (1D) array of mirrors is configured such that each mirror has a dual scanning axis (i.e., each mirror can be scanned in X and Y directions). In another embodiment, in which the components are arranged as a 4-f imaging system, two 1D arrays of mirrors are configured with orthogonal scanning directions. In both embodiments, the number of ports is increased from N to N(sup 2).
NTIS
Patent Applications; Switches

20070019958 Miller and Yudell, LLP, Austin, TX, USA, BAE Systems and Technology, Nashua, NH, USA
Circuit for Accessing a Chalcogenide Memory Array
Li, B., Inventor; Knowies, K. R., Inventor; Lawson, D. C., Inventor; 26 Mar 04; 8 pp.; In English
Contract(s)/Grant(s): SC0244000002
Patent Info.: Filed Filed 26 Mar 04; US-Patent-Appl-SN-10-811 454
Report No.(s): PB2007-105336; No Copyright; Avail.: CASI: A02, Hardcopy

A circuit for accessing a chalcogenide memory array is disclosed. The chalcogenide memory array includes multiple subarrays with rows and columns formed by chalcogenide storage elements. The chalcogenide memory array is accessed by discrete read and write circuits. Associated with a respective one of the subarrays, each of the write circuits includes an independent write 0 circuit and an independent write 1 circuit. Also associated with a respective one of the subarrays, each of the read circuits includes a sense amplifier circuit. In addition, a voltage level control module is coupled to the read and write circuits to ensure that voltages across the chalcogenide storage elements within the chalcogenide memory array do not exceed a predetermined value during read and write operations.
NTIS
Chalcogenides; Circuits; Memory (Computers); Patent Applications

20070019973 Quarles and Brandy, LLP., Milwaukee, WI, USA
Hybrid-Secondary Uncluttered Permanent Magnet Machine and Method
Hsu, J. S., Inventor; 12 Nov 03; 15 pp.; In English
Contract(s)/Grant(s): DEACO000R22725
Patent Info.: Filed Filed 12 Nov 03; US-Patent-Appl-SN-10-706 577
Report No.(s): PB2007-105836; No Copyright; Avail.: CASI: A03, Hardcopy

An electric machine (40) has a stator (43), a permanent magnet rotor (38) with permanent magnets (39) and a magnetic coupling uncluttered rotor (46) for inducing a slip energy current in secondary coils (47). A dc flux can be produced in the uncluttered rotor when the secondary coils are fed with dc currents. The magnetic coupling uncluttered rotor (46) has magnetic brushes (A, B, C, D) which couple flux in through the rotor (46) to the secondary coils (47c, 47d) without inducing a current in the rotor (46) and without coupling a stator rotational energy component to the secondary coils (47c, 47d). The machine can be operated as a motor or a generator in multi-phase or single-phase embodiments and is applicable to the hybrid electric vehicle. A method of providing a slip energy controller is also disclosed.
NTIS
Patent Applications; Permanent Magnets

20070019978 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Hafnium Nitride Buffer Layers for Growth of GaN on Silicon
Armitage, R. D., Inventor; Weber, E. R., Inventor; 20 May 05; 6 pp.; In English
Contract(s)/Grant(s): DEAC0376100098
Patent Info.: Filed Filed 20 May 05; US-Patent-Appl-SN-11-134 768
Report No.(s): PB2007-105838; No Copyright; Avail.: CASI: A02, Hardcopy

Gallium nitride is grown by plasma-assisted molecular-beam epitaxy on (111) and (001) silicon substrates using hafnium nitride buffer layers. Wurtzite GaN epitaxial layers are obtained on both the (111) and (001) HfN/Si surfaces, with crack-free thickness up to 1.2 Om. However, growth on the (001) surface results in nearly stress-free films, suggesting that much thicker crack-free layers could be obtained.
NTIS
Gallium Nitrides; Hafnium Compounds; Metal Nitrides; Patent Applications; Silicon

20070019980 Grant Prideco, L.P., Houston, TX, USA
Apparatus and Method for Routing a Transmission Line through a Downhole Tool
Hall, D. R., Inventor; Hall, T., Inventor; Pixton, D. S., Inventor; Briscoe, M., Inventor; Reynolds, J., Inventor; 10 Feb 04; 18 pp.; In English
Contract(s)/Grant(s): DE-FC26-97FT343656
Patent Info.: Filed Filed 10 Feb 04; US-Patent-Appl-SN-10-708 129
Report No.(s): PB2007-104268; No Copyright; Avail.: CASI: A03, Hardcopy

An apparatus and method for routing a transmission line through a tool joint having a primary and secondary shoulder, a central bore, and a longitudinal axis, includes drilling a straight channel, at a positive, nominal angle with respect to the longitudinal axis, through the tool joint from the secondary shoulder to a point proximate the inside wall of the central bore. The method further includes milling back, from within the central bore, a second channel to merge with the straight channel, thereby forming a continuous channel from the secondary shoulder to the central bore. In selected embodiments, drilling is accomplished by gun-drilling the straight channel. In other embodiments, the method includes tilting the tool joint before drilling to produce the positive, nominal angle. In selected embodiments, the positive, nominal angle is less than or equal to 15 degrees.
NTIS
Transmission Lines; Tools; Methodology

20070019981 Gauthier and Connors, LLP, Boston, MA, USA
Method for Photolithography Using Multiple Illuminations and a Single Fine Feature Mask
Fritze, M., Inventor; Tyrrell, B., Inventor; 23 May 05; 22 pp.; In English
Contract(s)/Grant(s): F18682DOC00002
Patent Info.: Filed Filed 23 May 05; US-Patent-Appl-SN-11-135 197
Report No.(s): PB2007-105831; No Copyright; Avail.: CASI: A03, Hardcopy

A method forms a feature pattern on a substrate by exposing the substrate, using a mask having a pattern of features thereon, with illumination having a first set of settings. The substrate is exposed a second time, using the same mask having the pattern of features thereon, with illumination having a second set of settings. The mask having the pattern of features thereon remains stationary between the two illumination exposures of the substrate.
NTIS
Masks; Patent Applications; Photolithography

20070019989 ATMI, Inc., Danbury, CT, USA
Feedback Control System and Method for Maintaining Constant Resistance Operation of Electrically Heated Elements
Chen, I. S., Inventor; Neuner, J. W., Inventor; 9 Feb 04; 23 pp.; In English
Patent Info.: Filed Filed 9 Feb 04; US-Patent-Appl-SN-10-775 473
Report No.(s): PB2007-104262; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates to a system and method for controlling electrical heating of an element to maintain a constant electrical resistance, by adjusting electrical power supplied to such element according to an adaptive feedback control algorithm, in which all the parameters are (1) arbitrarily selected; (2) pre-determined by the physical properties of the controlled element; or (3) measured in real time. Unlike the conventional proportion-integral-derivative (PID) control

mechanism, the system and method of the present invention do not require re-tuning of proportionality constants when used in connection with a different controlled element or under different operating conditions, and are therefore adaptive to changes in the controlled element and the operating conditions.
NTIS
Algorithms; Feedback Control; Electric Power; Electrical Resistance; Control Systems Design

20070019992 Bruckner (John), P.C, Austin, TX, USA
Apparatus for Controlled Alignment of Catalytically Grown Nanostructures
Merkulov, V. I., Inventor; Melechko, A. V., Inventor; Lowndes, D. H., Inventor; Simpson, M. L., Inventor; Guillorn, M. A., Inventor; 24 Mar 05; 15 pp.; In English
Patent Info.: Filed Filed 24 Mar 05; US-Patent-Appl-SN-11-089 098
Report No.(s): PB2007-104259; No Copyright; Avail.: CASI: A03, Hardcopy

Systems and methods are described for controlled alignment of catalyticaly grown nanostructures in a large-scale synthesis process. An apparatus includes an electrode including: a protruding section defining an edge; and a nonprotruding section coupled to the protruding section, where the edge is adapted to deflect an electric field generated with the electrode and at least one section selected from the group consisting of the protruding section and the nonprotruding section is adapted to support a substrate for the growth of elongated nanostructures.
NTIS
Alignment; Catalytic Activity; Nanostructures (Devices)

20070019994 Kenyon and Kenyon, New York, NY, USA
Methods of Fabricating Devices by Transfer of Organic Material
Kim, C., Inventor; Cao, Y., Inventor; Soboyejo, W. O., Inventor; Forrest, S., Inventor; 3 Nov 04; 36 pp.; In English
Contract(s)/Grant(s): NSF-DMR94-00362; USAF-OSR-F49620-96-1-0277
Patent Info.: Filed Filed 3 Nov 04; US-Patent-Appl-SN-10-979 448
Report No.(s): PB2007-104257; No Copyright; Avail.: CASI: A03, Hardcopy

The invention provides a method of depositing a layer of a conductive material, e.g. metal, metal oxide or electroconductive polymer, from a patterned stamp, preferably a soft, elastomeric stamp, to a substrate after an organic layer has been transferred from a patterned stamp to an organic layer over the substrate. The patterned metal or organic layer may be used for example, in a wide range of electronic devices. The present methods are particularly suitable for nanoscale patterning of organic electronic components.
NTIS
Fabrication; Organic Materials; Electronic Equipment

20070020032 Swedish Defence Research Establishment, Linkoeping, Sweden
RSD, Retinal Scanning Display Pilot Study and Evaluation
Allberg, H.; Berggren, P.; Kindstroem, M.; Osakarsson, P. A.; Oct. 2005; 38 pp.; In Swedish
Report No.(s): PB2007-105530; FOI-R-1715-SE; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose with this report is twofold: (1) to report on general methodology for evaluation of head mounted displays, and (2) to evaluate the usability of a head mounted RSD, (retinal scanning display). The RSD projects an image on the retina using a low-effect laser. The evaluated equipment in this study is monochrome and generates images only in the red part of the visible spectrum. The display is placed on the operator's forehead with an image generator over one of the operator's eyes. The image is projected through a transparent prism onto the operator's retina. Questions for the RSD-evaluation have been symbols usability, minimal size for presented symbols, and usage under different light conditions. These questions are fundamental in order to form an opinion of the operative usage of the equipment. The study indicates that RSD is a possible technique to continue to study for operative performance but the equipment has to be miniaturized.
NTIS
Display Devices; Retina; Scanning

20070020052 Los Alamos National Lab., NM, USA
Target Identification System and Method
Cooke, B. J., Inventor; 12 Jun 05; 17 pp.; In English
Contract(s)/Grant(s): W7405ENG35
Patent Info.: Filed Filed 12 Jun 05; US-Patent-Appl-SN-11-034 037
Report No.(s): PB2007-105302; No Copyright; Avail.: CASI: A03, Hardcopy

A system and method for target identification are disclosed. In one embodiment, a light source emits a beam of electromagnetic radiation with a wavelength that is shorter than one millimeter. The beam is split by a beam splitter into a first portion and a second portion. The first portion is modulated by a first modulating device to form a first modulated portion. The second portion is modulated by a second modulating device to form a second modulated portion. The first and second modulating devices may each take the form of a single modulator. Alternately, the first and second modulating devices may each take the form of a plurality of modulators. The first and second modulated portions are combined by a beam combiner to form a hybrid beam. The hybrid beam is directed to an aperture, where it is radiated toward a reflective target. A reflected portion of the beam is reflected off the reflective target in the direction of the aperture. The reflected portion and background noise are collected by the aperture and directed to a receiver. The receiver determines information about the target by processing the received signal, which includes a difference signal, i.e., a signal representing the difference between the first modulated portion and the second modulated portion. Because fluctuations and distortions due to source, atmosphere, and target are identically superimposed upon the first modulated portion and second modulated portion, these fluctuations and distortions will not appear in the difference signal. Thus, a high detection efficiency may be achieved.
NTIS
Detection; Patent Applications; Target Acquisition; Target Recognition; Targets

20070020102 TDA Research, Inc., Wheat Ridge, CO, USA
Production Scale-Up of Activated Carbons for Ultracapacitors. (Final Report, September 30, 2004-September 30, 2006)
Dietz, S.; Jan. 10, 2007; 18 pp.; In English
Contract(s)/Grant(s): DE-FG36-04GO14326
Report No.(s): DE2007-897102; No Copyright; Avail.: Department of Energy Information Bridge

Transportation use accounts for 67% of the petroleum consumption in the US. Electric and hybrid vehicles are promising technologies for decreasing our dependence on petroleum, and this is the objective of the FreedomCAR & Vehicle Technologies Program. Inexpensive and efficient energy storage devices are needed for electric and hybrid vehicle to be economically viable, and ultracapacitors are a leading energy storage technology being investigated by the FreedomCAR program. The most important parameter in determining the power and energy density of a carbon-based ultracapacitor is the amount of surface area accessible to the electrolyte, which is primarily determined by the pore size distribution. The major problems with current carbons are that their pore size distribution is not optimized for liquid electrolytes and the best carbons are very expensive. TDA Research, Inc. (TDA) has developed methods to prepare porous carbons with tunable pore size distributions from inexpensive carbohydrate based precursors. The use of low-cost feedstocks and processing steps greatly lowers the production costs. During this project with the assistance of Maxwell Technologies, we found that an impurity was limiting the performance of our carbon and the major impurity found was sulfur. A new carbon with low sulfur content was made and found that the performance of the carbon was greatly improved.
NTIS
Activated Carbon; Capacitors; Carbon; Electrochemical Capacitors; Energy Storage

20070020104 Kenyon and Kenyon, Washington, DC, USA
High Efficiency Organic Photovoltaic Cells Employing Hybridized Mixed Planar Heterojunctions
Xue, J., Inventor; Uchida, S., Inventor; Rand, B. P., Inventor; Forrest, S., Inventor; 4 Aug 04; 25 pp.; In English
Patent Info.: Filed Filed 4 Aug 04; US-Patent-Appl-SN-10-910 371
Report No.(s): PB2007-105848; No Copyright; Avail.: CASI: A03, Hardcopy

A device is provided, having a first electrode, a second electrode, and a photoactive region disposed between the first electrode and the second electrode. The photoactive region includes a first organic layer comprising a mixture of an organic acceptor material and an organic donor material, wherein the first organic layer has a thickness not greater than 0.8 characteristic charge transport lengths, and a second organic layer in direct contact with the first organic layer, wherein: the second organic layer comprises an unmixed layer of the organic acceptor material or the organic donor material of the first organic layer, and the second organic layer has a thickness not less than about 0.1 optical absorption lengths. Preferably, the first organic layer has a thickness not greater than 0.3 characteristic charge transport lengths. Preferably, the second organic

layer has a thickness of not less than about 0.2 optical absorption lengths. Embodiments of the invention can be capable of power efficiencies of 2 percent or greater, and preferably 5 percent or greater.
NTIS
Heterojunctions; Organic Materials; Patent Applications; Photovoltaic Cells; Solar Cells

20070020133 Lumen Intellectual Property Services, Inc., Palo Alto, CA, USA
Dynamic Acoustic Thermometer
Heyman, J. S., Inventor; Malyarenko, E. V., Inventor; 9 Mar 06; 14 pp.; In English
Contract(s)/Grant(s): SB1341-04-W-1127
Patent Info.: Filed Filed 9 Mar 06; US-Patent-Appl-SN-11-372 628
Report No.(s): PB2007-101767; No Copyright; Avail.: CASI: A03, Hardcopy

Acoustic temperature measurement at a remote location is provided. An acoustic source transmits acoustic radiation to an acoustic receiver along an acoustic path. The path passes through or near the remote location. The temperature is non-uniform along the path. A change in an integrated acoustic delay between the source and receiver along the path is measured. This acoustic delay can be either a phase velocity delay or a group velocity delay. The temperature at the remote location is determined by relating the measured change in integrated acoustic delay to the remote location temperature with a combined thermal-acoustic model. The combined model relates temperature to acoustic propagation velocity along the path. The combined model preferably includes temperatures of the source and receiver locations, and a heat source geometry at the remote location.
NTIS
Patent Applications; Position (Location); Thermometers; Acoustics

20070020135 Richards (James), Fayetteville, TN, USA, Polaris Sensor Technologies, Inc., Huntsville, AL, USA
System and Method for Dual Stacked Panel Display
Pezzaniti, J. L., Inventor; 12 Mar 05; 16 pp.; In English
Contract(s)/Grant(s): W31P4Q-05-C-R117
Patent Info.: Filed Filed 12 Mar 05; US-Patent-Appl-SN-11-078 945
Report No.(s): PB2007-101766; No Copyright; Avail.: CASI: A03, Hardcopy

A system for display of three dimensional images and video utilizing flat panel technology, such as liquid crystal technology, wherein the left and right images are separated by polarization and the user wears polarized glasses to view the display. A first display, which may be any display technology, is used to generate an intensity modulated image. A second display is used to modulate the polarization of the intensity modulated image. A light spreading device is used to spread the light to minimize Moire effects resulting from the use of two displays. In one embodiment, the light spreading device is a diffuser. In another embodiment, the light spreading device is a micro lens array.
NTIS
Patent Applications; Flat Panel Displays

20070020137
Systems and Methods for Tuning Filters
Tsurzuki, G., Inventor; Hernandez, M. P., Inventor; Willemsen, B. A., Inventor; 30 Nov 05; 33 pp.; In English
Contract(s)/Grant(s): MDA 972-00-C-0010
Patent Info.: Filed Filed 30 Nov 05; US-Patent-Appl-SN-11-289 463
Report No.(s): PB2007-101763; No Copyright; Avail.: CASI: A03, Hardcopy

Methods, systems and apparatus for filter design, analysis and adjustment are provided. Various embodiments may include, for example, methods, systems and apparatus for electric signal filter tuning. Embodiments may also include design techniques for planar electric signal (e.g., RF signals) filter tuning. In at least an embodiment of the present invention a technique for filter tuning is provided which may include parameter extraction, optimization and tuning recipes techniques that may require only a single permanent filter tuning. In at least another embodiment a system and method of filter design, analysis and adjustment according to the present invention includes use of tuning that may be set using a mechanical scribing tool or a laser trimming device. In at least one other embodiment, a filter tuning technique may be provided and include providing trimming tabs on a resonator edge that may be disconnected or trimmed for filter tuning.
NTIS
Patent Applications; Tuning; Tunable Filters

20070020144 VanDeuren (Richard) Boerner, SC, USA
Siloxane-Polymer Dielectric Compositions and Related Organic Field-Effect Transistors
Marks, T. J., Inventor; Facchetti, A., Inventor; Yoon, M. H., Inventor; Yan, H., Inventor; 22 Dec 05; 22 pp.; In English
Contract(s)/Grant(s): N00014-62-0909; DMR-0076097
Patent Info.: Filed Filed 22 Dec 05; US-Patent-Appl-SN-11-315 076
Report No.(s): PB2007-101761; No Copyright; Avail.: CASI: A03, Hardcopy

Dielectric compositions comprising siloxane and polymeric components, as can be used in a range of transistor and related device configurations.

NTIS
Dielectrics; Field Effect Transistors; Patent Applications; Siloxanes

20070020146 Honeywell International, Inc., Morristown, NJ, USA
Relative Humidity Sensor Enclosed with Formed Heating Element
Speidrich, J. W., Inventor; Alderman, R. A., Inventor; Frost, G. D., Inventor; Magee, S. J., Inventor; 2 Jun 04; 13 pp.; In English
Contract(s)/Grant(s): DE-FC36-02AL67615
Patent Info.: Filed Filed 2 Jun 04; US-Patent-Appl-SN-10-858 982
Report No.(s): PB2007-101753; No Copyright; Avail.: CASI: A03, Hardcopy

Sensor systems and methods are disclosed herein. A relative humidity sensor is generally associated one or more porous heating elements. A porous resistive material surrounds the relative humidity sensor. Additionally, one or more flat heating elements can be bonded to a base of the relative humidity sensor to conduct heat and insure uniform heating about the relative humidity sensor. The porous heating elements can be configured to permit humid air to pass through the porous heating elements. Also, the porous heating element(s) can be assembled slightly offset from a surface of the relative humidity sensor so that air that is saturated with water vapor passes through and is heated by the porous heating element in order to evaporate water droplets associated with the water vapor and thereby reduce relative humidity to a measurable level. The porous resistive material can be configured from a material such as, for example, tantalum or nichrome. The porous resistive material can also be configured in a sheet arranged in a woven pattern.

NTIS
Heating; Humidity; Meteorological Instruments; Patent Applications

20070020148 Fish and Richardson, Minneapolis, MN, USA
Fiber Waveguides and Methods of Making the Same
Benoit, G., Inventor; Fink, Y., Inventor; Joannopoulos, J. D., Inventor; Hart, S., Inventor; Temelkuran, B., Inventor; 6 Dec 05; 20 pp.; In English
Contract(s)/Grant(s): ECS-0123460; DAAD 19-01-1-0647
Patent Info.: Filed Filed 6 Dec 05; US-Patent-Appl-SN-11-294 813
Report No.(s): PB2007-101752; No Copyright; Avail.: CASI: A03, Hardcopy

In general, in one aspect, the invention features an article including a high-power, low-loss fiber waveguide that includes alternating layers of different dielectric materials surrounding a core extending along a waveguide axis, the different dielectric materials including a polymer and a glass.

NTIS
Patent Applications; Waveguides; Fibers

20070020151 Honeywell International, Inc., Morristown, NJ, USA
Magnetic Switching with Expanded Hard-Axis Magnetization Volume at Magnetoresistive Bit Ends
Katti, R. R., Inventor; 8 Aug 04; 12 pp.; In English
Contract(s)/Grant(s): DTRA01600002
Patent Info.: Filed Filed 8 Aug 04; US-Patent-Appl-SN-10-914 327
Report No.(s): PB2007-105863; No Copyright; Avail.: CASI: A03, Hardcopy

A magnetoresistive apparatus and method of operation with improved switching characteristics is provided. Switching of a magnetic direction of a magnetic layer of a magnetoresistive bit is promoted by parallel rotation of local magnetic direction of ends of the bit toward alignment with a hard-axis of the bit. Thus, an embodiment provides for expanded hard-axis magnetic volume of the bit ends to support hard-axis magnetization through bit shape alteration or doping, for example. A method

provides for applying a hard-axis magnetic field to the bit ends for initiating switching and applying an easy-axis magnetic field for completing switching.
NTIS
Magnetic Storage; Magnetic Switching; Magnetization; Magnetoresistivity; Patent Applications

20070020162 NASA Langley Research Center, Hampton, VA, USA
Bias Selectable Dual Band AlGaN Ultra-violet Detectors
Raju, I. S.; Murthy, P. L. N.; Patel, N. R.; Bonacuse, P. J.; Elliott, K. B.; Gordon, S. A.; Gyekenyesi, J. P.; Daso, E. O.; Aggarwal, P.; Tillman, R\g F.; [2007]; 11 pp.; In English; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020162

Bias selectable dual band AlGaN ultra-violet (UV) detectors, which can separate UV-A and UV-B using one detector in the same pixel by bias switching, have been designed, fabricated and characterized. A two-terminal n-p-n photo-transistor-like structure was used. When a forward bias is applied between the top electrode and the bottom electrode, the detectors can successfully detect W-A and reject UV-B. Under reverse bias, they can detect UV-B and reject UV-A. The proof of concept design shows that it is feasible to fabricate high performance dual-band UV detectors based on the current AlGaN material growth and fabrication technologies.
Author
Bias; Aluminum Alloys; Gallium Alloys; Nitrogen Compounds; Radiation Detectors; Ultraviolet Detectors

20070020251 Tendler (Robert K.), Boston, MA, USA
Method and Apparatus for Reworking a Microwave Module
Rochford, R. A., Inventor; Madej, R. F., Inventor; 2 Sep 04; 11 pp.; In English
Contract(s)/Grant(s): F33657-00-C-0020
Patent Info.: Filed Filed 2 Sep 04; US-Patent-Appl-SN-10-932 402
Report No.(s): PB2007-104278; No Copyright; Avail.: CASI: A03, Hardcopy

A specialized tool is provided for the removal of components in a microwave module in which a fixed tool having a channeled tip is positioned adjacent the component to be removed. A hot stream of gas, in one embodiment nitrogen, is then forced through the channel onto the top surface of the component to be removed, with the microwave module lying on a heated platen, such that the local increase in temperature at the component to be removed is enough hotter than the ambient temperature of the module as determined by the heated platen to soften the silver epoxy used to mount the component to the module without damaging nearby components. With the fixed tool adjacent the component to be removed and with the component provided with targeted heating, the module is moved against the tool to cause a shear force that moves the component away from its original position, thus breaking the epoxy bond, after which the component is plucked from the module. The subject tool and technique eliminates collateral damage associated with the use of a ball peen hammer and chisel, and results in a tenfold decrease in rework time.
NTIS
Microwaves; Tools; Heating; Platens

20070020267 Fish and Richardson, Minneapolis, MN, USA
Polymer and Small Molecule Based Hybrid Light Source
Choong, V. E., Inventor; Choulis, S., Inventor; Krummacher, B. C., Inventor; Mathai, M., Inventor; So, F., Inventor; 5 Dec 05; 7 pp.; In English
Contract(s)/Grant(s): DE-FC266-04NT41947
Patent Info.: Filed Filed 5 Dec 05; US-Patent-Appl-SN-11-294 904
Report No.(s): PB2007-101716; No Copyright; Avail.: CASI: A02, Hardcopy

Disclosed is an organic electroluminescent device, comprising: (1) a substrate; (2) a hole-injecting electrode (anode) coated over the substrate; (3) a hole injection layer coated over the anode; (4) a polymer based light emitting layer, coated over the hole transporting layer; (5) a small molecule based light emitting layer, thermally evaporated over the polymer based light emitting layer; and (6) an electron-injecting electrode (cathode) deposited over the electroluminescent polymer layer.
NTIS
Light Emitting Diodes; Light Sources; Molecules; Patent Applications

20070020275 Summa and Allan, P.A., Charlotte, NC, USA

Minimizing Degradation of SiC Bipolar Semiconductor Devices

Sumakeris, J. J., Inventor; Singh, R., Inventor; Paisley, M. J., Inventor; Mueller, G., Inventor; Hobgood, H. M., Inventor; 22 Dec 04; 16 pp.; In English

Contract(s)/Grant(s): F 33615-01-2-2108; F 33615-00-C-5403

Patent Info.: Filed Filed 22 Dec 04; US-Patent-Appl-SN-11-022 520

Report No.(s): PB2007-102435; No Copyright; Avail.: CASI: A03, Hardcopy

A bipolar device has at least one p-type layer of single crystal silicon carbide and at least one n-type layer of single crystal silicon carbide, wherein those portions of those stacking faults that grow under forward operation are segregated from at least one of the interfaces between the active region and the remainder of the device.

NTIS

Bipolarity; Degradation; Patent Applications; Semiconductor Devices

20070020287 Taser International, Inc., Scottsdale, AZ, USA

Systems and Methods for Immobilization

Smith, P. W., Inventor; Nerheim, M. H., Inventor; 31 Dec 03; 13 pp.; In English

Contract(s)/Grant(s): N00014-02-C-0059

Patent Info.: Filed Filed 31 Dec 03; US-Patent-Appl-SN-10-750 374

Report No.(s): PB2007-102426; No Copyright; Avail.: CASI: A03, Hardcopy

Systems and methods for immobilizing a target such as a human or animal with a stimulus signal coupled to the target via electrodes provide the stimulus signal in accordance with a strike stage, a hold stage, and a rest stage. Systems include a launch device and separate projectile, where the projectile includes a battery, a waveform generator, and electrodes. The strike stage and hold stage may include pulses at a pulse repetition rate, for example, from 10 to 20 pulses per second, each pulse delivering a predetermined amount of charge, for example, about 100 microcoulombs at less than about 500 volts peak. The hold stage may continue immobilization at a lesser expenditure of energy compared to the strike stage. Because the strike stage and hold stage may immobilize by interfering with skeletal muscle control by the target's nervous system, a rest stage may allow the target to take a breath.

NTIS

Electrodes; Immobilization; Patent Applications; Projectiles

20070020288 Iandiorio and Teska., Walthan, MA, USA

Dual Microwave Cavity Accelerometer

Bickford, J. A., Inventor; Weinberg, M. S., Inventor; Petrovich, A., Inventor; 14 Jan 03; 12 pp.; In English

Contract(s)/Grant(s): HP 10786M85

Patent Info.: Filed Filed 14 Jan 03; US-Patent-Appl-SN-10-341 666

Report No.(s): PB2007-102425; No Copyright; Avail.: CASI: A03, Hardcopy

A system and method for compensating for gradients in a dual cavity device such as but not limited to an accelerometer. A first source drives a first cavity at least two different modes, at least one mode varying with changes in cavity length. A second source drives a second cavity at least two different modes, at least one mode varying with changes in cavity length. A processor determines changes in cavity length as a function of both modes in both cavities to compensate for non-uniform behavior between the cavities.

NTIS

Accelerometers; Cavities; Microwaves; Missile Control; Patent Applications

20070020326 NASA Johnson Space Center, Houston, TX, USA, Texas A&M Univ., Corpus Christi, TX, USA

Eddy Current System for Material Inspection and Flaw Visualization

Bachnak, R.; King, S.; Maeger, W.; Nguyen, T.; May 27, 2007; 6 pp.; In English; 6th WSEAS International Conference on Applications of Electrical Engineering, 27-29 May 2007, Istanbul, Turkey; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy

Eddy current methods have been successfully used in a variety of non-destructive evaluation applications including detection of cracks, measurements of material thickness, determining metal thinning due to corrosion, measurements of coating thickness, determining electrical conductivity, identification of materials, and detection of corrosion in heat exchanger tubes. This paper describes the development of an eddy current prototype that combines positional and eddy-current data to

produce a C-scan of tested material. The preliminary system consists of an eddy current probe, a position tracking mechanism, and basic data visualization capability. Initial test results of the prototype are presented in this paper.
Author
Nondestructive Tests; Eddy Currents; Corrosion; Cracks; Thickness; Inspection; Heat Exchangers

20070020337 NASA Johnson Space Center, Houston, TX, USA
ISS Asset Tracking Using SAW RFID Technology
Schellhase, Amy; Powers, Annie; [2004]; 1 pp.; In English; Symposium for Space Applications of Wireless and RFID, 8-9 May 2007, Houston, TX, USA
Contract(s)/Grant(s): 609524.09.03.04.03; Copyright; Avail.: Other Sources; Abstract Only

A team at the NASA Johnson Space Center (JSC) is undergoing final preparations to test Surface Acoustic Wave (SAW) Radio Frequency Identification (RFID) technology to track assets aboard the International Space Station (ISS). Currently, almost 10,000 U.S. items onboard the ISS are tracked within a database maintained by both the JSC ground teams and crew onboard the ISS. This barcode-based inventory management system has successfully tracked the location of 97% of the items onboard, but its accuracy is dependant on the crew to report hardware movements, taking valuable time away from science and other activities. With the addition of future modules, the volume of inventory to be tracked is expected to increase significantly. The first test of RFID technology on ISS, which will be conducted by the Expedition 16 crew later this year, will evaluate the ability of RFID technology to track consumable items. These consumables, which include office supplies and clothing, are regularly supplied to ISS and can be tagged on the ground. Automation will eliminate line-of-sight auditing requirements, directly saving crew time. This first step in automating an inventory tracking system will pave the way for future uses of RFID for inventory tracking in space. Not only are there immediate benefits for ISS applications, it is a crucial step to ensure efficient logistics support for future vehicles and exploration missions where resupplies are not readily available. Following a successful initial test, the team plans to execute additional tests for new technology, expanded operations concepts, and increased automation.
Author
Surface Waves; Radio Frequencies; International Space Station; Consumables (Spacecraft); Inventory Management; Logistics Management

20070020372 Du Pont de Nemours (E. I.) and Co., Wilmington, DE, USA
Process for Removing an Organic Layer During Fabrication of an Organic Electronic Device and the Organic Electronic Device Formed By the Process
Prakash, S., Inventor; Li, F., Inventor; Gutierrez, L. A. L., Inventor; 13 Jul 04; 23 pp.; In English
Contract(s)/Grant(s): 4332
Patent Info.: Filed Filed 13 Jul 04; US-Patent-Appl-SN-10-890 360
Report No.(s): PB2007-102395; No Copyright; Avail.: CASI: A03, Hardcopy

A process for forming an organic electronic device includes the steps of: (1) forming a first conductive member and a conductive lead over a substrate, wherein the first conductive member and conductive lead are spaced apart from each other; (2) forming an organic layer over the substrate, the first conductive member, and the conductive lead; (3) forming a patterned conductive layer over the organic layer, wherein the patterned conductive layer includes a second conductive member, and the patterned conductive layer creates an exposed portion of the organic layer and an unexposed portion of the organic layer; and (4) dry etching at least the exposed portion of the organic layer to expose a portion of the conductive lead using at least one oxygen-containing gas, wherein dry etching is performed at a pressure in a range of approximately 0.01 to 7.5 mTorr.
NTIS
Fabrication; Patent Applications; Removal

20070020380 Colorado Univ., Boulder, CO USA, National Renewable Energy Lab., Golden, CO USA
New Family of Multilevel Matrix Converters for Wind Power Applications. Final Report. July 2002-March 2006
Erickson, R.; Angkititrakul, S.; Almazeedi, K.; Dec. 01, 2006; 468 pp.; In English
Contract(s)/Grant(s): DE-AC36-99-GO10337
Report No.(s): DE2007-897520; NREL/SR-500-40051; No Copyright; Avail.: National Technical Information Service (NTIS)

The goal of this project was to develop a new modular multilevel matrix converter for wind power applications and to demonstrate a working scale model in the laboratory.
NTIS
Semiconductor Devices; Windpower Utilization

34
FLUID MECHANICS AND THERMODYNAMICS

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

20070019817 Sandia National Labs., Albuquerque, NM USA
Hydrodynamic Effects on Coalescence
Grillet, A. M.; Brooks, C. F.; DeBoer, M. P.; Bourdon, C. J.; Dimiduk, T. G.; Oct. 01, 2006; 44 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-897639; SAND2006-6567; No Copyright; Avail.: National Technical Information Service (NTIS)

The goal of this project was to design, build and test novel diagnostics to probe the effect of hydrodynamic forces on coalescence dynamics. Our investigation focused on how a drop coalesces onto a flat surface which is analogous to two drops coalescing, but more amenable to precise experimental measurements. We designed and built a flow cell to create an axisymmetric compression flow which brings a drop onto a flat surface. A computer-controlled system manipulates the flow to steer the drop and maintain a symmetric flow. Particle image velocimetry was performed to confirm that the control system was delivering a well conditioned flow. To examine the dynamics of the coalescence, we implemented an interferometry capability to measure the drainage of the thin film between the drop and the surface during the coalescence process. A semi-automated analysis routine was developed which converts the dynamic interferogram series into drop shape evolution data.

NTIS
Coalescing; Hydrodynamics

20070019830 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Test Results of Total Ionizing Dose Conducted at the Jet Propulsion Laboratory
Rivas, Rosa M.; Johnston, Allan H.; Miyahira, Tetsuo F.; Rax, Bernard G.; Wiedeman, Michael D.; June 20, 2004; 7 pp.; In English; IEEE Nuclear and Space Radiation Effects Conference, 20 Jun. 2004, Atlanta, GA, USA; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39963

This paper reports recent Total Ionizing Dose (TID) test results obtained at JPL. Several device samples were analyzed exhibiting significant failure levels and ELDRS effects under biased and unbiased condition.

Author
Dosage; Ionization; Microelectronics; Fabrication; Electric Equipment Tests; Damage; Components

20070019941 California Univ., Berkeley, CA USA
Noninvasive Characterization of a Flowing Multiphase Fluid Using Ultrasonic Interferometry
Sinhg, D. N., Inventor; 12 Apr 05; 13 pp.; In English
Contract(s)/Grant(s): W7405ENG36
Patent Info.: Filed Filed 12 Apr 05; US-Patent-Appl-SN-11-105 098
Report No.(s): PB2007-105318; No Copyright; Avail.: CASI: A03, Hardcopy

An apparatus for noninvasively monitoring the flow and/or the composition of a flowing liquid using ultrasound is described. The position of the resonance peaks for a fluid excited by a swept-frequency ultrasonic signal have been found to change frequency both in response to a change in composition and in response to a change in the flow velocity thereof. Additionally, the distance between successive resonance peaks does not change as a function of flow, but rather in response to a change in composition. Thus, a measurement of both parameters (resonance position and resonance spacing), once calibrated, permits the simultaneous determination of flow rate and composition using the apparatus and method of the present invention.

NTIS
Interferometry; Patent Applications

20070019956 Los Alamos National Lab., NM USA

Mixing Utility Liquid Viscometric Apparatus

Steckle, W. P., Inventor; Smith, M. E., Inventor; Griego, J. R., Inventor; Fieero, F., Inventor; 23 Mar 04; 10 pp.; In English

Contract(s)/Grant(s): W7405ENG36

Patent Info.: Filed Filed 23 Mar 04; US-Patent-Appl-SN-10-808 173

Report No.(s): PB2007-105335; No Copyright; Avail.: CASI: A02, Hardcopy

An apparatus for foam emulsion processing, and/or determination of the rheological parameters of a given sample includes a syringe assembly, a movable assembly, and a platform assembly. The syringe assembly has a first and second syringe connected by a capillary tube (emulsion needle). The movable assembly includes a holder tube within which the syringe assembly is secured. The platform assembly restrains movement of the movable assembly to only one axis.

NTIS

Emulsions; Foams; Patent Applications; Rheology

20070020390 Fermi National Accelerator Lab., Batavia, IL, USA, Academy of Sciences (USSR), Novosibirsk, Russian Federation

Hydro Static Water Level Systems at Fermilab

Volk, J. T.; Guerra, J. A.; Hansen, S. U.; Kiper, T. E.; Jostlein, H.; January 2006; 14 pp.; In English

Report No.(s): DE2007-897257; FERMILAB-CONF-06-334-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Several Hydrostatic Water Leveling systems (HLS) are in use at Fermilab. Three systems are used to monitor quadrupoles in the Tevatron and two systems are used to monitor ground motion for potential sites for the International Linear Collider (ILC). All systems use capacitive sensors to determine the water level of water in a pool. These pools are connected with tubing so that relative vertical shifts between sensors can be determined. There are low beta quadrupoles at the B0 and D0 interaction regions of Tevatron accelerator. These quadrupoles use BINP designed and built sensors and have a resolution of 1 micron. All regular lattice superconducting quadrupoles (a total of 204) in the Tevatron use a Fermilab designed system and have a resolution of 6 microns. Data on quadrupole motion due to quenches, changes in temperature will be presented. In addition data for ground motion for ILC studies caused by natural and cultural factors will be presented.

NTIS

Hydrostatics; Particle Accelerators; Water

20070020502 Sandia Corp., Livermore, CA, USA

Final Report for the ASC Gas-Powder Two-Phase Flow Modeling Project AD2006-09

Winters, W. S.; Evans, G. H.; Jan. 01, 2006; 65 pp.; In English

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

Report No.(s): DE2007-899079; SAND2006-7579; No Copyright; Avail.: National Technical Information Service (NTIS)

This report documents activities performed in FY2006 under the Gas-Powder Two- Phase Flow Modeling Project, ASC project AD2006-09. Sandia has a need to understand phenomena related to the transport of powders in systems. This report documents a modeling strategy inspired by powder transport experiments conducted at Sandia in 2002. A baseline gas-powder two-phase flow model, developed under a companion PEM project and implemented into the Sierra code FUEGO, is presented and discussed here. This report also documents a number of computational tests that were conducted to evaluate the accuracy and robustness of the new model. Although considerable progress was made in implementing the complex two-phase flow model, this project has identified two important areas that need further attention. These include the need to compute robust compressible flow solutions for Mach numbers exceeding 0.35 and the need to improve conservation of mass for the powder phase. Recommendations for future work in the area of gas-powder two-phase flow are provided.

NTIS

Fluid Flow; Gas Flow; Mathematical Models; Powder (Particles); Two Phase Flow

35
INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation*; and *19 Spacecraft Instrumentation and Astrionics*.

20070019848 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Megapixel Multi-band QWIP Focal Plane Arrays
Gunapala, S. D.; Bandara, S. V.; Liu, J. K.; Rafo, S. B.; Hill, C.; Mumolo, J.; Thang, J.; Tidrow, M.; LeVan, P. D.; FROM; August 2, 2004; 5 pp.; In English; SPIE Infrared Technology and Applications, 2-6 Aug. 2004, Denver, CO, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39970

A mid-wavelength 1024x1024 pixel quantum well infrared photodetector (QW) focal plane array has been demonstrated with excellent imagery. Noise equivalent differential temperature (NETD) of 19 mK was achieved at 95K operating temperature with f/2.5 optics at 300K background. This focal plane array has shown background limited performance (BLIP) at 90K operating temperature with the same optics and background conditions. In this paper, we will discuss its performance in quantum efficiency, NETD, uniformity, and operability.
Author
Focal Plane Devices; Photometers; Quantum Wells; Quantum Efficiency; Infrared Radiation; Pixels

20070020164 NASA Johnson Space Center, Houston, TX, USA
The International Space Station Supports International Polar Year (IPY)
Evans, Cynthia A.; Pettit, Donald R.; [2007]; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020164

Every day, ISS astronauts photograph designated sites and dynamic events on the Earth's surface using digital cameras equipped with a variety of lenses. Depending on observation parameters, astronauts can collect high resolution (4-6 m pixel size) or synoptic views (lower resolution but covering very large areas) digital data in 3 (red-green-blue) color bands. ISS crews have daily opportunities to document a variety of high-latitude phenomena. Although lighting conditions, ground track and other viewing parameters change with orbital precessions and season, the 51.6o orbital inclination and 400 km altitude of the ISS provide the crew an unique vantage point for collecting image-based data of polar phenomena, including surface observations to roughly 65o latitude, and upper atmospheric observations that reach nearly to the poles. During the 2007-2009 timeframe of the IPY, polar observations will become a scientific focus for the CEO experiment; the experiment is designated ISS-IPY. We solicit requests from scientists for observations from the ISS that are coordinated with or complement ground-based polar studies. The CEO imagery website for ISS-IPY provides an on-line form that allows IPY investigators to interact with CEO scientists and define their imagery requests. This information is integrated into daily communications with the ISS astronauts about their Earth Observations targets. All data collected are cataloged and posted on the website for downloading and assimilation into IPY projects. Examples of imagery and detailed information about scientific observations from the ISS can also be downloaded from the ISS-IPY web site.
Derived from text
Digital Data; Imagery; Photographs; Polar Regions; International Cooperation

20070020194 NASA Langley Research Center, Hampton, VA, USA, College of William and Mary, Williamsburg, VA, USA
Impact of Multiscale Retinex Computation on Performance of Segmentation Algorithms
Rahman, Zia-ur; Jobson, Daniel J.; Woodell, Glenn A.; Hines, Glenn D.; Proceedings of SPIE; July 15, 2004; Volume 5438, pp. 171-182; In English; Visual Information Processing XIII, 15-16 April 2004, Orlando, FL, USA
Contract(s)/Grant(s): NNL04AA02A; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1117/12.543094

Classical segmentation algorithms subdivide an image into its constituent components based upon some metric that defines commonality between pixels. Often, these metrics incorporate some measure of 'activity' in the scene, e.g. the amount of detail that is in a region. The Multiscale Retinex with Color Restoration (MSRCR) is a general purpose, non-linear image enhancement algorithm that significantly affects the brightness, contrast and sharpness within an image. In this paper, we will analyze the impact the MSRCR has on segmentation results and performance.
Author
Segments; Algorithms; Image Enhancement; Pixels; Brightness; Color

20070020195 NASA Langley Research Center, Hampton, VA, USA

The Automatic Assessment and Reduction of Noise Using Edge Pattern Analysis in Nonlinear Image Enhancement

Jobson, Daniel J.; Rahman, Zia-ur; Woodells, Glenn A.; Hines, Glenn D.; Proceedings of SPIE; July 15, 2004; Volume 5438, pp. 141-149; In English; Visual Information Processing XIII, 15-16 April 2004, Orlando, FL, USA

Contract(s)/Grant(s): NNL04AA02A; Copyright; Avail.: Other Sources; Abstract Only

ONLINE: http://dx.doi.org/10.1117/12.539786

Noise is the primary visibility limit in the process of non-linear image enhancement, and is no longer a statistically stable additive noise in the post-enhancement image. Therefore novel approaches are needed to both assess and reduce spatially variable noise at this stage in overall image processing. Here we will examine the use of edge pattern analysis both for automatic assessment of spatially variable noise and as a foundation for new noise reduction methods.

Author

Noise Reduction; Image Processing; Image Enhancement; Augmentation

20070020196 NASA Langley Research Center, Hampton, VA, USA

DSP Implementation of the Multiscale Retinex Image Enhancement Algorithm

Hines, Glenn D.; Rahman, Zia-ur; Jobson, Daniel J.; Woodell, Glenn A.; Proceedings of SPIE; July 15, 2004; Volume 5438, pp. 13-24; In English; VIsual Information Processing XIII, 15-16 April 2004, Orlando, FL, USA

Contract(s)/Grant(s): NNL04AA02A; Copyright; Avail.: Other Sources; Abstract Only

ONLINE: http://dx.doi.org/10.1117/12.544500

The Retinex is a general-purpose image enhancement algorithm that is used to produce good visual representations of scenes. It performs a non-linear spatial/ spectral transform that synthesizes strong local contrast enhancement and color constancy. A real-time, video frame rate implementation of the Retinex is required to meet the needs of various potential users. Retinex processing contains a relatively large number of complex computations, thus to achieve real-time performance using current technologies requires specialized hardware and software. In this paper we discuss the design and development of a digital signal processor (DSP) implementation of the Retinex. The target processor is a Texas Instruments TMS320C6711 floating point DSP. NTSC video is captured using a dedicated frame grabber card, Retinex processed, and displayed on a standard monitor. We discuss the optimizations used to achieve real-time performance of the Retinex and also describe our future plans on using alternative architectures.

Author

Image Enhancement; Signal Processing; Spectra; Algorithms; Digital Systems

20070020197 NASA Langley Research Center, Hampton, VA, USA

Enhanced Images for Checked and Carry-on Baggage and Cargo Screening

Woodell, Glen; Rahman, Zia-ur; Jobson, Daniel J.; Hines, Glenn; Proceedings of SPIE; September 15, 2004; Volume 5403, pp. 582-589; In English; Sensors, and Command, Control, Communications, and Intelligence (C3I) Technologies for Homeland Security and Homeland Defense III, 12-16 April 2004, Orlando, FL, USA

Contract(s)/Grant(s): NNL04AA02A; Copyright; Avail.: Other Sources; Abstract Only

ONLINE: http://dx.doi.org/10.1117/12.530669

The current X-ray systems used by airport security personnel for the detection of contraband, and objects such as knives and guns that can impact the security of a flight, have limited effect because of the limited display quality of the X-ray images. Since the displayed images do not possess optimal contrast and sharpness, it is possible for the security personnel to miss potentially hazardous objects. This problem is also common to other disciplines such as medical X-rays, and can be mitigated, to a large extent, by the use of state-of-the-art image processing techniques to enhance the contrast and sharpness of the displayed image. The NASA Langley Research Centers Visual Information Processing Group has developed an image enhancement technology that has direct applications to this problem of inadequate display quality. Airport security X-ray imaging systems would benefit considerably by using this novel technology, making the task of the personnel who have to interpret the X-ray images considerably easier, faster, and more reliable. This improvement would translate into more accurate screening as well as minimizing the screening time delays to airline passengers. This technology, Retinex, has been optimized for consumer applications but has been applied to medical X-rays on a very preliminary basis. The resultant technology could be incorporated into a new breed of commercial x-ray imaging systems which would be transparent to the screener yet allow them to see subtle detail much more easily, reducing the amount of time needed for screening while greatly increasing the effectiveness of contraband detection and thus public safety.

Author

Warning Systems; Airport Security; X Ray Imagery; Image Enhancement; Image Processing; Detection

20070020198 NASA Langley Research Center, Hampton, VA, USA
Advanced Image Processing of Aerial Imagery
Woodell, Glenn; Jobson, Daniel J.; Rahman, Zia-ur; Hines, Glenn; Proceedings of SPIE; May 12, 2006; Volume 6246; 2 pp.; In English; Visual Information Processing XV, 18-19 April 2006, Kissimmee, FL, USA
Contract(s)/Grant(s): NNL04AA02A; Copyright; Avail.: Other Sources

Aerial imagery of the Earth is an invaluable tool for the assessment of ground features, especially during times of disaster. Researchers at the NASA Langley Research Center have developed techniques which have proven to be useful for such imagery. Aerial imagery from various sources, including Langley's Boeing 757 Aries aircraft, has been studied extensively. This paper discusses these studies and demonstrates that better-than-observer imagery can be obtained even when visibility is severely compromised. A real-time, multi-spectral experimental system will be described and numerous examples will be shown.
Author
Aerial Photography; Image Processing; Imagery; Imaging Techniques; Image Resolution

20070020200 NASA Langley Research Center, Hampton, VA, USA
Real-time Enhancement, Registration, and Fusion for an Enhanced Vision System
Hines, Glenn D.; Rahman, Zia-ur; Jobson, Daniel J.; Woodell, Glenn A.; Proceedings of SPIE; May 04, 2006; Volume 6226; 1 pp.; In English; Enhanced and Synthetic Vision 2006, 17-18 April 2006, Kissimmee, FL, USA
Contract(s)/Grant(s): NNL04AA02A; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1117/12.665853

Over the last few years NASA Langley Research Center (LaRC) has been developing an Enhanced Vision System (EVS) to aid pilots while flying in poor visibility conditions. The EVS captures imagery using two infrared video cameras. The cameras are placed in an enclosure that is mounted and flown forward-looking underneath the NASA LaRC ARIES 757 aircraft. The data streams from the cameras are processed in real-time and displayed on monitors on-board the aircraft. With proper processing the camera system can provide better-than-human-observed imagery particularly during poor visibility conditions. However, to obtain this goal requires several different stages of processing including enhancement, registration, and fusion, and specialized processing hardware for real-time performance. We are using a real-time implementation of the Retinex algorithm for image enhancement, affine transformations for registration, and weighted sums to perform fusion. All of the algorithms are executed on a single TI DM642 digital signal processor (DSP) clocked at 720 MHz. The image processing components were added to the EVS system, tested, and demonstrated during flight tests in August and September of 2005. In this paper we briefly discuss the EVS image processing hardware and algorithms. We then discuss implementation issues and show examples of the results obtained during flight tests.
Author
Visibility; Enhanced Vision; Image Enhancement; Real Time Operation; Cameras; Signal Processing; Digital Systems

20070020201 NASA Langley Research Center, Hampton, VA, USA, College of William and Mary, Williamsburg, VA, USA
Image Enhancement, Image Quality, and Noise
Rahman, Zia-ur; Jobson, Daniel J.; Woodell, Glenn A.; Hines, Glenn D.; Proceedings of SPIE; August 30, 2005; Volume 5907; 1 pp.; In English; Photonic Devices an Algorithms for Computing VII, 1-2 August 2005, San Diego, CA, USA
Contract(s)/Grant(s): NNL04AA02A; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1117/12.619460

The Multiscale Retinex With Color Restoration (MSRCR) is a non-linear image enhancement algorithm that provides simultaneous dynamic range compression, color constancy and rendition. The overall impact is to brighten up areas of poor contrast/lightness but not at the expense of saturating areas of good contrast/brightness. The downside is that with the poor signal-to-noise ratio that most image acquisition devices have in dark regions, noise can also be greatly enhanced thus affecting overall image quality. In this paper, we will discuss the impact of the MSRCR on the overall quality of an enhanced image as a function of the strength of shadows in an image, and as a function of the root-mean-square (RMS) signal-to-noise (SNR) ratio of the image.
Author
Image Enhancement; Image Resolution; Signal to Noise Ratios

20070020202 NASA Langley Research Center, Hampton, VA, USA, College of William and Mary, Williamsburg, VA, USA
Noise, Edge Extraction and Visibility of Features
Rahman, Zia-ur; Jobson, Daniel J.; Proceedings of SPIE; May 25, 2005; Volume 5817, pp. 200-211; In English; Visual Information Processing XIV, 29-30 March 2005, Orlando, FL, USA
Contract(s)/Grant(s): NNL04AA02A; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1117/12.602733

Noise, whether due to the image-gathering device or some other reason, reduces the visibility of fine features in an image. Several techniques attempt to mitigate the impact of noise by performing a low-pass filtering operation on the acquired data. This is based on the assumption that the uncorrelated noise has high-frequency content and thus will be suppressed by low-pass filtering. A result of this operation is that edges in a noisy image also tend to get blurred, and, in some cases, may get completely lost due to the low-pass filtering. In this paper, we quantitatively assess the impact of noise on fine feature visibility by using computer-generated targets of known spatial detail. Additionally, we develop a new scheme for noise-reduction based on the connectivity of edge-features. The overall impact of this scheme is to reduce overall noise, yet retain the high frequency content that make edge-features sharp.
Author
Noise Reduction; Visibility; High Frequencies; Extraction

20070020203 NASA Langley Research Center, Hampton, VA, USA, College of William and Mary, Williamsburg, VA, USA
Detecting Changes in Terrain Using Unmanned Aerial Vehicles
Rahman, Zia-ur; Hines, Glenn D.; Logan, Michael J.; Proceedings of SPIE; May 25, 2005; Volume 5817, pp. 53-63; In English; Visual Information Processing XIV, 29-30 March 2005, Orlando, FL, USA
Contract(s)/Grant(s): NNL04AA02A; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1117/12.602813

In recent years, small unmanned aerial vehicles (UAVs) have been used for more than the thrill they bring to model airplane enthusiasts. Their flexibility and low cost have made them a viable option for low-altitude reconnaissance. In a recent effort, we acquired video data from a small UAV during several passes over the same flight path. The objective of the exercise was to determine if objects had been added to the terrain along the flight path between flight passes. Several issues accrue to this simple-sounding problem: (1) lighting variations may cause false detection of objects because of changes in shadow orientation and strength between passes; (2) variations in the flight path due to wind-speed, and heading change may cause misalignment of gross features making the task of detecting changes between the frames very difficult; and (3) changes in the aircraft orientation and altitude lead to a change in size of the features from frame-to-frame making a comparison difficult. In this paper, we discuss our efforts to perform this change detection, and the lessons that we learned from this exercise.
Author
Pilotless Aircraft; Terrain; Change Detection; Reconnaissance; Video Data

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*.

20070019771 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Thermal Design and Flight Experience of the Mars Exploration Rover Spacecraft Computer-Controlled, Propulsion Line Heaters
Novak, Keith S.; Kinsella, Gary M; Krylo, Robert J.; Sunada, Eric T.; July 19, 2004; In English; 4th International Conference on Environmental Systems (ICES), 10-22 Jul. 2004, Colorado Springs, CO, USA; Original contains black and white illustrations
Report No.(s): Rept-2004-01-2414; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40028

This paper covers the design, thermal testing and flight experiences with the computer-controlled thermostats on the propulsion line heaters. Flight experience revealed heater control behavior with propellant loaded into the system and during

thruster firings that was not observable during system level testing. Explanations of flight behavior, lessons learned, and suggestions for improvement of the propellant line heater design are presented in this paper.
Author
Mars Exploration; Spacecraft Propulsion; Mars Roving Vehicles; Lines; Propulsion System Configurations; Control Systems Design; Heating Equipment

20070019952 Choate, Hall and Stewart, Boston, MA, USA
Low Current Plasmatron Fuel Converter Having Enlarged Volume Discharges
Rabinovich, A., Inventor; Alexeev, N., Inventor; Bromberg, L., Inventor; Cohn, D. R., Inventor; Samokhin, A., Inventor; 8 Apr 05; 14 pp.; In English
Contract(s)/Grant(s): DEFG0798ID1301; DEFG0495AL88002
Patent Info.: Filed Filed 8 Apr 05; US-Patent-Appl-SN-11-101 926
Report No.(s): PB2007-105330; No Copyright; Avail.: CASI: A03, Hardcopy

A novel apparatus and method is disclosed for a plasmatron fuel converter ('plasmatron') that efficiently uses electrical energy to produce hydrogen rich gas. The volume and shape of the plasma discharge is controlled by a fluid flow established in a plasma discharge volume. A plasmatron according to this invention produces a substantially large effective plasma discharge volume allowing for substantially greater volumetric efficiency in the initiation of chemical reactions within a volume of bulk fluid reactant flowing through the plasmatron.
NTIS
Hydrogen Production; Low Currents; Patent Applications; Plasmatrons

20070019982 UT-Battelle, LLC, Oak Ridge, TN, USA
Electric Machine for Hybrid Motor Vehicle
Hsu, J. S., Inventor; 24 Nov 04; 9 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Patent Info.: Filed Filed 24 Nov 04; US-Patent-Appl-SN-10-997 306
Report No.(s): PB2007-104266; No Copyright; Avail.: CASI: A02, Hardcopy

A power system for a motor vehicle having an internal combustion engine and an electric machine is disclosed. The electric machine has a stator having coils for receiving ac electrical power to provide a magnetic field, a permanent magnet rotor spaced from the stator to define a first air gap relative to an axis of rotation for the permanent magnet rotor, an uncluttered rotor spaced from the permanent magnet rotor to define a second air gap relative to an axis of rotation for the permanent magnet rotor, and at least one secondary core assembly spaced from the uncluttered rotor by a third air gap wherein the secondary core assembly is disposed around an axis of rotation for the uncluttered rotor to allow induction of a slip energy current in the secondary core assembly without inducing a rotational energy current. The power system also has a gearing arrangement for coupling the internal combustion engine to wheels on the vehicle via the permanent magnet rotor and the uncluttered rotor thereby providing a means for the electric machine to both power assist and brake in relation to the output of the internal combustion engine.
NTIS
Electric Motors; Internal Combustion Engines; Motor Vehicles

20070019988 Department of Energy, Washington, DC USA
Reformulated Diesel Fuel
McAdams, H. T., Inventor; Crawford, R. W., Inventor; Hadder, G. R., Inventor; 6 Feb 03; 18 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Patent Info.: Filed Filed 6 Feb 03; US-Patent-Appl-SN-10-359 213
Report No.(s): PB2007-104263; No Copyright; Avail.: CASI: A03, Hardcopy

Reformulated diesel fuels for automotive diesel engines which meet the requirements of ASTM 975-02 and provide significantly reduced emissions of nitrogen oxides (NO.sub.x) and particulate matter (PM) relative to commercially available diesel fuels.
NTIS
Automobile Engines; Diesel Engines; Diesel Fuels

20070020145 Ross (Dewitt) and Stevens, SC, USA

Engine Valve Actuation for Combustion Enhancement

Reitz, R. D., Inventor; Rutland, C. J., Inventor; Jhavar, R., Inventor; 16 Jan 04; 7 pp.; In English

Contract(s)/Grant(s): DE-FC04-02AL67612

Patent Info.: Filed Filed 16 Jan 04; US-Patent-Appl-SN-10-543 067

Report No.(s): PB2007-101756; No Copyright; Avail.: CASI: A02, Hardcopy

A combustion chamber valve, such as an intake valve or an exhaust valve, is briefly opened during the compression and/or power strokes of a 4-strokes combustion cycle in an internal combustion engine (in particular, a diesel or CI engine). The brief opening may (1) enhance mixing withing the combustion chamber, allowing more complete oxidation of particulates to decrease engine emissions; and/or may (2) delay ignition until a more desirable time, potentially allowing a means of timing ignition in otherwise difficult-to-control conditions, e.g., in HCCI (Homogeneous Charge Compression Ignition) conditions. NTIS

Augmentation; Combustion; Internal Combustion Engines; Patent Applications; Valves

20070020177 Mitchell (Matthew P.), Berkeley, CA, USA

Foil Structure for Regenerators

Mitchell, M. P., Inventor; 16 Nov 04; 10 pp.; In English

Contract(s)/Grant(s): F2960199C0171

Patent Info.: Filed Filed 16 Nov 04; US-Patent-Appl-SN-10-990 037

Report No.(s): PB2007-105847; No Copyright; Avail.: CASI: A02, Hardcopy

In a regenerator for a regenerative cycle machine, regenerator foil is grooved on both sides, with intersections of grooves on opposite side forming holes at which separate flows of fluid interact to induce flows ancillary to the overall direction of flow in the regenerator, thereby enhancing heat transfer to and from the material of the regenerator and improving thermodynamic performance of the gas cycle machine. NTIS

Airfoils; Patent Applications; Regenerators

20070020234 Centers for Disease Control and Prevention, Atlanta, GA, USA, National Inst. for Occupational Safety and Health, Cincinnati, OH, USA

Evaluation of Carbon Monoxide Concentration With and Without Catalytic Emission Controls from Gasoline Propulsion Engines

Garcia, A.; Marlow, D.; Earnest, G. S.; Hall, R. M.; Apr. 2007; 33 pp.; In English

Report No.(s): PB2007-107924; EPHB-289-12A; No Copyright; Avail.: National Technical Information Service (NTIS)

National Institute for Occupational Safety and Health (NIOSH) researchers evaluated carbon monoxide (CO) emissions and exposures on a ski boat in Punta Gorda, Florida. This evaluation was conducted under an interagency agreement between the U.S. Coast Guard's Office of Boating Safety and NIOSH to evaluate the CO concentrations before and after installing a production catalytic control device to reduce CO concentrations. This catalytic control device was manufactured by Indmar Marine Engines. Similar NIOSH surveys regarding houseboats and other types of recreational boats have been conducted and are described in separate reports. The evaluated boat was propelled by a gasoline-powered engine and could be configured with and without the catalytic converter depending on the evaluation. The boat was evaluated while stationary and at multiple speeds, ranging from 5 to 45 miles per hour (Open throttle). CO concentrations were measured by multiple real-time instruments, which were placed at different locations on the boats. A five gas emissions analyzer was also used to quantify CO emissions from cold crank start at the slip. The Indmar system significantly reduced CO exposures to boat occupants during the current evaluation. For most conditions, a reduction above 90% was observed when compared to a standard exhaust system. This catalytic technology can greatly reduce the CO poisoning hazard to occupants of boats that have gasoline-powered engines. This study specifically evaluated the performance of the Indmar technology designed to reduce CO emissions and protect boat occupants. NTIS

Carbon Monoxide; Carbon Monoxide Poisoning; Control Equipment; Exhaust Emission; Gasoline; Pollution Control; Propulsion; Propulsion System Configurations; Propulsion System Performance

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*.

20070019831 Oxford Superconducting Technology, Carteret, NJ, USA
Cost Effective Open Geometry HTS MRI System amended to BSCCO 2212 Wire for High Field Magnets
Marken, K.; Aug. 11, 2006; 13 pp.; In English
Contract(s)/Grant(s): DE-FC36-02GO11103
Report No.(s): DE2007-897815; No Copyright; Avail.: National Technical Information Service (NTIS)

The original goal of this Phase II Superconductivity Partnership Initiative project was to build and operate a prototype Magnetic Resonance Imaging (MRI) system using high temperature superconductor (HTS) coils wound from continuously processed dip-coated BSCCO 2212 tape conductor. Using dip-coated tape, the plan was for MRI magnet coils to be wound to fit an established commercial open geometry, 0.2 Tesla permanent magnet system. New electronics and imaging software for a prototype higher field superconducting system would have added significantly to the cost. However, the use of the 0.2 T platform would allow the technical feasibility and the cost issues for HTS systems to be fully established. Also it would establish the energy efficiency and savings of HTS open MRI compared with resistive and permanent magnet systems. The commercial goal was an open geometry HTS MRI running at 0.5 T and 20 K. This low field open magnet was using resistive normal metal conductor and its heat loss was rather high around 15 kolwatts. It was expected that an HTS magnet would dissipate around 1 watt, significantly reduce power consumption. The SPI team assembled to achieve this goal was led by Oxford Instruments, Superconducting Technology (OST), who developed the method of producing commercial dip coated tape. Superconductive Components Inc. (SCI), a leading US supplier of HTS powders, supported the conductor optimization through powder optimization, scaling, and cost reduction. Oxford Magnet Technology (OMT), a joint venture between Oxford Instruments and Siemens and the worlds leading supplier of MRI magnet systems, was involved to design and build the HTS MRI magnet and cryogenics. Siemens Magnetic Resonance Division, a leading developer and supplier of complete MRI imaging systems, was expected to integrate the final system and perform imaging trials. The original MRI demonstration project was ended in July 2004 by mutual consent of Oxford Instruments and Siemens. Between the project start and that date a substantial shift in the MRI marketplace occurred, with rapid growth for systems at higher fields (1.5 T and above) and a consequent decline in the low field market (\h1.0 T). While the project aim appeared technically attainable at that time, the conclusion was reached that the system and market economics do not warrant additional investment. The program was redirected to develop BSCCO 2212 multifilament wire development for high field superconducting magnets for NMR and other scientific research upon an agreement between DOE and Oxford Instruments, Superconducting Technology. The work t took place between September, 2004 and the project end in early 2006 was focused on 2212 multifilamentary wire. This report summarizes the technical achievements both in 2212 dip coated for an HTS MRI system and in BSCCO 2212 multifilamentary wire for high field magnets.

NTIS
BSCCO Superconductors; Cost Effectiveness; High Field Magnets; Magnets; Superconductivity; Wire

20070019919 Nevada Univ., Reno, NV, USA
Static and Dynamic Performance of RC Bridge Bents with Architectural-Flared Columns
Chandane, S. S.; Sanders, D. H.; Saiidi, M. S.; Mar. 2004; 342 pp.; In English
Contract(s)/Grant(s): CDOT59A0069
Report No.(s): PB2007-108151; CCEER-03-08; No Copyright; Avail.: CASI: A15, Hardcopy

A study was performed on architectural-flared column bents. The objective was to evaluate the static and dynamic performance of the bents. The unique aspect of the bents is a gap at the top of the flares to separate the flares from contributing structurally. The project concentrated on the effect of the gap width at the top of the column section. The study included both experimental and analytical investigations. Two specimens were tested statically that had been partially tested on a shake table in a previous study. The objective of the static tests was to evaluate the performances of the bents till failure. One specimen had columns that were flexure dominated while the other had shear dominated columns. Each column had same reinforcement except for the flare transverse reinforcement. A newly constructed specimen was tested to evaluate the performance of the bents with twice the gap that had been used in the previous study. The flare had the minimum longitudinal and transverse reinforcement. A nonlinear finite element analysis program DIANA was used to perform the analytical study. The results were

also compared with the results of programs like RCMC, RC-Shake and wFRAME. The performances of the specimens were compared. The behavior of the specimens during testing was discussed. Design recommendations were developed.
NTIS
Columns (Supports); Composite Materials; Concretes; Dynamic Loads; Static Loads

20070019920 Nevada Univ., Reno, NV, USA
Impact of Aspect Ratio on Two-Column Bent Seismic Performance
Mostafa, K.; Sanders, D.; Saiidi, M. S.; Mar. 2004; 594 pp.; In English
Contract(s)/Grant(s): CDOT59A0069
Report No.(s): PB2007-108152; CCEER-04-03; No Copyright; Avail.: CASI: A25, Hardcopy

The design of structural bridge elements like columns, beam-column joints, and cap beams has evolved in the past 20 years. Many experimental tests have been done in order to determine the behavior of bridge columns under seismic loading. Most of those tests were static performed with monotonic cyclic loading. Only a few of those tests were dynamically performed on shake tables to simulate the actual earthquakes. Based on the literature review, few studies were concerned about testing the seismic behavior of newly designed models; in particular, two-column bent models with hinged bases. Therefore, the objective of the present study was to test two-column bridge bents dynamically by subjecting them to actual time earthquakes. Three models with columns aspect ratios of 6.64, 4.5 and 2.5 and scale ratio of 0.3 were designed according to the updated Caltrans design criteria. The aspect ratio is the height of the column divided by the column diameter. The shake table was able to exert the record of the Sylmar earthquake, 1984, on the three specimens with various amplitudes. All deformations, rebar strains and mass accelerations were recorded during shaking. The three specimens behaved strongly and resisted high levels of the Sylmar earthquakes after experiencing high ductility levels. The two long specimens had a similar flexural behavior, whereas the short specimen had a hybrid between flexural and shear behavior.
NTIS
Aspect Ratio; Bridges (Structures); Columns (Supports)

20070019995 Christian [Stephen R.], Idaho Falls, ID, USA
Structure for Identifying, Locating and Quantifying Physical Phenomena
Richardson, J. G., Inventor; 24 Mar 05; 16 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID13727; DE-AC07-05ID14517
Patent Info.: Filed Filed 24 Mar 05; US-Patent-Appl-SN-11-089 690
Report No.(s): PB2007-104256; No Copyright; Avail.: CASI: A03, Hardcopy

A method and system for detecting, locating and quantifying a physical phenomena such as strain or a deformation in a structure. A minimum resolvable distance along the structure is selected and a quantity of laterally adjacent conductors is determined. Each conductor includes a plurality of segments coupled in series which define the minimum resolvable distance along the structure. When a deformation occurs, changes in the defined energy transmission characteristics along each conductor are compared to determine which segment contains the deformation.
NTIS
Deformation; Identifying; Physical Factors; Position (Location)

20070020402 Multidisciplinary Center for Earthquake Engineering Research, Buffalo, NY, USA
Proceedings of the Fifth National Seismic Conference on Bridges and Highways: Innovations in Earthquake Engineering for Highway Structures Held September 18-20, 2006
Sep. 2006; In English
Report No.(s): PB2007-500034; MCEER-06-SP09; No Copyright; Avail.: National Technical Information Service (NTIS)

This CD-ROM contains nearly 80 technical papers and over 20 posters presented under the theme of 'Innovations in Earthquake Engineering for Highway Structures' at the Fifth National Seismic Conference on Bridges and Highways. Held September 18-20, 2006 in the San Francisco area to commemorate the 1906 earthquake, over 400 engineers, design consultants, researchers, and other professionals responsible for transportation facilities attended the event. The CD-ROM also includes a preliminary agenda, author index, and information about corporate sponsors, exhibitors, committee members and conference organizers.
NTIS
Conferences; Earthquakes; Highways

20070020404 Multidisciplinary Center for Earthquake Engineering Research, Buffalo, NY, USA
Seismic Retrofitting Manual for Highway Structures. Part 2: Retaining Structures, Slopes, Tunnels,Culverts and Roadways (December 2006)
Power, M. S.; Fishman, K.; Makdisi, F.; Musser, S.; Richards, R.; Dec. 01, 2006; 376 pp.; In English
Contract(s)/Grant(s): DTFH61-92-C-00106
Report No.(s): PB2007-109044; MCEER-06-SP11; No Copyright; Avail.: CASI: A17, Hardcopy

Part 2 includes new procedures for determining the seismic vulnerability of other important highway system structures, namely, retaining structures, slopes, tunnels, culverts and roadways. Guidance is provided on (a) screening for potential seismic vulnerabilities; (b) conducting a detailed evaluation; and (c) describing strategies for retrofit design. In addition, discussion is provided for classifying each structure by type, construction, or expected performance. This report is the first known effort to capture, in a formal and consistent manner, the important aspects of seismic performance and retrofitting intended to improve performance of highway system structural components other than bridges.
NTIS
Highways; Manuals; Retaining; Retrofitting; Slopes; Structural Design

42
GEOSCIENCES (GENERAL)

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

20070019689 NASA Johnson Space Center, Houston, TX, USA
Linking Home Plate and Algonquin Class Rocks through Microtextural Analysis: Evidence for Hydrovolcanism in the Inner Basin of Columbia Hills, Gusev Crater
Mittlefehldt, David W.; Yingst, R. Aileen; Schmidt, Mariek E.; Herkenhoff, Ken E., et al.; July 09, 2007; 4 pp.; In English; 7th International Conference on Mars, 9-13 July 2007, Pasadena, CA, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Examining the his-tory of a rock as the summed history of its constituent grains is a proven and powerful strategy that has been used on Earth to maximize the information that can be gleaned from limited samples. Grain size, sorting, roundness, and texture can be observed at the handlens scale, and may reveal clues to transport regime (e.g. fluvial, glacial, eolian) and transport distance. Diagenetic minerals may be of a form and textural context to allow identification, and to point to dominant diagenetic processes (e.g. evaporitic concentration, intermittent dissolution, early vs. late diagenetic emplacement). Handlens scale features of volcaniclastic particles may be diagnostic of primary vs recycled (by surface processes) grains and may provide information about eruptive patterns and processes. When the study site is truly remote, such as Mars, and when there are severe limitations on sample return or sample analysis with other methods, examination at the hand lens scale becomes critical both for extracting a maximum of information, and for best utilizing finite analytical capabilities.
Author
Geochemistry; Rocks; Minerals; Mars Landing Sites; Mars Craters; Sediments

20070019850 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Glacier and Land Ice Surface Topography Interferometer (GLISTIN): A Novel Ka-band Digitally Beamformed Interferometer
Moller, Delwyn K.; Heavey, Brandon; Hodges, Richard; Rengarajan, Sembiam; Rignot, Eric; Rogez, Francois; Sadowy, Gregory; Simard, Marc; Zawadzki, Mark; June 26, 2006; 7 pp.; In English; 6th Annual NASA Earth Science Technology Conference, (ESCTC 2006), 26-28 Jun. 2006, College Park, MD, USA; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39915

The estimation of the mass balance of ice sheets and glaciers on Earth is a problem of considerable scientific and societal importance. A key measurement to understanding, monitoring and forecasting these changes is ice-surface topography, both for ice-sheet and glacial regions. As such NASA identified 'ice topographic mapping instruments capable of providing precise elevation and detailed imagery data for measurements on glacial scales for detailed monitoring of ice sheet, and glacier changes' as a science priority for the most recent Instrument Incubator Program (IIP) opportunities. Funded under this opportunity is the technological development for a Ka-Band (35GHz) single-pass digitally beamformed interferometric synthetic aperture radar (InSAR). Unique to this concept is the ability to map a significant swath impervious of cloud cover

with measurement accuracies comparable to laser altimeters but with variable resolution as appropriate to the differing scales-of-interest over ice-sheets and glaciers.
Author
Interferometers; Land Ice; Glaciers; Topography; Beamforming; Synthetic Aperture Radar; Laser Altimeters

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*.

20070019777 NASA Marshall Space Flight Center, Huntsville, AL, USA
Policy Document on Earth Observation for Urban Planning and Management: State of the Art and Recommendations for Application of Earth Observation in Urban Planning
Nichol, Janet; King, Bruce; Xiaoli, Ding; Dowman, Ian; Quattrochi, Dale; Ehlers, Manfred; [2007]; 26 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

A policy document on earth observation for urban planning and management resulting from a workshop held in Hong Kong in November 2006 is presented. The aim of the workshop was to provide a forum for researchers and scientists specializing in earth observation to interact with practitioners working in different aspects of city planning, in a complex and dynamic city, Hong Kong. A summary of the current state of the art, limitations, and recommendations for the use of earth observation in urban areas is presented here as a policy document.
Author
Cities; Policies; Urban Planning; Remote Sensing; Earth Environment; Observation

20070019854 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Compact, Lightweight Dual-Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions
Yueh, Simon; Wilson, William J.; Njoku, Eni; Dinardo, Steve; Hunter, Don; Rahmat-Samii, Yahya; Kona, Keerti S.; Manteghi, Majid; June 27, 2006; 6 pp.; In English; Earth Science Technology Conference, 27-29 Jun. 2006, College Park, MD, USA; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39910

The development of a compact, lightweight, dual-frequency antenna feed for future soil moisture and sea surface salinity (SSS) missions is described. The design is based on the microstrip stacked-patch array (MSPA) to be used to feed a large lightweight deployable rotating mesh antenna for spaceborne L-band (approx.1 GHz) passive and active sensing systems. The design features will also enable applications to airborne soil moisture and salinity remote sensing sensors operating on small aircrafts. This paper describes the design of stacked patch elements and 16-element array configuration. The results from the return loss, antenna pattern measurements and sky tests are also described.
Author
Soil Moisture; Ocean Surface; Salinity; Antenna Feeds; Microstrip Antennas; Large Space Structures; Detection; Remote Sensing

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*.

20070019935 MacMillan, Sobanski and Todd, LLC, Toledo, OH, USA, Toledo Univ., OH, USA
Integrated Photoelectrochemical Cell and System Having a Liquid Electrolyte
Deng, Y., Inventor; Xu, L., Inventor; 23 May 05; 15 pp.; In English
Contract(s)/Grant(s): NDJ130630408; F336150202299

Patent Info.: Filed Filed 23 May 05; US-Patent-Appl-SN-11-134 929
Report No.(s): PB2007-105315; No Copyright; Avail.: CASI: A03, Hardcopy

An integrated photoelectrochemical (PEC) cell generates hydrogen and oxygen from water while being illuminated with radiation. The PEC cell employs a liquid electrolyte, a multi-junction photovoltaic electrode, and a thin ion-exchange membrane. A PEC system and a method of making such PEC cell and PEC system are also disclosed.
NTIS
Electrolytes; Hydrogen; Oxygen; Patent Applications; Photoelectrochemical Devices; Photoelectrochemistry; Systems Integration

20070019961 Fleshner and Kim, LLP, Chantilly, VA, USA, Iowa State Univ. of Science and Technology, Ames, IA USA
Method for Forming Magnetically Modified Electrodes and Articles Produced Thereby
Leddy, J., Inventor; Minteer, S. D., Inventor; 17 May 05; 88 pp.; In English
Contract(s)/Grant(s): CHE9296013; CHE930011
Patent Info.: Filed Filed 17 May 05; US-Patent-Appl-SN-11-130 231
Report No.(s): PB2007-105338; No Copyright; Avail.: CASI: A05, Hardcopy

The present invention is directed to methods for making magnetically modified electrodes and electrodes made according to the method. Such electrode are useful as electrodes in batteries, such as Ni-MH batteries, Ni--Cd batteries, Ni--Zn batteries and Ni--Fe batteries.
NTIS
Electric Batteries; Electrodes; Patent Applications

20070020101 National Renewable Energy Lab., Golden, CO USA
Technical Assistance Project for the Minnesota Pollution Control Agency
Vimmerstedt, L.; Dec. 01, 2006; 16 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2007-897008; NREL/TP-620-40583; No Copyright; Avail.: Department of Energy Information Bridge

This report was prepared in response to a request for technical assistance from the Minnesota Pollution Control Agency (MPCA). The U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy supported the National Renewable Energy Laboratory (NREL) in its response to this request through the Technical Assistance Project. Discussion with the MPCA identified the following as the highest-priority questions: What is the effect of (1) size of Renewable Energy Reserve (RER) and (2) duration of allocation award on (a) NOx emissions in Minnesota and (b) retail electricity prices. What data is available on the response of wind energy development to financial incentives. This report addresses those questions.
NTIS
Pollution Control; Renewable Energy; Environmental Quality

20070020426 Clean Power Research, Napa, CA, USA
Photovoltaic Incentive Design Handbook
Hoff, T. E.; Dec. 01, 2006; 79 pp.; In English
Contract(s)/Grant(s): DE-AC36-99-GO10337
Report No.(s): DE2007-897437; NREL/SR-640-40845; No Copyright; Avail.: National Technical Information Service (NTIS)

Investments in customer-owned grid-connected photovoltaic (PV) energy systems are growing at a steady pace. This is due, in part, to the availability of attractive economic incentives offered by public state agencies and utilities. In the USA, these incentives have largely been upfront lump payments tied to the system capacity rating. While capacity-based 'buydowns' have stimulated the domestic PV market, they have been criticized for subsidizing systems with potentially poor energy performance. As a result, the industry has been forced to consider alternative incentive structures, particularly ones that pay based on long-term measured performance. The industry, however, lacks consensus in the debate over the tradeoffs between upfront incentive payments versus longer-term payments for energy delivery. This handbook is designed for agencies and utilities that offer or intend to offer incentive programs for customer-owned PV systems. Its purpose is to help select, design, and implement incentive programs that best meet programmatic goals. The handbook begins with a discussion of the various available incentive structures and then provides qualitative and quantitative tools necessary to design the most appropriate incentive structure.
NTIS
Handbooks; Incentives; Supplying

45
ENVIRONMENT POLLUTION

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

20070019930 Clean Fuels Development Coalition, Bethesda, MD, USA
Oxygenates Fact Book: A Compilation of Information on the Benefits of Oxygenates in Gasoline
January 2007; 25 pp.; In English
Report No.(s): PB2007-108447; No Copyright; Avail.: National Technical Information Service (NTIS)

This document explains that fuel oxygenates offer a number of benefits when added to gasoline, including: (1) Reducing and displacing cancer-causing gasoline compounds such as benzene, toluene, xylene and ethyl benzene; (2) Reducing the emission of carbon monoxide in winter months; (3) Reducing hydrocarbon emissions that (help) produce summertime smog; (4) Reducing air toxic emissions year-round; and (4) Reducing the emissions of small particulates and soot.
NTIS
Additives; Air Pollution; Gasoline; Pollution Control

20070020030 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM(sub 2.5), and Regional Haze
Apr. 2007; 262 pp.; In English
Report No.(s): PB2007-107917; EPA/454/B-07/002; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of this document is to provide guidance to EPA Regional, State, and Tribal air quality management authorities and the general public, on how to prepare 8-hour ozone and PM2.5 attainment demonstrations and regional haze uniform rate of progress analyses using air quality models and other relevant technical analyses. This guidance is designed to implement national policy on these issues. This document does not substitute for any Clean Air Act provision or EPA regulation, nor is it a regulation itself. Thus, it does not impose binding, enforceable requirements on any party, nor does it assure that EPA will approve all instances of its application. The guidance may not apply to a particular situation, depending upon the circumstances. The EPA and State decision makers retain the discretion to adopt approaches on a case-by-case basis that differ from this guidance where appropriate. Any decisions by EPA regarding a particular State Implementation Plan (SIP) demonstration will only be made based on the statute and regulations, and will only be made following notice and opportunity for public review and comment. Therefore, interested parties will be able to raise questions and objections about the contents of this guidance and the appropriateness of its application for any particular situation.
NTIS
Air Pollution; Air Quality; Haze; Ozone; Pollution Monitoring

20070020103 Electric Power Research Inst., Barler, NY, USA
Toxicological Evaluation of Realistic Emissions of Source Aerosols (Teresa): Application to Power Plant-Derived PM2.5
Rohr, A.; Dec. 01, 2006; 33 pp.; In English
Contract(s)/Grant(s): FC26-03NT41902
Report No.(s): DE2007-896973; No Copyright; Avail.: National Technical Information Service (NTIS)

TERESA (Toxicological Evaluation of Realistic Emissions of Source Aerosols) involves exposing laboratory rats to realistic coal-fired power plant and mobile source emissions to help determine the relative toxicity of these PM sources. There are three coal-fired power plants in the TERESA program; this report describes the results of fieldwork conducted at the second plant, located in the Southeastern USA. The project was technically challenging by virtue of its novel design and requirement for the development of new techniques. By examining aged, atmospherically transformed aerosol derived from power plant stack emissions, we were able to evaluate the toxicity of PM derived from coal combustion in a manner that more accurately reflects the exposure of concern than existing methodologies. TERESA also involves assessment of actual plant emissions in a field setting an important strength since it reduces the question of representativeness of emissions.
NTIS
Aerosols; Exhaust Emission; Power Plants; Toxicology

20070020154 Swedish Defence Research Establishment, Linkoeping, Sweden
Aerosol Attenuation Model for Scandinavian Environment; User Manual
Persson, R.; Hjelm, A.; May 2006; 20 pp.; In Swedish
Report No.(s): PB2007-106531; FOI-R-1977-SE; No Copyright; Avail.: CASI: A03, Hardcopy

The aerosol extinction model NORAM for Scandinavian environment has been implemented in a user friendly form. This

user manual describes installation and usage of the model and computer program NORAM (Nordic Aerosol Model). FOI has earlier carried out transmission measurements with a multi channel transmissometer (OLA) in order to characterize the aerosol attenuation in IR for Swedish conditions. The reason was that IR transmission models (mostly American) underestimated the IR attenuation compared to measurements. Data from the OLA measurements have been analyzed and have resulted in a number of models of how the aerosol attenuation depends on the weather. The models have earlier not been suited to distribute outside FOL In cooperation between FO1 and PvTT in Finland (The Finnish Defence Forces Technical Research Centre) the study has been resumed and has resulted in models for how the aerosol attenuation depends on the most common meteorological parameters. The models have been implemented in a computer program (NORAM) which lets the user define input data to a suitable model and calculates the aerosol attenuation. The input data are also used in MODTRAN for calculation of the gas attenuation. The user can study the calculated results in graphic and numeric form.
NTIS
Aerosols; Atmospheric Attenuation; Atmospheric Models; Optical Equipment; User Manuals (Computer Programs)

20070020165 Environmental Protection Agency, Washington, DC, USA
Policy Innovation Impacts on Scrubber Electricity Usage
Lange, I.; Bellas, A.; Apr. 2006; 21 pp.; In English
Report No.(s): PB2007-107547; EPA/WP-06-01; No Copyright; Avail.: CASI: A03, Hardcopy

The introduction of scrubbers as a means of controlling sulfur dioxide pollution from stationary sources coincided with the implementation of the Clean Air Act of 1970. Since that time, there have been many policy changes affecting the electricity generation industry. These changes may be characterized as moving from direct regulation toward market-based incentives, both in deregulation or restructuring of power markets and adoption of market-based environmental regulation. These changes provide natural experiments for investigating whether the form of regulation can alter the rate of technological progress. Previous literature (Popp 2003, Lange and Bellas 2005) is mixed on whether advancements as a result of the switch to market-based environmental incentives have led to lower costs. This paper extends this literature by analyzing changes in scrubbers use of electricity (also known as parasitic load) in relation to regulatory policy regimes. Results show that restructured electricity markets have led to a considerable (30-45%) decrease in parasitic load. Conversely, the change to a cap-andtrade system for sulfur dioxide has not led to a decrease.
NTIS
Electricity; Industries; Policies; Scrubbers; Sulfur Dioxides

20070020169 Environmental Protection Agency, Washington, DC, USA
Note on Trasande et al., 'Public Health and Economic Consequences of Methylmercury Toxicity on the Developing Brain'
Griffiths, C.; McGartland, A.; Miller, M.; Apr. 2006; 29 pp.; In English
Report No.(s): PB2007-107548; EPA/WP-06-02; No Copyright; Avail.: CASI: A03, Hardcopy

In 2005, EPA promulgated the Clean Air Mercury Rule (CAMR) to permanently cap and reduce mercury emissions from coal-fired power plants. During the final stages of promulgating this rule, an article was published by Trasande et al. that raised some issues regarding how to measure benefits from reducing mercury. Using one of the models presented by Trasande, we introduce the assumptions that the EPA used in its CAMR analysis and discuss the implication of introducing these assumptions. The impact of introducing all of the EPA assumptions except for those related to discounting would decrease the estimated monetized impact of anthropogenic emissions in the Trasande model by 81% and would decrease the estimated impact of U.S. sources (including power plants) by almost 97%. Including discounting decreases Trasandes estimate of global impacts by 88%, and decreases the impact of American and U.S. power plant impacts by 98%.
NTIS
Air Quality; Brain; Coal; Combustion; Economics; Environment Protection; Health; Toxicity

20070020170 National Center for Environmental Research, Washington, DC, USA
Combustion Emissions from Hazardous Waste Incinerators, Boilers and Industrial Furnaces, and Municipal Solid Waste Incinerators: Results from Five STAR Grants and Research Needs
Dec. 2006; 102 pp.; In English
Report No.(s): PB2007-107555; EPA/600/Q-06/002; No Copyright; Avail.: CASI: A06, Hardcopy

This report presents the results of five competitively awarded research grants on combustion emissions from hazardous waste incinerators, industrial furnaces and boilers, and municipal solid waste incinerators. These grants were awarded in

response to a Request for Applications (RFA) that was issued by EPAs Office of Research and Development (ORD) in 1999 under the National Center for Environmental Researchs (NCER) Science to Achieve Results (STAR) Program. The RFA was developed in consultation with EPA program offices and other parts of ORD. The grants were awarded in 2000 and completed in 2004-2005.
NTIS
Boilers; Emission; Furnaces; Hazardous Wastes; Incinerators; Solid Wastes

20070020172 Environmental Protection Agency, Washington, DC, USA
Global Climate Control: Is There a Better Strategy Than Reducing Greenhouse Gas Emissions
Carlin, A.; Sep. 2006; 65 pp.; In English
Report No.(s): PB2007-107560; EPA/WP-06-04; No Copyright; Avail.: National Technical Information Service (NTIS)

Many environmentalists and some developed nations appear to have concluded that there is one Many environmentalists and some developed nations appear to have concluded that there is one climate change problem, global warming, and that there is only one solution to it, reducing greenhouse gas emissions, usually through the Kyoto Protocol. This paper argues instead that there are actually four major inter-related problems and concludes that several different approaches, including engineered climate selection, would be required to solve all of them. Although some measures can address certain climate change problems, none can address all of them. The paper first reviews the four major climate change problems, analyses whether the most prominent of the greenhouse gas control approaches (the Kyoto Protocol) is likely to be either effective or efficient in solving them, and then analyses both management and technological alternatives to this approach.
NTIS
Climatology; Exhaust Emission; Exhaust Gases; Greenhouse Effect

20070020228 Environmental Protection Agency, Washington, DC USA, New Hampshire Univ., Durham, NH, USA
Deriving Benefit Measures with Higher Precision: A Study of Economic Values of Air Quality
Huang, J. C.; Jan. 2007; 22 pp.; In English
Report No.(s): PB2007-108478; No Copyright; Avail.: National Technical Information Service (NTIS)

A calibration strategy using ridge regression to generate more precise estimates for a particular parameter in a regression model is proposed. Formulae to compute the proposed ridge estimates from standard OLS results are provided. Marginal effects of air pollution on property values for nineteen published studies are recomputed. Results show that ridge estimates are superior to the OLS estimates under the mean squared error criterion in all nineteen studies. The same strategy could be used to re-estimate key parameters of interest in other applications such as price elasticities for demand forecasts or the value of a statistical life from hedonic wage regressions.
NTIS
Air Quality; Calibrating; Economic Analysis; Economics

20070020269 Savannah River National Lab., Aiken, SC, USA
Measurement and Prediction of Radiolytic Hydrogen Production in Defense Waste Processing Slurries at Savannah River Site
Bibler, N. E.; Pareizs, J. M.; Fellinger, T. L.; Bannochie, C. J.; Jan. 10, 2007; 16 pp.; In English
Contract(s)/Grant(s): DE-AC09-96SR18500
Report No.(s): DE2007-897548; WSRC-STI-2006-00114 REV.1; No Copyright; Avail.: Department of Energy Information Bridge

This paper presents results of measurements and predictions of radiolytic hydrogen production rates from two actual process slurries in the Defense Waste Processing Facility (DWPF) at Savannah River Site (SRS). Hydrogen is a flammable gas and its production in nuclear facilities can be a safety hazard if not mitigated. Measurements were made in the Shielded Cells of Savannah River National Laboratory (SRNL) using a sample of Sludge Batch 3 (SB3) currently being processed by the DWPF. Predictions were made using published values for rates of radiolytic reactions producing H(sub 2) in aqueous solutions and the measured radionuclide and chemical compositions of the two slurries. The agreement between measured and predicted results for nine experiments ranged from complete agreement to 24% difference. This agreement indicates that if the composition of the slurry being processed is known, the rate of radiolytic hydrogen production can be reasonably estimated.
NTIS
Grasslands; Hydrogen Production; Radioactive Wastes; Rivers; Slurries

20070020488 Lawrence Livermore National Lab., Livermore, CA USA

CO2 Capture by Absorption with Potassium Carbonate Fourth Quarterly Report 2006. Quarterly Progress Report. Reporting Period: October 1, 2006 through December 31, 2006

Rochelle, G. T.; Chen, E.; Oyenekan, B.; Sexton, A.; Davis, J.; Jan. 27, 2007; 63 pp.; In English

Contract(s)/Grant(s): DE-FC26-02NT41440

Report No.(s): DE2007-899120; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this work is to improve the process for CO2 capture by alkanolamine absorption/stripping by developing an alternative solvent, aqueous K2CO3 promoted by piperazine. The best solvent and process configuration, matrix with MDEA/PZ, offers 22% and 15% energy savings over the baseline and improved baseline, respectively, with stripping and compression to 10 MPa. The energy requirement for stripping and compression to 10 MPa is about 20% of the power output from a 500 MW power plant with 90% CO2 removal. The stripper rate model shows that a short and fat stripper requires 7 to 15% less equivalent work than a tall and skinny one. The stripper model was validated with data obtained from pilot plant experiments at the University of Texas with 5m K+/2.5m PZ and 6.4m K+/1.6m PZ under normal pressure and vacuum conditions using Flexipac AQ Style 20 structured packing. Experiments with oxidative degradation at low gas rates confirm the effects of Cu+2 catalysis; in MEA/PZ solutions more formate and acetate is produced in the presence of Cu+2. At 150 degrees C, the half life of 30% MEA with 0.4 moles CO2/mole amine is about 2 weeks.

NTIS

Carbon Dioxide; Carbonates; Potassium

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*.

20070019690 NASA Johnson Space Center, Houston, TX, USA

Processes in Early Planetesimals: Evidence from Ureilite Meteorites

Mittlefehldt, David W.; Downes, H.; [2007]; 1 pp.; In English; Goldschmidt 2007 Conference, 19-24 August 2007, Cologne, Germany; Copyright; Avail.: CASI: A01, Hardcopy

Ureilites are primitive ultramafic achondrites composed largely of olivine and pigeonite, with minor augite, carbon, sulphide and metal. They represent very early material in the history of the Solar System and form a bridge between undifferentiated chondrites and fully differentiated asteroids. They show a mixture of chemical characteristics, some of which are considered to be nebula-derived (e.g. a negative correlation between Mg/Fe and Delta O-17 that resembles that of the ordinary chondrites but at lower Delta O-17 values) whereas others have been imposed by asteroidal differentiation. Carbon isotope data show a striking negative correlation of delta C-13 values with mg# in olivine. delta C-13 also correlates positively with Delta O-17, and therefore this isotopic variation was probably also nebula-derived. Thus, oxygen and carbon isotope compositions and Fe-Mg systematics of each monomict ureilite were established before differentiation processes began. Heated by decay of short-lived radioactive isotopes, the ureilite asteroid started to melt. Metal and sulphide would have melted first, forming a Fe-S eutectic liquid, which removed chalcophile elements and incompatible siderophile elements, and basaltic melts that removed Al, Ca and the LREE. Several elements show different abundances and/or correlations with Fo content in olivine, e.g. carbon shows a positive correlation in ferroan ureilites, and a weak or even negative correlation in more magnesian compositions. HSE such as Os and Ir also show different distributions, i.e. ureilites with Fo \h 82 have very scattered Os and Ir concentrations, which reach high values, whereas ureilites with Fo \g 82 tend to have much less scattered and overall lower Os and Ir abundances. A similar change in elemental behaviour is shown by the Fe-Mn relations in ureilitic olivines: those with Fo contents \h 85 show a good negative correlation, whereas those with Fo \g 85 show much greater scatter. This suggests that a major change affected the parent body at a time when melting had reached relatively magnesian bulk compositions. We consider that this event may have been a hit and run collision in which the ureilite parent body collided with a larger object. During the collision, the ureilite mantle broke up catastrophically but re-accreted in a jumbled state around the still-intact core. Mg-rich basaltic melts that were in the process of being formed at the time of break-up were retained in part as melt clasts that re-accreted to the regolith and are found in polymict ureilites.

Author

Planetary Evolution; Meteorites; Ureilites; Mineralogy; Carbon Isotopes; Oxygen 17; Oxygen Isotopes; Radioactive Isotopes; Carbon 13; Achondrites; Breccia; Pyroxenes

20070019827 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Polarimetric Analysis of Scatterometer Data for Ocean Surface Wind Measurement

Lee, J. S.; Yueh, S. H.; Schuler, D. L.; September 20, 2004; 4 pp.; In English; IEEE International Geoscience and Remote Sensing Symposium, 20-24 Sep. 2006, Anchorage, AK, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39976

An experiment using a polarimetric scatterometer (POLSCAT) has been conducted by JPL for ocean surface wind measurement. It shows that (sigma) (subscript)0 values for HH, W, HV, and VH have the property of even symmetry with respect to the upwind direction, and correlation coefficients between co- and cross-polarizations have the odd symmetry property. In this paper, the symmetry properties will be further examined using polarimetric analysis to investigate the depolarization effect, the scattering mechanism, and the polarization orientation angle. Theoretical results based on a two scale model are used to verify the derived experiment results. The newly derived symmetry property has the potential to solve the 180(deg) ambiguity in wind direction, and to enhance the accuracy of wind vector measurements.

Author

Scatterometers; Ocean Surface; Ground Wind; Wind Measurement; Wind Velocity; Depolarization; Polarimetry; Symmetry

20070019835 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Dayside Global Ionospheric Response to the Major Interplanetary Events of October 29-30, 2003 ''Halloween Storms''

Mannucci, A. J.; Tsurutani, B. T.; Iijima, B. A.; Komjathy, A.; Saito, A.; Gonzalez, W. D.; Guarnieri, F. L.; Kozyra, J. U.; Skoug, R.; Geophysical Research Letters; May 4, 2005; ISSN 0094-8276; Volume 32, pp. L12S02; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40023; http://dx.doi.org/10.1029/2004GL021467

We demonstrate extreme ionospheric response to the large interplanetary electric fields during the 'Halloween' storms that occurred on October 29 and 30, 2003. Within a few (2 - 5) hours of the time when the enhanced interplanetary electric field impinged on the magnetopause, dayside total electron content increases of approx.40% and approx.250% are observed for the October 29 and 30 events, respectively. During the Oct 30 event, approx.900% increases in electron content above the CHAMP satellite (approx.400 km altitude) were observed at mid-latitudes (+/-30 degrees geomagnetic). The geomagnetic storm-time phenomenon of prompt penetration electric fields is a possible contributing cause of these electron content increases, producing dayside ionospheric uplift combined with equatorial plasma diffusion along magnetic field lines to higher latitudes, creating a 'daytime super-fountain' effect.

Author

Interplanetary Space; Electric Fields; Magnetopause; Geomagnetism; Electron Density (Concentration); Magnetic Storms

20070019838 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Effects of High-frequency Wind Sampling on Simulated Mixed Layer Depth and Upper Ocean Temperature

Lee, Tong; Liu, W. Timothy; Journal of Geophysical Research; May 5, 2005; ISSN 0148-0227; Volume 110, pp. C0500; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39996; http://dx.doi.org/10.1029/2004JC002746

Effects of high-frequency wind sampling on a near-global ocean model are studied by forcing the model with a 12 hourly averaged wind product and its 24 hourly subsamples in separate experiments. The differences in mixed layer depth and sea surface temperature resulting from these experiments are examined, and the underlying physical processes are investigated. The 24 hourly subsampling not only reduces the high-frequency variability of the wind but also affects the annual mean wind because of aliasing. While the former effect largely impacts mid- to high-latitude oceans, the latter primarily affects tropical and coastal oceans. At mid- to high-latitude regions the subsampled wind results in a shallower mixed layer and higher sea surface temperature because of reduced vertical mixing associated with weaker high-frequency wind. In tropical and coastal regions, however, the change in upper ocean structure due to the wind subsampling is primarily caused by the difference in advection resulting from aliased annual mean wind, which varies with the subsampling time. The results of the study indicate a need for more frequent sampling of satellite wind measurement and have implications for data assimilation in terms of identifying the nature of model errors.

Author

Assimilation; Ocean Temperature; Temperature Effects; Wind Effects; Wind Measurement; Ocean Models; Sampling; Satellite Observation

20070019869 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Microwave Remote Sensing Modeling of Ocean Surface Salinity and Winds Using an Empirical Sea Surface Spectrum

Yueh, Simon H.; September 20, 2004; 4 pp.; In English; IEEE International Geoscience and Remote Sensing Symposium, 20-24 Sep. 2006, Anchorage, AK, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39979

Active and passive microwave remote sensing techniques have been investigated for the remote sensing of ocean surface wind and salinity. We revised an ocean surface spectrum using the CMOD-5 geophysical model function (GMF) for the European Remote Sensing (ERS) C-band scatterometer and the Ku-band GMF for the NASA SeaWinds scatterometer. The predictions of microwave brightness temperatures from this model agree well with satellite, aircraft and tower-based microwave radiometer data. This suggests that the impact of surface roughness on microwave brightness temperatures and radar scattering coefficients of sea surfaces can be consistently characterized by a roughness spectrum, providing physical basis for using combined active and passive remote sensing techniques for ocean surface wind and salinity remote sensing. Author

Microwave Radiometers; Ocean Surface; Microwave Scattering; Spectra; Remote Sensing; Salinity; Brightness Temperature; Surface Roughness; Ground Wind

20070020016 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

The Aquarius Scatterometer: An Active System for Measuring Surface Roughness for Sea-Surface Brightness Temperature Correction

Freedman, Adam; McWatters, Dalia; Spencer, Michael; July 31, 2006; 4 pp.; In English; IEEE International Geoscience and Remote Sensing Symposium, 31 Jul. - 4 Aug. 2006, Denver, CO, USA; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39924

The Aquarius scatterometer is a total-power L-band radar system for estimating ocean surface roughness. Its measurements will enable the removal of wind effects from the Aquarius radiometer ocean-surface brightness temperature measurements being used to retrieve ocean salinity. The Aquarius scatterometer is a relatively simple, low-spatial resolution power-detecting radar, without ranging capability. But to meet its science requirement, it must be very stable, with repeatability on the order of 0.1 dB over several days, and calibrated accuracy to this level over several months. Data from this instrument over land as well as ocean areas will be available for a variety of geophysical applications.

Author

Surface Roughness; Sea Surface Temperature; Brightness Temperature; Scatterometers; Temperature Measurement; Geophysics; Salinity

20070020125 Multidisciplinary Center for Earthquake Engineering Research, Buffalo, NY, USA

Seismic Retrofitting Manual for Highway Structures. Part 1: Bridges (December 2006)

Buckle, I. G.; Fiedland, I.; Mander, J.; Martin, G.; Nutt, R.; Dec. 01, 2006; 662 pp.; In English

Contract(s)/Grant(s): DTFH61-92-C-00106

Report No.(s): PB2007-109043; MCEER-06-SP10; No Copyright; Avail.: CASI: A99, Hardcopy

Part 1 of this manual is based on previous Federal Highway Administration (FHWA) publications on this subject including Seismic Retrofitting Manual for Highway Bridges, published in 1995 as report FHWA-RD-94-052. Revisions have been made to include current advances in earthquake engineering, field experience with retrofitting highway bridges, and the performance of bridges in recent earthquakes. It is the result of several years of research with contributions from multidisciplinary team of researchers and practitioners. In particular, a performance-based retrofit philosophy is introduced similar to that used for the performance-based design of new buildings and bridges. Performance criteria are given for two earthquake ground motions with different return periods, 100 and 1000 years. A higher level of performance is required for the event with the shorter return period (the lower level earthquake ground motion) than for the longer return period (the upper level earthquake ground motion). Criteria are recommended according to bridge importance and anticipated service life, with more rigorous performance being required for important, relatively new bridges, and a lesser level for standard bridges nearing the end of their useful life.

NTIS

Highways; Manuals; Retrofitting; Seismology

20070020168 Lemoyne Coll., Syracuse, NY, USA, Lemoyne Coll., Syracuse, NY, USA

Anomalous Iridium Enrichment at the Triassic-Jurassic Boundary, Blomidon Formation, Fundy Basin, Canada

Kyte, Frank T.; Earth and Planetary Science Letters; December 15, 2005; Volume 240, Issues 3-4, pp. 634-641; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAG5-12895; NNA04CC10A; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1016/j.epsl.2005.09.050

We present new analyses that confirm Ir enrichment (up to 0.31 ng/g) in close proximity to the palynological Triassic-Jurassic boundary in strata near the top of the Blomidon Formation at Partridge Island, Nova Scotia. High Ir concentrations have been found in at least two samples within the uppermost 70 cm of the formation. Ratios of other PGEs and Au to Ir are generally higher by an order of magnitude than in ordinary chondrites. No impact-related materials have been identified at #is horizon in the Blomidon Formation, therefore we cannot confirm an extraterrestrial source for the anomalous Ir levels. We consider, however, the possibility that regional basaltic volcanism is a potential source for the Ir in these sediments. The elevated Ir concentrations are found in reduced, grey colored mudstones, so redox concentration is a possible explanation for the distribution of Ir in these strata.

Author

Iridium; Sediments; Chondrites; Oxidation-Reduction Reactions; Basalt; Strata

20070020327 California Univ., Los Angeles, CA, USA

Primary Mineralogical and Chemical Characteristics of the Major K/T and Late Eocene Impact Deposits

Kyte, Frank T.; Eos Transactions. American Geophysical Union. Fall Meeting Supplement; December 13, 2004; Volume 85, No. 47; 2 pp.; In English; AGU Fall Meeting 2004, 13-17 December 2004, San Francisco, CA, USA

Contract(s)/Grant(s): NAG5-12895; Copyright; Avail.: Other Sources

Three well-characterized, distal impact deposits at the WT boundary and in upper Eocene sediments serve as a baseline for understanding other proposed impact deposits. All contain abundant spherules, evidence of shock metamorphism, and the largest have significant extraterrestrial components (ETCs). The K/T and the Eocene cpx-spherule (cpxS) deposits are global - likely from the events that produced the 180 km Chicxulub and 100 km Popigai craters. The Eocene North American microtektite (NAM) deposit is regional and likely from the event that produced the 45 km Chesapeake Bay crater. These deposits all contain abundant spherules formed from both shock-melted target and mixtures of target and projectile in the ejecta plume. Spherules constitute most of the mass of the distal ejecta. K/T spherules in regional deposits around the Gulf of Mexico are from low-velocity, target-rich ejecta. These can be a few mm in size and form deposits 10s of cm thick. Globally deposited KIT spherules from the plume (typically a few hundred micron size) are both target- and projectile-rich. When well preserved, the global deposits are 3 mm thick. Eocene cpxS deposits are similar to distal K/T with both target- and projectile-rich varieties (Le., glassy microtektite, and cpx spherules). They are smaller on average than WT spherules, concentrated in the 125-250 micron and smaller fractions. They are invariably bioturbated, but the initial deposit was probably less than 1 mm thick. The NAM are composed entirely of target-rich glass. They are similar in size to the cpxS. Size is an important criterion for distal ejecta because droplet size in the impact plume is proportional to the energy of the impact. Both the JUT and cpxS deposits are characterized by well-defined ETCs, commonly measured by Ir. The total Ir deposited is about 55 ng per square cm in WT sediments, and about 11 ng for the cpxS layer. This 5/1 proportion in Ir is generally consistent with the approx.1.8/1 ratio in crater diameters. The NAM have no significant ETC. This may be a function of the smaller impact. It indicates there was no significant projectile-rich plume deposit.

Author

Craters; Deposits; Spherules; Tektites; Mineralogy; Metamorphism (Geology); Ejecta

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20070019779 NASA Marshall Space Flight Center, Huntsville, AL, USA

Lightning Charge Retrievals: Dimensional Reduction, LDAR Constraints, and a First Comparison with LIS Satellite Data

Koshak, W. J.; Krider, E. P.; Murray, N.; Boccippio, D. J.; February 02, 2007; 56 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAG10-302; NRA-97-MTPE-03; 621-1598; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070019779

A 'dimensional reduction' (DR) method is introduced for analyzing lightning field changes (DELTAEs) whereby the number of unknowns in a discrete two-charge model is reduced from the standard eight (x, y, z, Q, x', y', z', Q') to just four (x, y, z, Q). The four unknowns (x, y, z, Q) are found by performing a numerical minimization of a chi-square function. At each step of the minimization, an Overdetermined Fixed Matrix (OFM) method is used to immediately retrieve the best 'residual source' (x', y', z', Q'), given the values of (x, y, z, Q). In this way, all 8 parameters (x, y, z, Q, x', y', z', Q') are found, yet a numerical search of only 4 parameters (x, y, z, Q) is required. The DR method has been used to analyze lightning-caused DeltaEs derived from multiple ground-based electric field measurements at the NASA Kennedy Space Center (KSC) and USAF Eastern Range (ER). The accuracy of the DR method has been assessed by comparing retrievals with data provided by the Lightning Detection And Ranging (LDAR) system at the KSC-ER, and from least squares error estimation theory, and the method is shown to be a useful 'stand-alone' charge retrieval tool. Since more than one charge distribution describes a finite set of DELTAEs (i.e., solutions are non-unique), and since there can exist appreciable differences in the physical characteristics of these solutions, not all DR solutions are physically acceptable. Hence, an alternative and more accurate method of analysis is introduced that uses LDAR data to constrain the geometry of the charge solutions, thereby removing physically unacceptable retrievals. The charge solutions derived from this method are shown to compare well with independent satellite- and ground-based observations of lightning in several Florida storms.

Author

Detection; Lightning; Mathematical Models; Satellite Observation; Earth Sciences; Rangefinding

20070019832 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Windsat Validation Using Seawinds, Windrad and POLSCAT Measurements

Yueh, Simon H.; Wilson, William J.; Dinardo, Steve; Hsiao, S. Vincent; September 20, 2004; 4 pp.; In English; IEEE International Geoscience and Remote Sensing Symposium, 20-24 Sep. 2006, Anchorage, AK, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40021

Global mapping of near surface ocean wind vectors is crucial for many oceanographic and atmospheric studies. The US Navy together with the National Polar Orbiting Environmental Satellite System (NPOESS) launched the Windsat with multi-frequency polarimetric radiometers in January 2003 to demonstrate the passive polarimetry for large spatial coverage of ocean surface wind vector measurements from space. We derived the geophysical model function (GMF) for Windsat polarimetric brightness temperature measurements using six months of matchup dataset. The Windsat GMF was compared with the aircraft radiometer and radar measurements and the SeaWinds scatterometer winds with good agreement up to about 20 m/s wind speed.

Author

Geophysics; Oceanography; Polarimetry; Scatterometers; Wind (Meteorology); Wind Velocity Measurement

20070019841 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Improved Hurricane Boundary Layer Observations with the Imaging Wind and Rain Airborne Profiler

Esteban-Fernandez, Daniel; Changy, P.; Carswell, J.; Contreras, R.; Chu, T.; July 30, 2006; 4 pp.; In English; IEEE International Geoscience and Remote Sensing Symposium, Denver, Colorado, July 31- August 4, 2006, 31 Jul. - 4 Aug. 2006, Denver, CO, USA; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39921

During the NOAA/NESDIS 2005 Hurricane Season (HS2005) and the 2006 Winter Experiment, the University of Massachusetts (UMass) installed two instruments on the NOAA N42RF WP-3D research aircraft: the Imaging Wind and Rain

Airborne Profiler (IWRAP) and the Simultaneous Frequency Microwave Radiometer (SFMR). IWRAP is a dual-band (C- and Ku), dual-polarized pencil-beam airborne radar that profiles the volume backscatter and Doppler velocity from rain and that also measures the ocean backscatter response. It simultaneously profiles along four separate incidence angles while conically scanning at 60 RPM. SFMR is a C-band nadir viewing radiometer that measures the emission from the ocean surface and intervening atmosphere simultaneously at six frequencies. It is designed to obtain the surface wind speed and the column average rain rate. Both instruments have previously been flown during the 2002, 2003 and 2004 hurricane seasons. For the HS2005, the IWRAP system was modified to implement a raw data acquisition system. The importance of the raw data system arises when trying to profile the atmosphere all the way down to the surface with a non-nadir looking radar system. With this particular geometry, problems arise mainly from the fact that both rain and ocean provide a return echo coincident in time through the antenna s main lobe. This paper shows how this limitation has been removed and presents initial results demonstrating its new capabilities to derive the atmospheric boundary layer (ABL) wind field within the inner core of hurricanes to much lower altitudes than the ones the original system was capable of, and to analyze the spectral response of the ocean backscatter and the rain under different wind and rain conditions.
Author
Hurricanes; Microwave Radiometers; Atmospheric Boundary Layer; Rain; Wind Profiles; Wind Velocity

20070019855 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Deep Space Ka-band Link Management and the MRO Demonstration: Long-term Weather Statistics Versus Forecasting
Davarian, Faramaz; Shambayati, Shervin; Slobin, Stephen; September 2004; 20 pp.; In English; IEEE Ka-band Utilization Conference, September 2004, Italy; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39964

During the last 40 years, deep space radio communication systems have experienced a move toward shorter wavelengths. In the 1960s a transition from L- to S-band occurred which was followed by a transition from S- to X-band in the 1970s. Both these transitions provided deep space links with wider bandwidths and improved radio metrics capability. Now, in the 2000s, a new change is taking place, namely a move to the Ka-band region of the radio frequency spectrum. Ka-band will soon replace X-band as the frequency of choice for deep space communications providing ample spectrum for the high data rate requirements of future missions. The low-noise receivers of deep space networks have a great need for link management techniques that can mitigate weather effects. In this paper, three approaches for managing Ka-band Earth-space links are investigated. The first approach uses aggregate annual statistics, the second one uses monthly statistics, and the third is based on the short-term forecasting of the local weather. An example of weather forecasting for Ka-band link performance prediction is presented. Furthermore, spacecraft commanding schemes suitable for Ka-band link management are investigated. Theses schemes will be demonstrated using NASA's Mars Reconnaissance Orbiter (MRO) spacecraft in the 2007 to 2008 time period, and the demonstration findings will be reported in a future publication.
Author
Deep Space; Extremely High Frequencies; Frequency Distribution; Radio Communication; Space Communication; Ultrahigh Frequencies; Weather Forecasting; Superhigh Frequencies

20070019915 Florida Univ., Gainesville, FL, USA
Design Hurricane Storm Surge Pilot Study
Sheppard, D. M.; Slinn, D.; Hagen, S.; Dec. 2006; 149 pp.; In English
Contract(s)/Grant(s): FDOT-BD545-42; UF-000-52102
Report No.(s): PB2007-107865; No Copyright; Avail.: National Technical Information Service (NTIS)

The design storm event for most of Florida's coastal waters is produced by hurricane generated storm surge. Computer models that compute the propagation of storm surge from the open coast through the tidal inlets and over the low lying barrier islands into the bays, waterways and streams require the appropriate storm surge hydrograph as the ocean boundary condition. This hydrograph must include wave setup that is created by breaking waves in the surf zone. A recent study (Sheppard) clearly showed that there are substantial differences in the 50, 100 and 500 year return interval open coast storm surge elevations predicted by the various state and federal agencies. This study also showed that there is very little information on the shape and spatial attenuation (storm surge hydrograph elevation decreasing in amplitude in both directions along the coast from the point where the eye makes landfall) of hurricane generated storm surge hydrographs. There is a need for (1) more accurate design storm surge elevations, (2) design storm surge hydrographs, and (3) spatial attenuation of these surges along the coast. Fundamental to obtaining improved design storm surge hydrographs are questions regarding (1) the coupling of storm surge and wave models and (2) the effect of tidal inlets and the adjoining bays on the open coast storm surge in the vicinity of the

inlet. The objectives of this project are to improve storm surge hydrographs for Florida by (1) developing the code required to two-way couple ADCIRC (2D, depth averaged, storm surge model) with wave models, (2) determine the impact of two-way (v. one-way) coupling between ADCIRC and wave models on an open coast storm surge hydrograph, and (3) determine the effects of tidal inlets and adjacent coastal waters on the open coast storm surge hydrograph in the vicinity of the inlet.
NTIS
Computerized Simulation; Hurricanes; Hydrology; Storm Surges; Transportation

20070019921 Alaska Univ., Fairbanks, AK, USA
Proceedings of a Workshop on Hydrological Modeling of Freshwater Discharge from Alaska's Arctic Coast
Wang, J.; Jul. 2006; 56 pp.; In English
Contract(s)/Grant(s): CA-0102; CA-85294
Report No.(s): PB2007-108159; OCS-MMS-2006-043; No Copyright; Avail.: National Technical Information Service (NTIS)

This hydrological modeling workshop was undertaken to bring modelers and observationalists together to discuss strategies for state-of-the-art hydrological modeling north of the Brooks Range. The workshop highlighted approaches to medium-range, regional hydrological modeling that could be applied to the North Slope region, which drains into the nearshore Beaufort and Chukchi seas, affecting seasonal landfast ice, coastal circulation, and water mass properties. The workshop had three research themes: (1) Climate and variability and its impacts; (2) Hydrological observations and modeling; and (3) Sea ice, oceanography, and geochemistry. There were 28 participants (23 presentations). The workshop made a series of detailed recommendations in the three research themes, and proposed an interdisciplinary (hydrology, meteorology, oceanography, sea ice, and geochemistry) integration/synthesis (I/S) study in the pan-North Slope (and Beaufort-Chukchi seas) region, an important research platform for oil and gas exploration and development.
NTIS
Alaska; Arctic Regions; Coasts; Conferences; Fresh Water; Hydrology; Hydrology Models

20070019950 Lawrence Livermore National Lab., Livermore, CA USA
Using Historic Models of C(sub n)(sup 2) to Predict r(sub 0) and Regimes Affected by Atmospheric Turbulence for Horizontal, Slant and Topological Paths
Lawson, J. K.; Carrano, C. J.; Jun. 30, 2006; 14 pp.; In English
Report No.(s): DE2007-897959; UCRL-CONF-222540; No Copyright; Avail.: Department of Energy Information Bridge

Image data collected near the ground, in the boundary layer, or from low altitude planes must contend with the detrimental effects of atmospheric turbulence on the image quality. So it is useful to predict operating regimes (wavelength, height of target, height of detector, total path distance, day vs. night viewing, etc.) where atmospheric turbulence is expected to play a significant role in image degradation. In these regimes, image enhancement techniques such as speckle processing, deconvolution and Wiener filtering methods can be utilized to recover near instrument-limited resolution in degraded images. We conducted a literature survey of various boundary layer and lower troposphere models for the structure coefficient of the index of refraction (C(sub n)(sup 2)). Using these models, we constructed a spreadsheet tool to estimate the Fried parameter (r(sub 0)) for different scenarios, including slant and horizontal path trajectories. We also created a tool for scenarios where the height along the path crudely accounted for the topology of the path. This would be of particular interest in mountain-based viewing platforms surveying ground targets. The tools that we developed utilized Visual Basic(reg-sign) programming in an Excel(reg-sign) spreadsheet environment for accessibility and ease of use. In this paper, we will discuss the C(sub n)(sup 2) profile models used, describe the tools developed and compare the results obtained for the Fried parameter with those estimated from experimental data.
NTIS
Atmospheric Turbulence; Slopes

20070020008 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Status of MTP Data Analysis for TCSP
Mahoney, Michael J.; April 4, 2006; 41 pp.; In English; TCSP Science Team Workshop, 4-5 Apr. 2006, Huntsville, AL, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39906

Topics covered include: a) MTP temperature calibration and data analysis; b) Background for interpreting MTP data; c)

Large amplitude temperature structure; d) Gravity waves (GWs) in MTP data; and e) Subsidence over hurricanes.
Derived from text
Atmospheric Temperature; Gravity Waves; Hurricanes

20070020012 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Impact of Rainfall on the Retrieval of Soil Moisture Using AMSR-E Data
Jin, Kyoung-Wook; Njoku, Eni; Chan, Steven; July 13, 2006; 4 pp.; In English; International Geoscience and Remote Sensing Symposium (IGARSS), 31 Jul - 4 Aug. 2006, Denver, CO, USA; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39899

Rainfall leads to errors and limitations on the soil moisture retrieval using satellite radiometry. To understand the impact of rainfall, we examined the temporal and spatial correlations between rainfall and soil moisture using AMSR-E (Advanced Microwave Scanning Radiometer-EOS) data. Scan by scan (swath basis) analyses were conducted to find the short time scale relationship between the two physical parameters. The retention of soil moisture after rainfall in different climatic regimes (e.g. humid and arid regions) was also examined.
Author
Rain; Climatology; Arid Lands; Soil Moisture

20070020159 Environmental Protection Agency, Washington, DC, USA
If Geoengineering Is the First Best Step Towards Global Climate Change Control, How Could It Best Be Implemented
Carlin, A.; Jan. 2007; 9 pp.; In English
Report No.(s): PB2007-107546; EPA/WP-07-04; No Copyright; Avail.: CASI: A02, Hardcopy

If, as argued elsewhere, geoengineering represents the most efficient and effective first step towards a solution of the global climate change problem, it is important to analyze how such a geoengineering effort might best be organized. A number of possible organizations are discussed and criteria are proposed for judging between them. The paper concludes that since different phases of the program can be carried on by different organizations, involving one, or possibly only a few countries,would appear to offer advantages for the early and less politically sensitive research and plan development while international organizations would appear to offer important advantages for the later implementation and maintenance phases. An important question is whether the international organization should be very broadly representative of all nations, such as the United Nations, or have a narrower membership, say of developed countries willing to contribute resources towards actually implementing a plan once it has been agreed to.
NTIS
Climate Change; Climatology

20070020176 Environmental Protection Agency, Washington, DC, USA
Summary of NHEERL Ecological Research on Global Climate Change
Beedlow, P. A.; Tingey, D. T.; Apr. 2007; 112 pp.; In English
Report No.(s): PB2007-107851; EPA/600/R-05/007; No Copyright; Avail.: National Technical Information Service (NTIS)

NHEERL is studying the potential effects of global change on vulnerable ecosystems. Species or ecosystems whose natural habitat is within an ecotone are expected to exhibit the first signals of global change. Latitudinal migration of high altitude wild flowers, for example, may be such a signal. Identification of changes within these sentinel species would significantly decrease the uncertainty as to whether climate change is indeed occurring and provide information on the vulnerability of these sensitive ecosystems to climate change. Our research also focuses on coastal areas which are extremely vulnerable to sea-level rise and therefore considered high risk. The high population density, loss of coastal wetlands, the costs of defending sheltered shorelines and property, the loss of beaches and recreational facilities, as well as the impact on the infrastructure of coastal cities(i.e., sewers, drinking water supplies, etc.) establish the coastal regions as the most vulnerable region to climate change. The last component of our research focuses on the impacts of atmospheric stressors -- such as UV-B -- on ecosystem health, including potential linkages to amphibian decline.
NTIS
Climate Change; Climatology; Environment Effects; Health

20070020233 Environmental Protection Agency, Washington, DC, USA
Energy Star (Trade Name) and Other Climate Protection Partnerships 2005 Annual Report
January 2005; 76 pp.; In English
Report No.(s): PB2007-108469; No Copyright; Avail.: CASI: A05, Hardcopy

The U.S. Environmental Protection Agency's (EPA's) climate protection partnership programs continue to play an important role in reducing emissions of greenhouse gases (GHGs) that contribute to global climate change. EPA's programs are well-designed efforts that address identified market barriers, accelerate the adoption of proven technologies and practices, and deliver substantial emissions reductions. Greater investments in energy efficiency, clean energy supply, and other climate-friendly technologies provide cost-effective, near-term means for protecting our global environment, in addition to combating higher utility bills and hedging against volatility in electricity and natural gas markets. By 2005, these programs had more than a decade of success delivering environmental and economic results. A diverse and growing set of partner organizations have delivered sizeable emissions reductions and made significant progress towards meeting the President's greenhouse gas intensity reduction goal for 2012.
NTIS
Climate; Climate Change; Energy Conservation; Protection

48
OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics; and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

20070019836 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Societal Benefits of Ocean Altimetry Data
Srinivasen, Margaret; Leben, Robert; September 20, 2004; 3 pp.; In English; International Geophysics and Remote Sensing Symposium, (IGARSS), 20-24 Sep. 2004, Anchorage, AK, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39955

The NASA/CNES Jason satellite, follow-on to the highly successful TOPEX/Poseidon mission, continues to provide oceanographers and marine operators across the globe with a continuous twelve-year, high quality stream of sea surface height data. The mission is expected to extend through 2007, when the NASA/NOAA/CNES follow-on mission, OSTM, will be launched with the wide-swath ocean altimeter on board. This unprecedented resource of valuable ocean data is being used to map sea surface height, geostrophic velocity, significant wave height, and wind speed over the global oceans. Altimeter data products are currently used by hundreds of researchers and operational users to monitor ocean circulation and improve our understanding of the role of the oceans in climate and weather. Ocean altimeter data has many societal benefits and has proven invaluable in many practical applications including; a) Ocean forecasting systems; b) Climate research and forecasting; c) Ship routing; d) Fisheries management; e) Marine mammal habitat monitoring; f) Hurricane forecasting and tracking; g) Debris tracking; and h) Precision marine operations such as cable-laying and oil production. The data has been cited in nearly 2,000 research and popular articles since the launch of TOPEX/Poseidon in 1992, and almost 200 scientific users receive the global coverage altimeter data on a monthly basis. In addition to the scientific and operational uses of the data, the educational community has seized the unique concepts highlighted by these altimeter missions as a resource for teaching ocean science to students from grade school through college. This presentation will highlight societal benefits of ocean altimetry data in the areas of climate studies, marine operations, marine research, and non-ocean investigations.
Author
Ocean Surface; Altimetry; Climate; Forecasting; Tracking (Position); Fisheries; Poseidon Satellite; Hurricanes; Operations Research

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*.

20070020344 NASA Johnson Space Center, Houston, TX, USA
Assuring Crew Health Protection
Robinson, Judith L.; May 17, 2007; 7 pp.; In English; Aerospace Medical Association Meeting, 13-17 May 2007, New Orleans, LA, USA; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020344

Amongst the recommendation of the Columbia Accident Investigation Board (CAIB) were the establishment of an independent technical authorities, one of which is the Health and Medical Technical Authority. This viewgraph presentation reviews the work of this Technical Authority in maintaining standards that are aimed at implementing health and medical policy, responding to medical events and emergencies consistent with acceptable levels defined by standards and providing expertise for program milestones.
CASI
Aerospace Medicine; Health; Spacecrews; Policies; Standards

20070020458 NASA Johnson Space Center, Houston, TX, USA
A Brief Historical Review of Vestibular and Sensorimotor Research Associated with Space Flight
Reschke, M. F.; Krnavek, J. M.; Somers, J. T.; Ford, G.; May 2007; 124 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/SP-2007-560; No Copyright; Avail.: CASI: A06, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020458

This short report provides a brief history of space flight, serves as a valuable resource for neurovestibular and sensorimotor space flight experiments conducted by all countries through 2005, and finally, it provides a comprehensive set of space flight physiology references with an emphasis on sensorimotor documents. Therefore, the intent and purpose of this historical overview of neuroscience and space flight is two-fold: First to equip researchers with a single, common reference document, and second, to allow those who helped create this history, a record of accomplishment.
Author
Histories; Vestibular Tests; Sensorimotor Performance; Aerospace Medicine; Neurology; Space Flight; NASA Space Programs; Research and Development

53
BEHAVIORAL SCIENCES

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

20070020217 Sandia National Labs., Albuquerque, NM USA
Investigating Surety Methodologies for Cognitive Systems
Peercy, D. E.; Shaneyfelt, W. L.; Calders, E.; Caudell, T.; Mills, K.; Nov. 01, 2006; 67 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-897618; SAND2006-6895; No Copyright; Avail.: National Technical Information Service (NTIS)

Advances in cognitive science provide a foundation for new tools that promise to advance human capabilities with significant positive impacts. As with any new technology breakthrough, associated technical and non-technical risks are involved. Sandia has mitigated both technical and non-technical risks by applying advanced surety methodologies in such areas as nuclear weapons, nuclear reactor safety, nuclear materials transport, and energy systems. In order to apply surety to the development of cognitive systems, we must understand the concepts and principles that characterize the certainty of a system's operation as well as the risk areas of cognitive sciences. This SAND report documents a preliminary spectrum of risks involved with cognitive sciences, and identifies some surety methodologies that can be applied to potentially mitigate such risks. Some potential areas for further study are recommended. In particular, a recommendation is made to develop a

cognitive systems epistemology framework for more detailed study of these risk areas and applications of surety methods and techniques.
NTIS
Cognition; Nuclear Weapons; Risk; Nuclear Reactors; Decision Making

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*.

20070019707 NASA Johnson Space Center, Houston, TX, USA
Maintenance Procedure Display: Head Mounted Display (HMD) Evaluations
Whitmore, Milrian; Litaker, Harry L., Jr.; Solem, Jody A.; Holden, Kritina L.; Hoffman, Ronald R., et al.; May 04, 2007; 20 pp.; In English; Human Factors and Ergonomics Society, 4 May 2007, Houston, TX, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

A viewgraph presentation describing maintenance procedures for head mounted displays is shown. The topics include: 1) Study Goals; 2) Near Eye Displays (HMDs); 3) Design; 4) Phase I-Evaluation Methods; 5) Phase 1 Results; 6) Improved HMD Mounting; 7) Phase 2 -Evaluation Methods; 8) Phase 2 Preliminary Results; and 9) Next Steps.
CASI
Head-Up Displays; Maintenance; Systems Integration; International Space Station

20070019808 NASA Johnson Space Center, Houston, TX, USA
STS 116 Return Samples: Assessment of Air Quality aboard the Shuttle (STS-116) and International Space Station (12A.1)
James, John T.; January 2007; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070019808

The toxicological assessments of 2 grab sample canisters (GSCs) from the Shuttle are reported. Analytical methods have not changed from earlier reports. The Shuttle atmosphere was acceptable for human respiration.
Derived from text
Air Quality; International Space Station; Space Transportation System; Aerospace Environments; Spacecraft Environments

20070019811 NASA Johnson Space Center, Houston, TX, USA
Crew Exploration Vehicle Environmental Control and Life Support Emergency Gas Consumable Sizing
Lewis, John F.; Peterso, Laurie; [2007]; 3 pp.; In English; International Conference on Environmental Sciences, 9-12 Jul. 2007, Chicago, IL, USA
Contract(s)/Grant(s): 644423.02.36.12.10
Report No.(s): 07ICES-174; Copyright; Avail.: Other Sources

As part of preparing for the Crew Exploration Vehicle (CEV), the National Aeronautics and Space Administration (NASA) worked on developing the requirements that drive the emergency gas consumables. Emergency gas is required to support Extravehicular Activities (EVA), maintain the cabin pressure during a cabin leak for the crew to don their suits, and to recover the cabin following a toxic even or a fire.
Author
Environmental Control; Life Support Systems; Crew Exploration Vehicle; Consumables (Spacecraft); Space Shuttles; Compressed Gas

20070019814 NASA Johnson Space Center, Houston, TX, USA
International Space Station (ISS) Environmental Control and Life Support (ECLS) System Overview of Events: February 2006 - 2007
Gentry, Gregory J.; Reysa, Richard P.; Williams, David E.; [2007]; 11 pp.; In English; 37th International Conference on Environmental Sciences, 9-12 Jul. 2007, Chicago, IL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 401769.06.01.01.01
Report No.(s): 2007-ICES-306; Copyright; Avail.: Other Sources

The International Space Station (ISS) continues to mature and operate its life support equipment. Major events occurring

between February 2006 and February 2007 are discussed in this paper, as are updates from previously ongoing hardware anomalies. This paper addresses the major ISS operation events over the last year. Impact to overall ISS operations is also discussed.
Author
Environmental Control; International Space Station; Life Support Systems; General Overviews; Space Shuttles

20070019823 NASA Johnson Space Center, Houston, TX, USA
Characteristics of Post-Sorbent and High Temperature Catalytic Oxidizer Beds After Long-Term On-Orbit Use
Johnson, Sharon; Williams, David E.; [2007]; 4 pp.; In English; 37th International Conference on Environmental Sciences, 9-12 Jul. 2007, Chicago, IL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 401769.01.01.01
Report No.(s): 07ICES-78; Copyright; Avail.: CASI: A01, Hardcopy

Trace contaminants are produced on-orbit by human metabolic processes and equipment off-gassing. These potentially hazardous contaminants are removed by the Trace Contaminant Control Subassembly (TCCS) in the US segment of the International Space Station (ISS). The TCCS has been operating since February 2001. Analysis of on-orbit telemetry data indicated a slow increase in the TCCS system flow resistance over the five years of operation. Two of the packed beds within the TCCS were replaced to return the TCCS to its nominal operation conditions; the high temperature catalytic oxidizer and the post-sorbent bed. Results from the examination of the returned beds are presented along with a discussion about changes to bed service life.
Author
High Temperature; Oxidizers; Subassemblies; Trace Contaminants; International Space Station; Catalytic Activity; Beds (Process Engineering); Sorbents; In-Flight Monitoring; Telemetry; Contaminants

20070019851 NASA Johnson Space Center, Houston, TX, USA
International Space Station Environmental Control and Life Support System: Verification for the Pressurized Mating Adapters
Williams, David E.; July 9, 2007; 10 pp.; In English; 37th International Conference on Environmental Systems, 9-12 Jul. 2007, Chicago, IL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 401769.06.01.01.01; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070019851

The International Space Station (ISS) Pressurized Mating Adapters (PMAs) Environmental Control and Life Support (ECLS) System is comprised of three subsystems: Atmosphere Control and Supply (ACS), Temperature and Humidity Control (THC), and Water Recovery and Management (WRM). PMA 1 and PMA 2 flew to ISS on Flight 2A and PMA 3 flew to ISS on Flight 3A. This paper provides a summary of the PMAs ECLS design and the detailed Element Verification methodologies utilized during the Qualification phase for the PMAs.
Author
International Space Station; Environmental Control; Life Support Systems; Atmospheric Temperature; Humidity

20070019936 Vinson and Elkins, LLP, Houston, TX, USA
Recycling of Used Perfluorosulfonic Acid Membranes
Gront, S., Inventor; Gront, W., Inventor; 24 Mar 05; 6 pp.; In English
Contract(s)/Grant(s): DE1C3603GO
Patent Info.: Filed Filed 24 Mar 05; US-Patent-Appl-SN-11-089 547
Report No.(s): PB2007-105313; No Copyright; Avail.: CASI: A02, Hardcopy

A method for recovering and recycling catalyst coated fuel cell membranes includes dissolving the used membranes in water and solvent, heating the dissolved membranes under pressure and separating the components. Active membranes are produced from the recycled materials.
NTIS
Fuel Cells; Membranes; Patent Applications; Recycling

20070019990 Legal Barber, Golden, CO, USA

Multi-Dimensioned Easily Adjustable Single Sheet Container Formula with Indicia

Kim, R. H., Inventor; Kim, B., Inventor; Kim, S. Y., Inventor; Kim, D. Y., Inventor; 9 Feb 04; 24 pp.; In English

Patent Info.: Filed Filed 9 Feb 04; US-Patent-Appl-SN-10-774 792

Report No.(s): PB2007-104261; No Copyright; Avail.: CASI: A03, Hardcopy

A multidimensional and easily adjusted container may be created from a single sheet container template having a plurality of horizontal and vertical fold lines and perforation lines extending along portions of the fold lines. A large number of containers having a variety of dimensions may be created by using indicia such as numbering of the fold lines and perforation lines, instructions and so on to indicate to users how to fold the box into various sizes and shapes. A unit dimension of the separation of the parallel lines may provide a regular grid of lines, or the separation distance between parallel lines may be a multiple of the unit distance. Different multiples of the unit distance may be used on a single container template, and the unit distance may be different for the horizontal and vertical fold lines.

NTIS

Adjusting; Templates; Sheets; Dimensions; Boxes (Containers)

20070020003 NASA Johnson Space Center, Houston, TX, USA

Testing of an Amine-Based Pressure-Swing System for Carbon Dioxide and Humidity Control

Lin, Amy; Smith, Frederick; Sweterlitsch, Jeffrey; Graf, John; Nalette, Tim; Papale, William; Campbell, Melissa; Lu, Sao-Dung; July 12, 2007; 12 pp.; In English; 37th International Conference on Environmental Systems, 9-12 July 2007, Chicago, IL, USA; Original contains color and black and white illustrations

Report No.(s): Paper Number 07ICES-140; Copyright; Avail.: CASI: A03, Hardcopy

In a crewed spacecraft environment, atmospheric carbon dioxide (CO2) and moisture control is crucial. Hamilton Sundstrand has developed a stable and efficient amine-based CO2 and water vapor sorbent, SA9T, that is well-suited for use in a spacecraft environment. The sorbent is efficiently packaged in pressure-swing regenerable beds that are thermally linked to improve removal efficiency and minimize vehicle thermal loads. Flows are all controlled with a single spool valve. This technology has been baselined for the new Orion spacecraft. However, more data was needed on the operational characteristics of the package in a simulated spacecraft environment. A unit was therefore tested with simulated metabolic loads in a closed chamber at Johnson Space Center during the last third of 2006. Tests were run at a variety of cabin temperatures and with a range of operating conditions varying cycle time, vacuum pressure, air flow rate, and crew activity levels. Results of this testing are presented and potential flight operational strategies discussed.

Author

Amines; Carbon Dioxide; Humidity; Moisture; Spacecraft Environments; Water Vapor; Spacecraft Cabin Atmospheres

20070020157 Swedish Defence Research Establishment, Linkoeping, Sweden

Human-Factors Perspective On Simulator Fidelity Assessment

Naehlinder, S.; Sep. 2006; 32 pp.; In English

Report No.(s): PB2007-106540; FOI-R-2047-SE; No Copyright; Avail.: CASI: A03, Hardcopy

The present report describes a study performed together with the Lund University School of Aviation. The report has two specific purposes: (1) compare two different recording devices for psychophysiological data with respect for their usefulness in assessing pilot mental workload in simulated and real flight. (2) Study the similarities and differences between both psychophysiological data and subjective ratings of mental workload between simulated and real flight. Nine student pilots flew the same exercise first in a simulator and one or two days later in real flight. The simulator had no display of the outside world and no motion. The results show that the two different psychophysiological recording devices have a very high degree of correspondence. The results also indicate that the student pilots have similar reactions in the simulator as they do in real flight. This was true for most flight phases; however, on some occasions the reactions were quite different. These differences are attributed to differences in the way the exercise was performed in the simulator and in real Sight. The lack of visual system in the simulator seemed to have an effect on the final landing phase. The results validate the use of the simulator, but more importantly, the results validate the method for a human-factors validation of a simulator.

NTIS

Human Factors Engineering; Simulators; System Effectiveness; Training Devices

20070020163 NASA Johnson Space Center, Houston, TX, USA

Overview of Umbilical Extravehicular Activity (EVA) Interfaces in Life Support Systems on Spacecraft Vehicles and Applications for the Crew Exploration Vehicle (CEV)

Peterson, Laurie J.; Jordan, Nicole C.; Barido, Richard A.; [2007]; 6 pp.; In English; International Conference on

Environmental Systems, 9-12 July 2007, Chicago, IL, USA; Original contains black and white illustrations; No Copyright; Avail.: Other Sources; Abstract Only

Extravehicular Activities (EVAs) for manned spacecraft vehicles have been performed for contingencies and nominal operations numerous times throughout history. This paper will investigate how previous U.S. manned spacecraft vehicles provided life support to crewmembers performing the EVA. Specifically defined are umbilical interfaces with respect to crewmember cooling, drinking water, air (or oxygen), humidity control, and carbon dioxide removal. As historical data is available, the need for planned versus contingency EVAs in previous vehicles as well as details for a nominal EVA day versus a contingency EVA day will be discussed. The hardware used to provide the cooling, drinking water, air (or oxygen), humidity control, and carbon dioxide removal, and the general functions of that hardware, will also be detailed, as information is available. The Crew Exploration Vehicle (CEV or Orion) EVA interfaces will be generically discussed to provide a glimpse of how similar they are to the EVA interfaces in previous vehicles. Conclusions on strategies that should be used for CEV based on previous spacecraft EVA interfaces will be made in the form of questions and recommendations.
Author

Extravehicular Activity; Life Support Systems; Manned Spacecraft; Umbilical Connectors; Crew Exploration Vehicle; Onboard Equipment

20070020174 NASA Johnson Space Center, Houston, TX, USA

Assessment of Silver Based Disinfection Technology for CEV and Future US Spacecraft

Callahan, Michael R.; Adam, Niklas M.; Roberts, Michael S.; Garland, Jay L.; Sager, John C.; Pickering, Karen D.; July 9, 2007; 11 pp.; In English; International Conference on Environmental Systems, 9-12 Jul. 2007, Chicago, IL, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): 516572.04.04.02

Report No.(s): Rept-07ICES-138; Copyright; Avail.: Other Sources

Silver biocide offers a potential advantage over iodine, the current state-of-the-art in US spacecraft disinfection technology, in that silver can be safely consumed by the crew. As such, silver may reduce the overall complexity and mass of future spacecraft potable water systems, particularly those used to support long duration missions. A primary technology gap identified for the use of silver biocide is one of material compatibility. Wetted materials of construction are required to be selected such that silver ion concentrations can be maintained at biocidally effective levels. Preliminary data on silver biocide depletion rates in heritage spacecraft potable water system wetted-materials of construction has been gathered as part of a multi-phase test project aimed at the characterization of silver based biocide technology through: development of preferred materials lists, investigation of silver biocide forms and delivery methods, down-selection of silver biocide technologies, and integrated testing. A 10% - 20% loss in silver ion concentration per day was observed for acid passivated Nitronic 40 tubing with surface area to volume (S/V) ratios of approximately 4.59 cm-1. The Nitronic 40 tubes were tested both with and without biocide pretreatment. Silver biocide depletion was also observed at approximately 0.1% per day for the first 35 days of exposure to acid passivated Inconel 718 coupon, S/V of approximately 0.14 cm-1. Surface analysis by scanning election microscopy (SEM) suggested deposition of silver metal on both test materials. SEM analysis also provided evidence of potential variability in the passivation process for tube configuration of the Nitronic 40 test apparatus. These preliminary results are presented and discussed herein, along with the current project status.
Author

Antiseptics; Potable Water; Silver; Antiinfectives and Antibacterials; Chemical Sterilization; Purification

20070020230 Westat Research, Inc., Rockville, MD, USA, Foster-Miller Associates, Inc., Waltham, MA, USA

Human Factors Guidelines for Intelligent Transportation Systems at the Highway-Rail Intersection: Technical Report

Lerner, N. D.; Jenness, J. W.; Singer, J. P.; Huey, R. W.; Llaneras, R. E.; Mar. 2007; 58 pp.; In English

Report No.(s): PB2007-108887; No Copyright; Avail.: CASI: A04, Hardcopy

The highway-rail intersection (HRI), where a highway and railroad tracks intersect, is a point of potential conflict between highway traffic and trains. In 2004, 3,133 events, 1,131 injuries, and 377 fatalities occurred at HRIs in the USA. With increasing traffic on highways and on rail lines, safety and operational efficiency at the HRI are important concerns. In 1997, the National Intelligent Transportation Systems (ITS) Program Plan identified the HRI as a location that could reap important benefits in safety, mobility, and productivity through the use of innovative communications and electronics technologies known as ITS. Like all systems, ITS must be designed with the human user in mind. The field of human factors specifically addresses issues of human interaction with systems. This technical report documents the development of a set of guidelines entitled Human Factors Guidance for Intelligent Transportation Systems at the Highway-Rail Intersection. The guidelines have two objectives: (1) to provide preliminary guidance that would be of immediate use to designers and implementers of ITS at

HRIs and (2) to serve as a resource and impetus for the development of consensus standards, approved practices, industry guidelines, and other more formal guidance. The scope of the guidelines is limited to human factors issues for ITS systems that are applicable to roadway user safety at HRIs. The first step in guidelines development was to define the set of potential human factors requirements that need to be addressed through guidelines. These issues were derived from a 1999 workshop entitled ITS Standards for the Highway-Rail Intersection; a literature search and review; contacts with key experts, ITS implementers, and organization representatives; and a review of guidelines in related fields. Once the key human factors applications and guidance needs were defined, guidance recommendations were developed, and the guidelines document structure was established. In the guidelines document, Human Factors Guidance for Intelligent Transportation Systems at the Highway-Rail Intersection, Chapters 1 through 3 introduce the purpose and scope of the guidelines, describe the road user for whom the ITS systems are intended, and review current and past ITS systems implemented at HRIs. Chapters 4 through 7 provide general human factors considerations, including message factors, roadside displays, in-vehicle displays, and displays for pedestrians. Chapters 8 through 11 provide human factors considerations for specific applications, including warnings about train arrival, advance information about the HRI and dynamic route guidance, enforcement and control of vehicles, and light rail transit. Each of the guidance chapters (Chapters 4 through 11) has a similar structure. The Background section describes the application and the relevant safety and operational concerns; this section also reviews relevant research, practice, and field experience. The Key Human Factors Issues and Need for Guidance section identifies the major human factors issues of particular concern for the application and why guidance is needed. The Recommendations section provides actual guidance statements with supporting discussions and rationales, as well as cross references to other sections of the guidelines and citations of key documents, where appropriate.
NTIS
Crossings; Highways; Human Factors Engineering; Intersections; Rail Transportation; Rails; Transportation

20070020241 National Inst. for Occupational Safety and Health, Washington, DC, USA, Centers for Disease Control and Prevention, Atlanta, GA, USA
Ergonomic Guidelines for Manual Material Handling
Apr. 2007; 68 pp.; In English
Report No.(s): PB2007-107922; No Copyright; Avail.: CASI: A04, Hardcopy

This booklet is written for managers and supervisors in industries that involve the manual handling of containers. It offers suggestions to improve the handling of rectangular, square, and cylindrical containers, sacks, and bags. 'Improving Manual Material Handling in Your Workplace' lists the benefits of improving your work tasks. It also contains information on risk factors, types of ergonomic improvements, and effective training and sets out a four-step proactive action plan. The plan helps you identify problems, set priorities, make changes, and follow up. Sections 1 and 2 of 'Improvement Options' provide ways to improve lifting, lowering, filling, emptying, or carrying tasks by changing work practices and/or the use of equipment. Guidelines for safer work practices are also included. Section 3 of 'Improvement Options' provides ideas for using equipment instead of manually handling individual containers. Guidelines for safer equipment use are also included.
NTIS
Human Factors Engineering; Materials Handling

20070020456 NASA Johnson Space Center, Houston, TX, USA
Space Human Factors Engineering Gap Analysis Project Final Report
Hudy, Cynthia; Woolford, Barbara; March 2007; 68 pp.; In English
Contract(s)/Grant(s): NAS9-02078
Report No.(s): NASA/TP-2007-213739; S-997; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020456

This six-month gap analysis included literature reviews, database searches, interviews with NASA personnel, and then, a survey of NASA program and project managers as stakeholders. The primary focus of the GAP was on tools and methods to aid in the development of requirements and guidelines for the Crew Exploration Vehicle, since there was an immediate need for such information. However, the GAP is seen as a long-term effort and, therefore, future lunar and Mars exploration missions, as well as ground support needs for all missions, were also considered. The project was divided into four parts, two phases for data gathering, and two for compiling and prioritizing results. The Human Factors Background Review focused on the results of space program literature searches, review of human factors documents, and interviews of human factors personnel. The Field User Review focused on interviewing people outside the human factors area, but who work with crew interfaces. The results from these phases were then compiled and categorized into logical human factors topic areas. Using this compiled list, the Gap Evaluation phase began. In this phase the categories and description of potential research topics

were rated by GAP personnel on seven different factors to create a reduced list to present to stakeholders. A more concise list of topic areas were then sent to NASA stakeholders to obtain their prioritization and buy-in of the important areas for human factors research. Last, the identified gaps were prioritized using four factors: CEV need, interview significance, stakeholder rating, and relevance to the Exploration Systems Architecture Study.
Author
Human Factors Engineering; Crew Exploration Vehicle; NASA Programs; Lunar Exploration; Mars Exploration; Surveys; Data Bases

59
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

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

20070019807 Sandia National Labs., Albuquerque, NM USA
Efficient MATLAB Computations with Sparse and Factored Tensors
Bader, B. W.; Kolda, T. G.; Dec. 01, 2006; 50 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-897641; SAND2006-7592; No Copyright; Avail.: Department of Energy Information Bridge

In this paper, the term tensor refers simply to a multidimensional or N-way array, and we consider how specially structured tensors allow for efficient storage and computation. First, we study sparse tensors, which have the property that the vast majority of the elements are zero. We propose storing sparse tensors using coordinate format and describe the computational efficiency of this scheme for various mathematical operations, including those typical to tensor decomposition algorithms. Second, we study factored tensors, which have the property that they can be assembled from more basic components. We consider two specific types: a Tucker tensor can be expressed as the product of a core tensor (which itself may be dense, sparse, or factored) and a matrix along each mode, and a Kruskal tensor can be expressed as the sum of rank-1 tensors. We are interested in the case where the storage of the components is less than the storage of the full tensor, and we demonstrate that many elementary operations can be computed using only the components. All of the efficiencies described in this paper are implemented in the Tensor Toolbox for MATLAB.
NTIS
Tensors; Codes; Efficiency

20070019822 Sandia National Labs., Albuquerque, NM USA
Final Report for the Network Authentication Investigation and Pilot
Wizke, E. L.; Eldridge, J. M.; Miller, M. M.; Wiener, D. J.; Dautenhahn, N.; Nov. 01, 2006; 40 pp.; In English
Report No.(s): DE2007-897643; SAND2006-7078; No Copyright; Avail.: National Technical Information Service (NTIS)

New network based authentication mechanisms are beginning to be implemented in industry. This project investigated different authentication technologies to see if and how Sandia might benefit from them. It also investigated how these mechanisms can integrate with the Sandia Two-Factor Authentication Project. The results of these investigations and a network authentication path forward strategy are documented in this report.
NTIS
Computer Information Security; Computer Networks

20070019834 Lawrence Livermore National Lab., Livermore, CA USA
Design and Implementation of Ceph: A Scalable Distributed File System
Weil, S. A.; Brandt, S. A.; Miller, E. L.; Long, D. D.; Maltzahn, C.; Apr. 20, 2006; 19 pp.; In English
Report No.(s): DE2007-897941; UCRL-CONF-220714; No Copyright; Avail.: National Technical Information Service (NTIS)

File system designers continue to look to new architectures to improve scalability. Object-based storage diverges from server-based (e.g. NFS) and SAN-based storage systems by coupling processors and memory with disk drives, delegating low-level allocation to object storage devices (OSDs) and decoupling I/O (read/write) from metadata (file open/close) operations. Even recent object-based systems inherit decades-old architectural choices going back to early UNIX file systems, however, limiting their ability to effectively scale to hundreds of petabytes. We present Ceph, a distributed file system that provides excellent performance and reliability with unprecedented scalability. Ceph maximizes the separation between data

and metadata management by replacing allocation tables with a pseudo-random data distribution function (CRUSH) designed for heterogeneous and dynamic clusters of unreliable OSDs. We leverage OSD intelligence to distribute data replication, failure detection and recovery with semi-autonomous OSDs running a specialized local object storage file system (EBOFS). Finally, Ceph is built around a dynamic distributed metadata management cluster that provides extremely efficient metadata management that seamlessly adapts to a wide range of general purpose and scientific computing file system workloads. We present performance measurements under a variety of workloads that show superior I/O performance and scalable metadata management (more than a quarter million metadata ops/sec).
NTIS
Systems Engineering; Data Management; Data Storage

20070019846 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
A Dynamical Systems Approach to the Design of the Science Orbit Around Europa
Gomez, Gerard; Lara, Martin; Russell, Ryan P.; June 4, 2006; 6 pp.; In English; 19th International Symposium on Space Flight Dynamics, 4-11 Jun. 2006, Kanazawa, Japan; Original contains color and black and white illustrations
Contract(s)/Grant(s): BFM2003-09504; ESP2004-04376; ESP2005-07107
Report No.(s): ISTS 2006-d-02; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39918

The science orbit for a future mission to Europa requires low eccentricity, low altitude, and high inclination. However, high inclination orbits around planetary satellites are unstable due to third-body perturbations. Without control, the orbiter impacts Europa after few weeks. To minimize control, a tour over the stable-unstable, averaged manifolds of unstable frozen orbits has been suggested. We proceed with the unaveraged equations and study the manifolds of unstable orbits that are periodic in a rotating frame attached to Europa. Massive numerical computation helps in understanding the unstable dynamics close to Europa, and, thus, in selecting long lifetime high inclination orbits. A final test of a selected set of initial conditions on a high fidelity, ephemeris model, validate the results.
Author
Europa; Dynamical Systems; Low Altitude; Eccentricity; Manifolds (Mathematics); Computation

20070019859 Lawrence Livermore National Lab., Livermore, CA USA
Evaluating the Performance Impact of Xen on MPI and Process Execution for HPC Systems
Youseff, L.; Wolski, R.; Gorda, B.; Krintz, C.; Dec. 22, 2006; 10 pp.; In English
Report No.(s): DE2007-897944; UCRL-TR-226980; No Copyright; Avail.: National Technical Information Service (NTIS)

Virtualization has become increasingly popular for enabling full system isolation, load balancing, and hardware multiplexing for high-end server systems. Virtualizing software has the potential to benefit HPC systems similarly by facilitating efficient cluster management, application isolation, full-system customization, and process migration. However, virtualizing software is not currently employed in HPC environments due to its perceived overhead. In this work, we investigate the overhead imposed by the popular, open-source, Xen virtualization system, on performance-critical HPC kernels and applications. We empirically evaluate the impact of Xen on both communication and computation and compare its use to that of a customized kernel using HPC cluster resources at Lawrence Livermore National Lab (LLNL). We also employ statistically sound methods to compare the performance of a paravirtualized kernel against three popular Linux operating systems: RedHat Enterprise 4 (RHEL4) for build versions 2.6.9 and 2.6.12 and the LLNL CHAOS kernel, a specialized version of RHEL4. Our results indicate that Xen is very efficient and practical for HPC systems.
NTIS
Evaluation; Messages; Performance Tests

20070019860 Lawrence Livermore National Lab., Livermore, CA USA
Parallel H-1-Based Auxiliary Space AMG Solver for H(curl) Problems
Kolev, T. V.; Vassilevski, P. S.; Jul. 11, 2006; 14 pp.; In English
Report No.(s): DE2007-897951; UCRL-TR-222763; No Copyright; Avail.: Department of Energy Information Bridge

This report describes a parallel implementation of the auxiliary space methods for definite Maxwell problems proposed in (4). The solver, named AMS, extends our previous study (7). AMS uses ParCSR sparse matrix storage and the parallel AMG (algebraic multigrid) solver BoomerAMG (1) from the hypre library. It is designed for general unstructured finite element

discretizations of (semi)definite H(curl) problems discretized by Nedelec elements. We document the usage of AMS and illustrate its parallel scalability and overall performance.
NTIS
Maxwell Equation; Parallel Processing (Computers); Matrices (Mathematics)

20070019914 University of South Florida, Tampa, FL, USA
Efficacy of Utility Database Management
Kranc, S. C.; Yalcin, A.; Tsalatsanis, S.; Collier, N. O.; Feb. 2007; 149 pp.; In English
Report No.(s): PB2007-107864; BD544-27; No Copyright; Avail.: National Technical Information Service (NTIS)

Research is needed to justify changes in current Law, Rules, Policy, Processes and Utility Data Management Requirements to affect savings in time and dollars to the Department's work Program. The purpose of this research is to investigate whether the five following cost saving objectives are realistic: (1) Useable and worthwhile utility location information can be made available for less than $750,000.00 a year (2) The roadway design plans production process can be accelerated from three to six months on major projects and thereby reducing public inconvenience and cost to produce design plans (3) The information gained will facilitate better management of R/W resources in the Maintenance permitting process (4) Within the Construction discipline two major benefits will be achieved: lower project bids by reducing contractor risk, and a reduction in construction claims and delays (5) The establishment and maintenance of a utility database is an overall cost effective tool worth pursuing and dedicating time and resources to. The principal focus of the research will be to investigate the use of database methodology to accomplish these objectives. A database is defined as a means of recording, storing and retrieving graphic and/or tabular information. Specifically, for the proposed application, the database methodology shall include real time recording of utility as-built information on to the Florida Department of Transportation (FDOT) construction plans in what ever formats are available.
NTIS
Data Base Management Systems; Position (Location); Transportation; Utilities

20070019916 University of South Florida, Tampa, FL, USA, Data Transfer Solutions, LLC, Orlando, FL, USA
Roadway Data Representation and Application Development: Developing a New Straight Line Diagram Application for the Florida Department of Transportation
Ibaugh, A.; Bryan, D.; McFadden, B.; Chakraborty, J.; Feb. 23, 2007; 83 pp.; In English
Contract(s)/Grant(s): PR608207
Report No.(s): PB2007-107868; No Copyright; Avail.: National Technical Information Service (NTIS)

The Straight Line Diagram (SLD) is a roadway mapping and data presentation methodology that has been used by the Florida Department of Transportation (DOT) for more than 25 years. It is utilized by technicians and engineers to verify field Roadway Characteristics Inventory (RCI) data, to prepare for field surveys, and for other related applications. The basic structure of the current programs and methodologies used to produce SLDs has become somewhat dated. Recent developments in Geographic Information System (GIS) technology provide flexibility and efficiency in presenting/mapping data. This technology, as well as the proliferation of various new alternatives based on aerial photography or roadway Videolog applications, makes it possible to leverage technologies that are capable of producing a more customized product.
NTIS
Transportation; Mapping; Surveys

20070019917 Florida State Univ., Tallahassee, FL, USA
Decision Support for Bridge Programming and Budgeting
Sobanjo, J. O.; Thomas, P. D.; Jan. 2007; 136 pp.; In English
Contract(s)/Grant(s): BD543-9
Report No.(s): PB2007-107869; No Copyright; Avail.: National Technical Information Service (NTIS)

The Florida Department of Transportation (FDOT) is currently in the process of implementing the American Association of State Highway and Transportation Officials (AASHTO) Pontis Bridge Management System to support network-level decision making in the headquarters and district offices. Pontis is an integral part of a Department-wide effort to improve the quality of asset management information provided to decision makers. The credibility and usefulness of this information is also essential for satisfaction of the requirements of GASB 34 regarding the reporting of capital assets. Previous Department research in the areas of user costs and agency costs have identified the remaining analytical needs for implementation of the economic models of Pontis, and have made significant progress in the development of these models. A spreadsheet-based

Project Level Analysis Tool has been developed to process and present Pontis analytical results in a form useful for bridge-level decision-making. Strong interest has been expressed within the Department as well as in other states for having an objective network-level analysis of tradeoffs between performance and funding. GASB 34 specifically requires this capability in its modified approach, which FDOT is planning to adopt. The project level analysis tool provides all the necessary inputs for individual bridges, so what is needed now is a tool to compile and summarize all this information, using a multi-objective benefit/cost analysis to predict system-wide performance at any given budget or the funding requirement of any target performance level. This will improve programmatic decision-making by helping managers to optimize the allocation of funding among competing uses. The proposed research will provide this capability for bridges, and will be generic enough to be extended to other types of transportation assets (e.g., pavements, rest areas) in the future. The product will be very timely because of the immediate need for tools supporting the Department's GASB 34 implementation.
NTIS
Budgeting; Decision Support Systems; Highways; Information Management; Management Information Systems; Management Systems; Transportation

20070019922 Kansas State Univ., Manhattan, KS, USA
Development of a Materials and Engineering Database for Shales of Eastern Kansas
Miller, K. B.; Hubbard, M. L.; Jan. 2007; 53 pp.; In English
Report No.(s): PB2007-108172; KSU-04-1; No Copyright; Avail.: CASI: A04, Hardcopy

Construction site assessments as well as materials analyses are currently filed away when projects are completed. The accumulated data is not easy to access or manipulate. The past experience of contractors is also not systematically recorded and available. When similar materials or geologic units are encountered in future projects, the cycle of testing is repeated. This does not make efficient or effective use of previously gathered information. The primary filed data included in this database are shale lithology, structure, and color. Laboratory data include second cycle slake durability (Id2), jar index, water absorption, and calcium carbonate content. For some localities, contractors provided information on excavation and shale manipulation methods required to meet engineering specifications. The database is expandable and new localities, shale units, and types of data can be added easily. The database can also be converted into a web-based format that can be readily accessed by KDOT employees, contractors, and other interested parties. We anticipate that the development of a central database for shale materials will save the Kansas Department of Transportation many hours of field, laboratory, and administrative time. Such a database will minimize the duplication of testing. The identification of well-defined relationships between outcrop observations, test results, and engineering performance will enable the behavior of rock units to be better predicted. This should improve the success of both project planning and contractor bidding. The identification of potentially problematic units early will also save both time and money expended in redesign, remediation, and repair. This database will give KDOT inspectors and estimators a wealth of information for bids and construction of KDOT projects.
NTIS
Data Bases; Kansas; Shales

20070019931 National Telecommunications and Information Administration, Washington, DC USA
Reduced Reference Video Calibration Algorithms
Pinson, M. H.; Wolf, S.; Jul. 2006; 50 pp.; In English
Report No.(s): PB2007-108505; NTIA-TR-06-433A; No Copyright; Avail.: CASI: A03, Hardcopy

This report describes four Reduced Reference (RR) video calibration algorithms of low computational complexity. RR methods are useful for performing end-to-end in-service video quality measurements since these methods utilize a low bandwidth network connection between the original (source) and processed (destination) ends. The first RR video calibration algorithm computes temporal registration of the processed video stream with respect to the original video stream (i.e., video delay estimation). The second algorithm jointly calculates spatial scaling and spatial shift. The third algorithm calculates luminance gain level offset of the processed video stream with respect to the original video stream. The fourth algorithm estimates the valid video region of the original or processed video stream (i.e., the portion of the video image that contains actual picture content). All the algorithms utilize only the luminance (Y) image plane of the video signal.
NTIS
Algorithms; Calibrating; Video Signals; Bandwidth

20070019942 Telecordia Technologies Inc., Piscataway, NJ, USA
Method and Device for Generating Approximate Message Authentication Codes
Graveman, R. F., Inventor; 27 Jan 05; 21 pp.; In English
Contract(s)/Grant(s): DAAL01962002

Patent Info.: Filed Filed 27 Jan 05; US-Patent-Appl-SN-10-969 518
Report No.(s): PB2007-105319; No Copyright; Avail.: CASI: A03, Hardcopy

An approximate message authentication code (AMAC) which, like conventional message authentication codes, provides absolute authentication of the origin of the message, yet provides an approximate integrity check for the content of the message. The approximate integrity check will be computed probabilistically and will likely be the same for messages having only a small percentage of different bits. A distance measure on the AMACs, such as a Hamming distance measure, may be used to determine whether the number of bit differences between the messages is likely to be within an acceptable amount. The AMAC is a probabilistic checksum based on a shared key. The AMAC uses the message and a shared key as inputs. Optionally, an initial value may also be used as an input. In one version of the invention, the data in the message M are permuted and arranged (physically or logically) into a table having 'A' bits in each column and T (sup 2) rows, where T is may be an odd integer. The permuted data are masked, for example, to generate an unbiased, independent, identically distributed set of bits (1s and 0s). Taking T rows at a time, the majority bit value for each column is determined and that majority value is used to generate a new row. This procedure is repeated on the T new rows of majority bits. The resulting 'A' bits is the AMAC.

NTIS

Computer Information Security; Patent Applications

20070019944 Cardinal Law Group, Evanston, IL, USA

Siso Model Predictive Controller

Rawlings, J. B., Inventor; Pannucchia, G., Inventor; Lauchi, N., Inventor; 4 Feb 05; 17 pp.; In English
Contract(s)/Grant(s): CTS0105360
Patent Info.: Filed Filed 4 Feb 05; US-Patent-Appl-SN-11-051 814
Report No.(s): PB2007-105341; No Copyright; Avail.: CASI: A03, Hardcopy

A method of predictive control for a single input, single output (SISO) system, including modeling the SISO system with model factors, detecting output from the SISO system, estimating a filtered disturbance from the output, determining a steady state target state from the filtered disturbance and a steady state target output, populating a dynamic optimization solution table using the model factors and a main tuning parameter, and determining an optimum input from the dynamic optimization solution table. Determining an optimum input includes determining a time varying parameter, determining a potential optimum input from the time varying parameter, and checking whether the potential optimum input is the optimum input.

NTIS

Controllers; Patent Applications; Predictions; SISO (Control Systems)

20070019945 Verizon Corporate Services Group, Inc., Irving, TX, USA

Packet-Based and Pseudo-Packet Based Cryptographic Communications System and Method

Toxel, G. D., Inventor; Milliken, W. C., Inventor; 9 Mar 05; 34 pp.; In English
Contract(s)/Grant(s): MDA90403C0969
Patent Info.: Filed Filed 9 Mar 05; US-Patent-Appl-SN-11-016 215
Report No.(s): PB2007-105343; No Copyright; Avail.: CASI: A03, Hardcopy

The disclosed technology provides a system and method of securely communicating data. An encryptor located at a transmitter can provide encrypted data to the transmitter. The transmitter can maintain a packet number indicating a particular packet for carrying the encrypted data and a sub-packet number indicating a position within the packet where the encrypted data is to be stored. The encryptor can produce the encrypted data using an encryptor seed generated based on the packet number and sub-packet number. A receiver can maintain a receiver packet number indicating a number of previously received packets and can compute a receiver sub-packet number. The receiver can receive a packet containing encrypted data and can decrypt the encrypted data using a decryptor seed generated based on the receiver packet number and sub-packet number.

NTIS

Communicating; Cryptography; Packets (Communication); Patent Applications; Transmitters

20070019957 Lawrence Livermore National Lab., Livermore, CA USA

Multigrid Methods for Mesh Relaxation

O'Brien, M. J.; Jun. 15, 2006; 11 pp.; In English
Report No.(s): DE2007-897998; UCRL-TR-222074; No Copyright; Avail.: Department of Energy Information Bridge

When generating a mesh for the initial conditions for a computer simulation, you want the mesh to be as smooth as

possible. A common practice is to use equipotential mesh relaxation to smooth out a distorted computational mesh. Typically a Laplace-like equation is set up for the mesh coordinates and then one or more Jacobi iterations are performed to relax the mesh. As the zone count gets really large, the Jacobi iteration becomes less and less effective and we are stuck with our original unrelaxed mesh. This type of iteration can only damp high frequency errors and the smooth errors remain. When the zone count is large, almost everything looks smooth so relaxation cannot solve the problem. In this paper we examine a multigrid technique which effectively smooths out the mesh, independent of the number of zones.
NTIS
Computerized Simulation; Multigrid Methods

20070019963 Lawrence Livermore National Lab., Livermore, CA USA
Contact Interface Verification for DYNA3D. Scenario 1: Basic Contact
McMichael, L. D.; Mar. 31, 2006; 61 pp.; In English
Report No.(s): DE2007-898003; UCRL-TR-221283; No Copyright; Avail.: National Technical Information Service (NTIS)

A suite of test problems has been developed to examine contact behavior within the nonlinear, three-dimensional, explicit finite element analysis (FEA) code DYNA3D (Lin, 2005). The test problems address the basic functionality of the contact algorithms, including the behavior of various kinematic, penalty, and Lagrangian enforcement formulations. The results from the DYNA3D analyses are compared to closed form solutions to verify the contact behavior. This work was performed as part of the Verification and Validation efforts of LLNL W Program within the NNSA's Advanced Simulation and Computing (ASC) Program. DYNA3D models the transient dynamic response of solids and structures including the interactions between disjoint bodies (parts). A wide variety of contact surfaces are available to represent the diverse interactions possible during an analysis, including relative motion (sliding), separation and gap closure (voids), and fixed relative position (tied). The problem geometry may be defined using a combination of element formulations, including one-dimensional beam and truss elements, two-dimensional shell elements, and three-dimensional solid elements. Consequently, it is necessary to consider various element interactions for each contact algorithm being verified. Most of the contact algorithms currently available in DYNA3D are examined; the exceptions are the Type 4--Single Surface Contact and Type 11--SAND algorithms. It is likely that these algorithms will be removed since their functionality is embodied in other, more robust, contact algorithms. The automatic contact algorithm is evaluated using the Type 12 interface. Two other variations of automatic contact, Type 13 and Type 14, offer additional means to adapt the interface domain, but share the same search and restoration algorithms as Type 12. The contact algorithms are summarized in Table 1. This report and associated test problems examine the scenario where one contact surface exists between two disjoint bodies. These test problems focus on whether a particular contact algorithm properly represents the interactions along the interface. A companion report (McMichael, 2006) and test problems address the multi-contact scenario in which multiple bodies interact with each other via multiple interfaces. The multi-contact test problems examine whether any ordering issues exist in the contact logic. The test problems are analyzed using version 5.2 (compiled on 12/22/2005) of DYNA3D. The analytical results are used to form baseline solutions for subsequent regression testing.
NTIS
Finite Element Method; Proving; Algorithms; Kinematics

20070019967 Lawrence Livermore National Lab., Livermore, CA USA
Support for Whole-Program Analysis and the Verification of the One-Definition Rule in C++
Quinlan, D.; Vuduc, R.; Panas, T.; Haerdtlein, J.; Saebjoernsen, A.; Jun. 15, 2006; 11 pp.; In English
Report No.(s): DE2007-898014; UCRL-CONF-222122; No Copyright; Avail.: National Technical Information Service (NTIS)

We present a compact and accurate representation of a whole-program abstract syntax tree, and use it to detect a specific security vulnerability in C++ programs known as a One-Definition Rule (ODR) violation. The ODR states that types and functions appearing in multiple compilation units must be defined identically. However, no current compiler can enforce ODR because doing so requires the ability to see the full application source at once; where ODR is violated, the program is incorrect. Moreover, a lack of ODR enforcement makes a program vulnerable to the so-called VPTR exploit, in which an object's virtual function table is replaced by malicious code. Our representation of the whole program preserves all features of the source for analysis and transformation, and permits a million-line application to fit entirely in the memory of a workstation with 1 GB of RAM.
NTIS
C++ (Programming Language); Program Verification (Computers)

20070020027 Lockheed Martin Environmental Systems and Technologies, Las Vegas, NV, USA, Nevada Univ., Las Vegas, NV, USA

ProUCL Version 4.0, Technical Guide

Singh, A.; Singh, A. K.; Apr. 2007; 232 pp.; In English

Report No.(s): PB2007-107919; No Copyright; Avail.: CASI: A11, Hardcopy

Statistical inference, including both estimation and hypotheses testing approaches, is routinely used to: (1) Estimate environmental parameters of interest, such as exposure point concentration (EPC) terms, not-to-exceed values, and background level threshold values (BTVs) for contaminants of potential concern (COPC); (2) Identify areas of concern (AOC) at a contaminated site; (3) Compare contaminant concentrations found at two or more AOCs of a contaminated site; (4) Compare contaminant concentrations found at an AOC with background or reference area contaminant concentrations; and (5) Compare site concentrations with a cleanup standard to verify the attainment of cleanup standards.

NTIS

Computer Programs; Statistical Analysis; Environments

20070020028 Lockheed Martin Environmental Systems and Technologies, Las Vegas, NV, USA, Nevada Univ., Las Vegas, NV, USA

ProUCL Version 4.0, User Guide

Singh, A.; Maichle, R.; Singh, A. K.; Lee, S. E.; Apr. 2007; 236 pp.; In English

Report No.(s): PB2007-107918; No Copyright; Avail.: CASI: A11, Hardcopy

Statistical inference, including both estimation and hypotheses testing approaches, is routinely used to: (1) Estimate environmental parameters of interest, such as exposure point concentration (EPC) terms, not-to-exceed values, and background level threshold values (BTVs) for contaminants of potential concern (COPC); (2) Identify areas of concern (AOC) at a contaminated site; (3) Compare contaminant concentrations found at two or more AOCs of a contaminated site; (4) Compare contaminant concentrations found at an AOC with background or reference area contaminant concentrations; and (5) Compare site concentrations with a cleanup standard to verify the attainment of cleanup standards.

NTIS

Computer Programs; Statistical Analysis; Environmental Cleanup

20070020126 Intellectual Property Group, Indianapolis, IN, USA

Method for Computing Subjective Dissimilarities Among Discrete Entities

Dzhafaroy, E., Inventor; Columus, H., Inventor; 1 Apr 05; 13 pp.; In English

Contract(s)/Grant(s): SES0318010

Patent Info.: Filed Filed 1 Apr 05; US-Patent-Appl-SN-11-097 585

Report No.(s): PB2007-105860; No Copyright; Avail.: CASI: A03, Hardcopy

A method for computing subjective dissimilarities among discrete entities is provided. The method includes the steps of presenting a plurality of entities to a perceiver, determining discrimination probabilities among the entities, and computing Fechnerian distances and the shortest pathways between the entities.

NTIS

Patent Applications; Psychometrics

20070020153 Swedish Defence Research Establishment, Linkoeping, Sweden

Parameters for Intrusion Analysis

Karresand, M.; Dec. 2005; 34 pp.; In Swedish

Report No.(s): PB2007-106527; FOI-R-1831-SE; No Copyright; Avail.: CASI: A03, Hardcopy

This report presents an analysis of 11 papers treating anomaly based intrusion detection from Recent Advances in Intrusion Detection (RAID) published between 2000 and 2004, and 9 papers from the IEEE Symposium on Security and Privacy (S&P) published between 2000 and 2005. The analysis is performed with the aim to find what parameters are used as a basis to detect intrusions. In addition to that four more papers are presented and analyzed. The papers are treating the question of whether it is possible to use the byte frequency distribution of a data fragment to correctly classify it as belonging to a specific file type.

NTIS

Anomalies; Detection; Intrusion; Warning Systems

20070020155 Swedish Defence Research Establishment, Linkoeping, Sweden

Risks in Using USB Flash Drives and u3

Loefvenbereg, J.; Oct. 2006; 16 pp.; In Swedish

Report No.(s): PB2007-106532; FOI-R-2078-SE; No Copyright; Avail.: CASI: A03, Hardcopy

U3 is a new technology used in combination with USB flash drives. It makes it possible to keep applications, data and configurations on the flash drive. When a u3 stick (USB flash drive with u3) is connected to the host computer, a launch program is automatically run, in which the user can run and administrate the applications on the stick. It is also possible to update the launch program when new versions are made available by the manufacturer. Unfortunately, in practice it is easy for anybody do exchange the launch program for anything. The combination of automatic program run and the possibility to exchange the launch program is problematic from a security point of view. An attack can be aimed at the host computer by exchanging the launch program for a program that installs a surveillance program, forwarding sensitive information over the Internet to a suitable receiver. It is also possible to create viruses which spread using u3 sticks, similar to floppy disk viruses. Thus, the security problems with u3 Sticks are evident, especially considering how widely used the technology is.

NTIS

Computer Information Security; Data Storage; Risk

20070020188 Sandia National Labs., Albuquerque, NM USA

Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan. Part 1: ASC Software Quality Engineering Practices, Version 2.0

Boucheron, E. A.; Drake, R. R.; Edwards, H. C.; Forsythe, C. A.; Heaphy, R.; Sep. 01, 2006; 62 pp.; In English

Report No.(s): DE2007-897607; SAND 2006-5998; No Copyright; Avail.: Department of Energy Information Bridge

The purpose of the Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan is to clearly identify the practices that are the basis for continually improving the quality of ASC software products. The plan defines the ASC program software quality practices and provides mappings of these practices to Sandia Corporate Requirements CPR 1.3.2 and 1.3.6 and to a Department of Energy document, ASCI Software Quality Engineering: Goals, Principles, and Guidelines. This document also identifies ASC management and software project teams responsibilities in implementing the software quality practices and in assessing progress towards achieving their software quality goals.

NTIS

Computer Programs; Computerized Simulation; Laboratories; Procedures; Quality Control

20070020189 Sandia National Labs., Albuquerque, NM USA

Finite Element Calculations Illustrating a Method of Model Reduction for the Dynamics of Structures with Localized Nonlinearities

Griffith, D. T.; Segalman, D. J.; Oct. 01, 2006; 41 pp.; In English

Report No.(s): DE2007-897608; SAND2006-5843; No Copyright; Avail.: National Technical Information Service (NTIS)

A technique published in SAND Report 2006-1789 'Model Reduction of Systems with Localized Nonlinearities' is illustrated in two problems of finite element structural dynamics. That technique, called here the Method of Locally Discontinuous Basis Vectors (LDBV), was devised to address the peculiar difficulties of model reduction of systems having spatially localized nonlinearities. It's illustration here is on two problems of different geometric and dynamic complexity, but each containing localized interface nonlinearities represented by constitutive models for bolted joint behavior. As illustrated on simple problems in the earlier SAND report, the LDBV Method not only affords reduction in size of the nonlinear systems of equations that must be solved, but it also facilitates the use of much larger time steps on problems of joint macro-slip than would be possible otherwise. These benefits are more dramatic for the larger problems illustrated here. The work of both the original SAND report and this one were funded by the LDRD program at Sandia National Laboratories.

NTIS

Dynamic Structural Analysis; Finite Element Method; Nonlinearity

20070020190 Sandia National Labs., Albuquerque, NM USA, Arizona State Univ., Tempe, AZ, USA, North Carolina State Univ., Raleigh, NC, USA, ProStat, Mesa, AZ, USA

Sampling-Based Computational Strategy for the Representation of Epistemic Uncertainty in Model Predictions with evidence Theory

Helton, J. C.; Johnson, J. D.; Oberkampf, W. L.; Storlie, C. B.; Oct. 01, 2006; 66 pp.; In English

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

Report No.(s): DE2007-897617; SAND2006-5557; No Copyright; Avail.: Department of Energy Information Bridge

Evidence theory provides an alternative to probability theory for the representation of epistemic uncertainty in model

predictions that derives from epistemic uncertainty in model inputs, where the descriptor epistemic is used to indicate uncertainty that derives from a lack of knowledge with respect to the appropriate values to use for various inputs to the model. The potential benefit, and hence appeal, of evidence theory is that it allows a less restrictive specification of uncertainty than is possible within the axiomatic structure on which probability theory is based. Unfortunately, the propagation of an evidence theory representation for uncertainty through a model is more computationally demanding than the propagation of a probabilistic representation for uncertainty, with this difficulty constituting a serious obstacle to the use of evidence theory in the representation of uncertainty in predictions obtained from computationally intensive models. This presentation describes and illustrates a sampling-based computational strategy for the representation of epistemic uncertainty in model predictions with evidence theory. Preliminary trials indicate that the presented strategy can be used to propagate uncertainty representations based on evidence theory in analysis situations where naive sampling-based (i.e., unsophisticated Monte Carlo) procedures are impracticable due to computational cost.
NTIS
Sampling; Monte Carlo Method; Costs

20070020245 Williams (Hovey), LLP, Kansas City, MO, USA
System and Method for Identifying, Reporting, and Evaluating Presence of Substance
Smith, M., Inventor; Lusby, M., Inventor; Van Hook, A., Inventor; Cook, C. J., Inventor; Wenski, E. G., Inventor; 26 Sep 03; 19 pp.; In English
Contract(s)/Grant(s): DE-AC04-01AL66850
Patent Info.: Filed Filed 26 Sep 03; US-Patent-Appl-SN-10-672 210
Report No.(s): PB2007-104280; No Copyright; Avail.: CASI: A03, Hardcopy

A system and method for identifying, reporting, and evaluating a presence of a solid, liquid, gas, or other substance of interest, particularly a dangerous, hazardous, or otherwise threatening chemical, biological, or radioactive substance. The system comprises one or more substantially automated, location self-aware remote sensing units; a control unit; and one or more data processing and storage servers. Data is collected by the remote sensing units and transmitted to the control unit; the control unit generates and uploads a report incorporating the data to the servers; and thereafter the report is available for review by a hierarchy of responsive and evaluative authorities via a wide area network. The evaluative authorities include a group of relevant experts who may be widely or even globally distributed.
NTIS
Identifying; Remote Sensing

20070020252 Shumaker and Sieffert, P.A., Saint Paul, MN, USA
Translator Database
Palmquist, R. D., Inventor; 15 Dec 04; 9 pp.; In English
Contract(s)/Grant(s): N00014-02-C-0122
Patent Info.: Filed Filed 15 Dec 04; US-Patent-Appl-SN-11-012 890
Report No.(s): PB2007-104277; No Copyright; Avail.: CASI: A02, Hardcopy

In one embodiment, the invention is directed to a system including a database that supports a plurality of client translation devices. Although each client translation device may operate as a stand-alone translator, each device may establish a communication with a server that can keep the client translation device up-to-date. The server is coupled to a database that supports the client translation devices by dynamically adding, subtracting and changing translation entries, thereby evolving as the language evolves. The server communicates one or more translation entries in the database to the client translation devices.
NTIS
Data Bases; Translating; Communication

20070020268 Tarolli Sundheim Covell and Tummino, LLP, Cleveland, OH, USA
Method and Means for Generating High Order Hermite Functions for Simulation of Electromagnetic Wave Devices
Shih, C. C., Inventor; 7 Mar 05; 10 pp.; In English
Contract(s)/Grant(s): F29601-C-0001
Patent Info.: Filed Filed 7 Mar 05; US-Patent-Appl-SN-11-074 455
Report No.(s): PB2007-101745; No Copyright; Avail.: CASI: A02, Hardcopy

A technique for generating very-high-order Hermite functions needed for accurately simulating operation of various

devices and structures involving propagation of electromagnetic waves. By using modified recursion formulas, the technique generates asymptotic Hermite functions, smooth Hermite functions or optimized smooth Hermite functions, allowing for very high orders of the functions to be generated without the intermediate function values becoming so large as to exceed the capacity of conventional computers. The disclosed method for generating smooth Hermite functions provides for generation of well-behaved functions of order 30,000 or higher.
NTIS
Patent Applications; Simulation

20070020361 Fenwick and West, LLP, Mountain View, CA, USA
Visualization and Processing of Multidimensional Data Using Prefiltering and Sorting Criteria
Yang, M. M., Inventor; Bylina, E. J., Inventor; Coleman, W. J., Inventor; Dilworth, M. R., Inventor; Robles, S. J., Inventor; 1 Oct 04; 32 pp.; In English
Contract(s)/Grant(s): R44GM5555470
Patent Info.: Filed Filed 1 Oct 04; US-Patent-Appl-SN-10-956 878
Report No.(s): PB2007-102421; No Copyright; Avail.: CASI: A03, Hardcopy

Complex multidimensional datasets generated by digital imaging spectroscopy can be organized and analyzed by applying software and computer-based methods comprising sorting algorithms. Combinations of these algorithms to images and graphical data, allow pixels or features to be rapidly and efficiently classified into meaningful groups according to defined criteria. Multiple rounds of pixel or feature selection may be performed based on independent sorting criteria. In one embodiment sorting by spectral criteria (e.g., intensity at a given wavelength) is combined with sorting by temporal criteria (e.g., absorbance at a given time) to identify microcolonies of recombinant organisms harboring mutated genes encoding enzymes having desirable kinetic attributes and substrate specificity. Restriction of the set of pixels analyzed in a subsequent sort based on criteria applied in an earlier sort ('sort and lock' analyses) minimize computational and storage resources. User-defined criteria can also be incorporated into the sorting process by means of a graphical user interface that comprises a visualization tools including a contour plot, a sorting bar and a grouping bar, an image window, and a plot window that allow run-time interactive identification of pixels or features meeting one or more criteria, and display of their associated spectral or kinetic data. These methods are useful for extracting information from imaging data in applications ranging from biology and medicine to remote sensing.
NTIS
Image Processing; Patent Applications

20070020494 Lawrence Livermore National Lab., Livermore, CA USA
Adaptive Mesh Refinement Algorithms for Parallel Unstructured Finite Element Codes
Parsons, I. D.; Solberg, J. M.; Feb. 07, 2006; 27 pp.; In English
Report No.(s): DE2007-899100; UCRL-TR-218661; No Copyright; Avail.: National Technical Information Service (NTIS)

This project produced algorithms for and software implementations of adaptive mesh refinement (AMR) methods for solving practical solid and thermal mechanics problems on multiprocessor parallel computers using unstructured finite element meshes. The overall goal is to provide computational solutions that are accurate to some prescribed tolerance, and adaptivity is the correct path toward this goal. These new tools will enable analysts to conduct more reliable simulations at reduced cost, both in terms of analyst and computer time. Previous academic research in the field of adaptive mesh refinement has produced a voluminous literature focused on error estimators and demonstration problems; relatively little progress has been made on producing efficient implementations suitable for large-scale problem solving on state-of-the-art computer systems. Research issues that were considered include: effective error estimators for nonlinear structural mechanics; local meshing at irregular geometric boundaries; and constructing efficient software for parallel computing environments.
NTIS
Algorithms; Finite Element Method; Grid Generation (Mathematics); Grid Refinement (Mathematics)

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.

20070019702 Naval Research Lab., Washington, DC USA
Extended Abstract: Organizing Automaton Specifications to Achieve Faithful Representation
Leonard, Elizabeth; Archer, Myla; Jan 2005; 3 pp.; In English
Report No.(s): AD-A465569; XB-NRL/MR/5540; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA465569

In using models for verification, an important question is how faithful a model is to the thing modeled. In 2002 and 2003, we specified two applications as automaton models: the TESLA multicast stream authentication protocol and a portion of the Security-Enhanced Linux (SELinux) operating system. Both models used a single reference variable to capture essentially all of the information about the actual state of the system. Additional state variables in the models were defined to provide access to some of the reference variable information in a form that made specifying system transitions and reasoning about the system easier. Having used the same organizational approach to advantage in defining automaton models for two different applications, we wondered if this approach would have benefits in other applications. We decided to specify the well-known IEEE 1394 leader election algorithm (Tree Identify Protocol) using this modeling technique to see if it would provide any benefit.
DTIC
Automation; Specifications; Computer Information Security

20070019773 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Effects of Fault Counting Methods on Fault Model Quality
Nikora, Allen P.; Munson, John C.; September 28, 2004; 10 pp.; In English; 28th International Computer Software adn Applications Conference (COMPSAC 2004), 9 Sep,. 2004, Hong Kong, China; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40026

In this paper, we describe three other fault-counting techniques and compare the models resulting from the application of two of those methods to the models obtained from the application of our proposed definition.
Author
Fracture Mechanics; Mathematical Models; Computer Programs; Systems Engineering; Counting

20070020328 NASA Johnson Space Center, Houston, TX, USA
Using EIGER for Antenna Design and Analysis
Champagne, Nathan J.; Khayat, Michael; Kennedy, Timothy F.; Fink, Patrick W.; May 8, 2007; 1 pp.; In English; Symposium for Space Applications of Wireless and RFID 2007, 8-9 May 2007, Houston, TX, USA; Copyright; Avail.: Other Sources; Abstract Only

EIGER (Electromagnetic Interactions GenERalized) is a frequency-domain electromagnetics software package that is built upon a flexible framework, designed using object-oriented techniques. The analysis methods used include moment method solutions of integral equations, finite element solutions of partial differential equations, and combinations thereof. The framework design permits new analysis techniques (boundary conditions, Green#s functions, etc.) to be added to the software suite with a sensible effort. The code has been designed to execute (in serial or parallel) on a wide variety of platforms from Intel-based PCs and Unix-based workstations. Recently, new potential integration schemes that avoid singularity extraction techniques have been added for integral equation analysis. These new integration schemes are required for facilitating the use of higher-order elements and basis functions. Higher-order elements are better able to model geometrical curvature using fewer elements than when using linear elements. Higher-order basis functions are beneficial for simulating structures with rapidly varying fields or currents. Results presented here will demonstrate current and future capabilities of EIGER with respect to analysis of installed antenna system performance in support of NASA#s mission of exploration. Examples include antenna coupling within an enclosed environment and antenna analysis on electrically large manned space vehicles.
Author
Electromagnetic Interactions; Antenna Design; Design Analysis; Object-Oriented Programming; Finite Element Method; Integral Equations; Boundary Conditions

62
COMPUTER SYSTEMS

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

20070019699 Naval Research Lab., Washington, DC USA
A Formal Language for Cryptographic Protocol Requirements
Syverson, Paul; Meadows, Catherine; Jan 1996; 31 pp.; In English
Report No.(s): AD-A465327; XB-NRL/MR/5540; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA465327

In this paper we present a formal language for specifying and reasoning about cryptographic protocol requirements. We give sets of requirements for key distribution protocols and for key agreement protocols in that language. We look at a key agreement protocol due to Aziz and Diffe that might meet those requirements and show how to specify it in the language of the NRL Protocol Analyzer. We also show how to map our formal requirements to the language of the NRL Protocol Analyzer and use the Analyzer to show that the protocol meets those requirements. In other words, we use the Analyzer to assess the validity of the formulae that make up the requirements in models of the protocol. Our analysis reveals an implicit assumption about implementations of the protocol and reveals subtleties in the kinds of requirements one might specify for similar protocols.
DTIC
Cryptography; Protocol (Computers); Language Programming; Computer Systems Programs

20070019701 Naval Research Lab., Washington, DC USA
Language Generation and Verification in the NRL Protocol Analyzer
Meadows, Catherine; Jan 1996; 15 pp.; In English
Report No.(s): AD-A465477; XB-NRL/MR/5540; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465477

The NRL Protocol Analyzer is a tool for proving security properties of cryptographic protocols, and for finding flaws if they exist. It is used by having the user first prove a number of lemmas stating that infinite classes of states are unreachable, and then performing an exhaustive search on the remaining state space. One main source of difficulty in using the tool is in generating the lemmas that are to be proved. In this paper we show how we have made the task easier by automating the generation of lemmas involving the use of formal languages.
DTIC
Protocol (Computers); Analyzers; Program Verification (Computers); Languages

20070020523 BAE Systems, Manassas, VA, USA, NASA Langley Research Center, Hampton, VA, USA
Organization's Orderly Interest Exploration: Inception, Development and Insights of AIAA's Topics Database
Marshall, Jospeh R.; Morris, Allan T.; May 07, 2007; 20 pp.; In English; 2007 Infotech\@Aerospace Conference and Exhibit, 7-10 May 2007, Rohnert Park, CA, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2007-2936; Copyright; Avail.: CASI: A03, Hardcopy

Since 2003, AIAA's Computer Systems and Software Systems Technical Committees (TCs) have developed a database that aids technical committee management to map technical topics to their members. This Topics/Interest (T/I) database grew out of a collection of charts and spreadsheets maintained by the TCs. Since its inception, the tool has evolved into a multi-dimensional database whose dimensions include the importance, interest and expertise of TC members and whether or not a member and/or a TC is actively involved with the topic. In 2005, the database was expanded to include the TCs in AIAA s Information Systems Group and then expanded further to include all AIAA TCs. It was field tested at an AIAA Technical Activities Committee (TAC) Workshop in early 2006 through live access by over 80 users. Through the use of the topics database, TC and program committee (PC) members can accomplish relevant tasks such as: to identify topic experts (for Aerospace America articles or external contacts), to determine the interest of its members, to identify overlapping topics between diverse TCs and PCs, to guide new member drives and to reveal emerging topics. This paper will describe the origins, inception, initial development, field test and current version of the tool as well as elucidate the benefits and insights gained by using the database to aid the management of various TC functions. Suggestions will be provided to guide future

development of the database for the purpose of providing dynamics and system level benefits to AIAA that currently do not exist in any technical organization.
Author
Data Bases; Computer Systems Programs; Software Engineering; Avionics; Aerospace Sciences

63
CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

20070019694 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Intelligent Vision Systems Independent Research and Development (IR&D) 2006
Patrick, Clinton; Chavis, Katherine; October 2006; 5 pp.; In English; 2007 IEEE Aerospace Conference, 3-10 Mar. 2007, Big Sky, MT, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070019694

This report summarizes results in conduct of research sponsored by the 2006 Independent Research and Development (IR&D) program at Marshall Space Flight Center (MSFC) at Redstone Arsenal, Alabama. The focus of this IR&D is neural network (NN) technology provided by Imagination Engines, Incorporated (IEI) of St. Louis, Missouri. The technology already has many commercial, military, and governmental applications, and a rapidly growing list of other potential spin-offs. The goal for this IR&D is implementation and demonstration of the technology for autonomous robotic operations, first in software and ultimately in one or more hardware realizations. Testing is targeted specifically to the MSFC Flat Floor, but may also include other robotic platforms at MSFC, as time and funds permit. For the purpose of this report, the NN technology will be referred to by IEI's designation for a subset configuration of its patented technology suite: Self-Training Autonomous Neural Network Object (STANNO).
Author
Autonomy; Research and Development; Robotics; Neural Nets; Systems Engineering; Artificial Intelligence

20070019849 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
From Prime to Extended Mission: Evolution of the MER Tactical Uplink Process
Michkin, Andrew H.; Laubach, Sharon; June 19, 2006; 12 pp.; In English; AIAA 9th International Conference on Spacecraft Operations (SpaceOps), 16-24 Jun. 2006, Rome, Ivory Coast; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39916

To support a 90-day surface mission for two robotic rovers, the Mars Exploration Rover mission designed and implemented an intensive tactical operations process, enabling daily commanding of each rover. Using a combination of new processes, custom software tools, a Mars-time staffing schedule, and seven-day-a-week operations, the MER team was able to compress the traditional weeks-long command-turnaround for a deep space robotic mission to about 18 hours. However, there was never an intention of maintaining the pace of this process indefinitely. Even before the end of the three-month prime mission, MER operations began evolving towards greater sustainability. A combination of continued software tool development, increasing team experience, and availability of reusable sequences first reduced the mean process duration to approximately 11 hours. The number of workshifts required to perform the process dropped, and the team returned to a modified 'Earth-time' schedule. Additional process and tool adaptation eventually provided the option of planning multiple Martian days of activity within a single workshift, making 5- day-a-week operations possible. The vast majority of the science team returned to their home institutions, continuing to participate fully in the tactical operations process remotely. MER has continued to operate for over two Earth-years as many of its key personnel have moved on to other projects, the operations team and budget have shrunk, and the rovers have begun to exhibit symptoms of aging.
Author
Mars Exploration; Roving Vehicles; Software Engineering; Computer Programming; Deep Space; Schedules; Sequencing; Robotics

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20070019774 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Clustering with Missing Values: No Imputation Required
Wagstaff, Kiri; July 15, 2004; 10 pp.; In English; International Federation of Classification Societies Annual Meeting, 15-18 Jul. 2004, Chicago, IL, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NSF IIS-03-25329; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40024

Clustering algorithms can identify groups in large data sets, such as star catalogs and hyperspectral images. In general, clustering methods cannot analyze items that have missing data values. Common solutions either fill in the missing values (imputation) or ignore the missing data (marginalization). Imputed values are treated as just as reliable as the truly observed data, but they are only as good as the assumptions used to create them. In contrast, we present a method for encoding partially observed features as a set of supplemental soft constraints and introduce the KSC algorithm, which incorporates constraints into the clustering process. In experiments on artificial data and data from the Sloan Digital Sky Survey, we show that soft constraints are an effective way to enable clustering with missing values.
Author
Algorithms; Cluster Analysis; Multisensor Fusion; Constraints

65
STATISTICS AND PROBABILITY

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

20070020403 National Center for Health Statistics, Hyattsville, MD, USA
Detailed Linked Birth/Infant Death Period Public Use File for 2003 (Raw data on CD-ROM)
January 2003; In English
Report No.(s): PB2007-500032; No Copyright; Avail.: National Technical Information Service (NTIS)

The linked birth/infant death data set (linked file) is released in two formats: period data and birth cohort data. The data in this product is for the 2003 period linked file. Beginning with 1995 data, the period linked files have formed the basis for all official NCHS linked file statistics. Differences between period and birth cohort data are outlined as follows: (1) Period data - The numerator for the 2003 period linked file consists of all infant deaths occurring in 2003 linked to their corresponding birth certificates, whether the birth occurred in 2002 or 2003. The denominator file for this data set is the 2003 natality file, that is, all births occurring in 2003. NCHS accepted late filed birth certificates to be used specifically for the 2003 linked file. This reduced the number of unlinked records and increased the number of births in the denominator file; and (2) Birth cohort data - The numerator for the 2002 birth cohort linked file consists of deaths to infants born in 2002 whether the death occurred in 2002 or 2003. The denominator file is the 2002 natality file, that is, all births occurring in 2002. The 2003 period linked birth/infant death data set includes several data files. The first file includes all U.S. infant deaths which occurred in the 2003 data year linked to their corresponding birth certificates, whether the birth occurred in 2002 or in 2003 (referred to as the numerator file). The second file contains information from the death certificate for all U.S. infant death records which could not be linked to their corresponding birth certificates (referred to as the unlinked death file). The third file is the 2003 NCHS natality file for the U.S. (plus late filed records mentioned above), which is used to provide denominators for rate computations. These same three data files are also available for Puerto Rico, the Virgin Islands, and Guam.
NTIS
Birth; CD-ROM; Death; Health; Mortality

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20070019700 Baker (Wilfred) Engineering, Inc., San Antonio, TX USA

PVS Strategies for Proving Abstraction Properties of Automata

Mitra, Sayan; Archer, Myla; Jan 2005; 22 pp.; In English

Report No.(s): AD-A465352; XB-NRL/MR/5540; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA465352

Abstractions are important in specifying and proving properties of complex systems. To prove that a given automaton implements an abstract specification automaton, one must first find the correct abstraction relation between the states of the automata, and then show that this relation is preserved by all corresponding action sequences of the two automata. This paper describes tool support based on the PVS theorem prover that can help users accomplish the second task, in other words, in proving a candidate abstraction relation correct. This tool support relies on a clean and uniform technique for defining abstraction properties relating automata that uses library theories for defining abstraction relations and templates for specifying automata and abstraction theorems. The paper then describes how the templates and theories allow development of generic, high level PVS strategies that aid in the mechanization of abstraction proofs. These strategies first set up the standard subgoals for the abstraction proofs and then execute the standard initial proof steps for these subgoals, thus making the process of proving abstraction properties in PVS more automated. With suitable supplementary strategies to implement the natural proof steps needed to complete the proofs of any of the standard subgoals remaining to be proved, the abstraction proof strategies can form part of a set of mechanized proof steps that can be used interactively to translate high level proof sketches into PVS proofs. Using timed I/O automata examples taken from the literature, this paper illustrates use of the templates, theories, and strategies described to specify and prove two types of abstraction property: refinement and forward simulation.

DTIC

Automata Theory; Program Verification (Computers)

20070020015 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Fusing Quantitative Requirements Analysis with Model-based Systems Engineering

Cornford, Steven L.; Feather, Martin S.; Heron, Vance A.; Jenkins, J. Steven; September 11, 2006; 6 pp.; In English; 14th IEEE International Requirements Engineering Conference, 11-15 Sep. 2006, Saint Paul, MN, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39905

A vision is presented for fusing quantitative requirements analysis with model-based systems engineering. This vision draws upon and combines emergent themes in the engineering milieu. 'Requirements engineering' provides means to explicitly represent requirements (both functional and non-functional) as constraints and preferences on acceptable solutions, and emphasizes early-lifecycle review, analysis and verification of design and development plans. 'Design by shopping' emphasizes revealing the space of options available from which to choose (without presuming that all selection criteria have previously been elicited), and provides means to make understandable the range of choices and their ramifications. 'Model-based engineering' emphasizes the goal of utilizing a formal representation of all aspects of system design, from development through operations, and provides powerful tool suites that support the practical application of these principles. A first step prototype towards this vision is described, embodying the key capabilities. Illustrations, implications, further challenges and opportunities are outlined.

Author

Systems Engineering; Optimization; Quantitative Analysis; Proving

70
PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics*, or *92 Solar Physics*.

20070019800 Brookhaven National Lab., Upton, NY, USA, Brookhaven National Lab., Upton, NY, USA, Purdue Univ., Hammond, IN, USA

Heavy Quarks at RHIC from Parton Transport Theory

Molnar, D.; Jan. 01, 2007; 8 pp.; In English

Contract(s)/Grant(s): DE-AC02-98CH10886

Report No.(s): DE2007-897802; BNL-77386-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

There are several indications that an opaque partonic medium is created in energetic Au+Au collisions ((radical)s(sub NN) (approx) GeV/nucleon) at the Relativistic Heavy Ion Collider (RHIC). At the extreme densities of (approx) 10-100 times normal nuclear density reached even heavy-flavor hadrons are affected significantly. Heavy-quark observables are presented from the parton transport model MPC, focusing on the nuclear suppression pattern, azimuthal anisotropy ('elliptic flow'), and azimuthal correlations. Comparison with Au + Au data at top RHIC energy (radical)s(sub NN) = 200 GeV indicates significant heavy quark rescattering, corresponding roughly five times higher opacities than estimates based on leading-order perturbative QCD. We propose measurements of charm-anticharm, e.g., D-meson azimuthal correlations as a sensitive, independent probe to corroborate these findings.

NTIS

Heavy Ions; Partons; Quarks; Transport Theory

20070019802 Fermi National Accelerator Lab., Batavia, IL, USA

Progress on a Cryogenically Cooled RF Gun Polarized Electron Source

Fliller, R. P.; Edwards, H.; January 2006; 3 pp.; In English

Report No.(s): DE2007-897047; FERMILAB-CONF-06-273-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

RF guns have proven useful in multiple accelerator applications. An RF gun capable of producing polarized electrons is an attractive electron source for the ILC or an electron-ion collider. Producing such a gun has proven elusive. The NEA GaAs photocathode needed for polarized electron production is damaged by the vacuum environment in an RF gun. Electron and ion back bombardment can also damage the cathode. These problems must be mitigated before producing an RF gun polarized electron source. In this paper we report continuing efforts to improve the vacuum environment in a normal conducting RF gun by cooling it with liquid nitrogen after a high temperature vacuum bake out. We also report on a design of a cathode preparation chamber to produce bulk GaAs photocathodes for testing in such a gun. Future directions are also discussed.

NTIS

Cathodes; Electron Sources; Radio Frequencies; Electron Guns

20070019803 Fermi National Accelerator Lab., Batavia, IL, USA, Michigan Univ., Ann Arbor, MI, USA

B-Tagging at CDF and DO Lesson for LHC

Wright, T.; January 2006; 6 pp.; In English

Report No.(s): DE2007-897048; FERMILAB-CONF-06-313-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The identification of jets resulting from the fragmentation and hadronization of b quarks is an important part of high-p(sub T) collider physics. The methods used by the CDF and D0 collaborations to perform this identification are described, including the calibration of the efficiencies and fake rates. Some thoughts on the application of these methods in the LHC environment are also presented.

NTIS

Marking; Quarks; Fragmentation; Flavor (Particle Physics)

20070019805 Fermi National Accelerator Lab., Batavia, IL, USA
Study of 2-in-1 Large-Aperture Nb3Sn IR Quadrupoles for the LHC Luminosity Upgrade
Kashikhin, V. V.; Zlobin, A. V.; Jun. 01, 2006; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2007-897051; FERMILAB-CONF-06-195-TD; No Copyright; Avail.: National Technical Information Service (NTIS)

Double-aperture Nb(sub 3)Sn quadrupoles with asymmetric coils and with cold and warm iron yokes were studied for the dipole-first upgrade scenario of the LHC Interaction Regions (IR). This paper describes the magnet design concepts and discusses their performance parameters, including field gradient and field quality limitations.
NTIS
Apertures; Luminosity; Quadrupoles

20070019806 Fermi National Accelerator Lab., Batavia, IL, USA
Fundamental Channeling Questions at Ultra Relativistic Energies
Carigan, R. A.; January 2006; 11 pp.; In English
Report No.(s): DE2007-897052; FERMILAB-CONF-06-310-AD; No Copyright; Avail.: Department of Energy Information Bridge

TeV-range bent crystal channeling has interesting advantages for several applications at high energy accelerators. Observations of enhanced deflection over the whole arc of a bent crystal at RHIC and recently at the Tevatron may be due to a process called 'volume reflection'. More investigations of volume reflection and of the complimentary process, volume capture, are needed. So-called quasimosaic bending processes also deserve additional study. Negative particle channeling may be relevant to channeling collimation for electron machines. Electron and positron channeling and channeling radiation are interwoven so that the impact of channeling radiation on applications needs to be better understood. Beams in the 0.1 to 1 GeV range may be useful for some of these investigations. Finally there has been little or no study of positive and negative muon channeling. The current understanding of these topics and the desirability of further work is reviewed.
NTIS
Crystals; Relativistic Particles

20070019809 Brookhaven National Lab., Upton, NY USA
Future Science at the Relativistic Heavy Ion Collider
Ludlam, T.; Dec. 21, 2006; 66 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2007-897801; BNL-77334-2006-IR; No Copyright; Avail.: National Technical Information Service (NTIS)

QCD was developed in the 1970's as a theory of the strong interaction describing the confinement of quarks in hadrons. An early consequence of this picture was the realization that at sufficiently high temperature, or energy density, the confining forces are overcome by color screening effects, resulting in a transition from hadronic matter to a new state--later named the Quark Gluon Plasma--whose bulk dynamical properties are determined by the quark and gluon degrees of freedom, rather than those of confined hadrons. The suggestion that this phase transition in a fundamental theory of nature might occur in the hot, dense nuclear matter created in heavy ion collisions triggered a series of experimental searches during the past two decades at CERN and at BNL, with successively higher-energy nuclear collisions. This has culminated in the present RHIC program. In their first five years of operation, the RHIC experiments have identified a new form of thermalized matter formed in Au+Au collisions at energy densities more than 100 times that of a cold atomic nucleus. Measurements and comparison with relativistic hydrodynamic models indicate that the matter thermalizes in an unexpectedly short time (less than 1 fm/c) , has an energy density at least 15 times larger than needed for color deconfinement, has a temperature about 2 times the critical temperature of (approx)170 MeV predicted by lattice QCD, and appears to exhibit collective motion with ideal hydrodynamic properties--a 'perfect liquid' that appears to flow with a near-zero viscosity to entropy ratio - lower than any previously observed fluid and perhaps close to a universal lower bound. There are also indications that the new form of matter directly involves quarks. Comparison of measured relative hadron abundances with very successful statistical models indicates that hadrons chemically decouple at a temperature of 160-170 MeV. There is evidence suggesting that this happens very close to the quark-hadron phase transition, ie. that hadrons are born in the phase transition from quark matter, and abundance-changing interactions then quickly cease. Valence quark number scaling of the measured anisotropy parameter for all hadrons suggests that the collectively flowing matter involves quarks, not hadrons. And the striking observation of a universal, strong enhancement of baryons relative to mesons at intermediate transverse momentum has been interpreted as evidence of

competition between quark coalescence of the bulk medium and jet fragmentation. It is generally agreed that the new matter is not describable in terms of ordinary color neutral hadrons, and that many observations are consistent with models that incorporate quark and gluon degrees of freedom. The evidence is consistent with the matter being a strongly coupled quark gluon plasma (sQGP), and thus it behaves quite differently from the perturbative QCD parton gas that was expected by most people prior to RHIC data. The extraordinary properties of this new state of matter demand further measurements to better understand its behavior, properties, origin and description.
NTIS
Hadrons; Heavy Ions; Quantum Chromodynamics

20070019812 Department of Energy, Washington, DC, USA, Department of Energy, Washington, DC, USA
Basic Research Needs for Superconductivity. Report of the Basic Energy Sciences Workshop on Superconductivity, May 8-11, 2006
Sarrao, J.; Kwok, W. K.; Bozovic, E.; Mazin, I.; Lellogg, G.; May 11, 2006; 250 pp.; In English
Report No.(s): DE2007-899129; DOE/SC/BES-0603; No Copyright; Avail.: National Technical Information Service (NTIS)

As an energy carrier, electricity has no rival with regard to its environmental cleanliness, flexibility in interfacing with multiple production sources and end uses, and efficiency of delivery. In fact, the electric power grid was named the greatest engineering achievement of the 20th century by the National Academy of Engineering. This grid, a technological marvel ingeniously knitted together from local networks growing out from cities and rural centers, may be the biggest and most complex artificial system ever built. However, the growing demand for electricity will soon challenge the grid beyond its capability, compromising its reliability through voltage fluctuations that crash digital electronics, brownouts that disable industrial processes and harm electrical equipment, and power failures like the North American blackout in 2003 and subsequent blackouts in London, Scandinavia, and Italy in the same year. The North American blackout affected 50 million people and caused approximately $6 billion in economic damage over the four days of its duration. Superconductivity offers powerful new opportunities for restoring the reliability of the power grid and increasing its capacity and efficiency. Superconductors are capable of carrying current without loss, making the parts of the grid they replace dramatically more efficient. Superconducting wires carry up to five times the current carried by copper wires that have the same cross section, thereby providing ample capacity for future expansion while requiring no increase in the number of overhead access lines or underground conduits. Their use is especially attractive in urban areas, where replacing copper with superconductors in power-saturated underground conduits avoids expensive new underground construction. Superconducting transformers cut the volume, weight, and losses of conventional transformers by a factor of two and do not require the contaminating and flammable transformer oils that violate urban safety codes. Unlike traditional grid technology, superconducting fault current limiters are smart. They increase their resistance abruptly in response to overcurrents from faults in the system, thus limiting the overcurrents and protecting the grid from damage.
NTIS
Research; Superconductivity

20070019818 Fermi National Accelerator Lab., Batavia, IL, USA
Design of 325MHz Single and Triple Spoke Resonators at FNAL
Lanfranco, G.; Apollinari, G.; Gonin, I.; Khabiboulline, T.; McConologue, F.; January 2006; 3 pp.; In English
Report No.(s): DE2007-897053; FERMILAB-CONF-06-307-TD; No Copyright; Avail.: National Technical Information Service (NTIS)

The proposed 8-GeV driver at FNAL is based on approximately 400 independently phased SC resonators. In this paper the design of 325 MHz Spoke Resonators, two single spoke resonators ((beta)=0.22 and (beta)=0.4) and a triple spoke resonator ((beta)=0.62), for the High Intensity Neutrino Source (HINS) front end is presented. We describe the optimization of the spoke resonators geometry, the goal being to minimize the E(sub peak)/E(sub acc) and B(sub peak)/E(sub acc) ratios. We report on the coupled ANSYS-MWS analysis on the resonators mechanical properties and power coupler RF design. The current status of mechanical design, slow tuning mechanism and cryostat are also presented.
NTIS
Cryostats; Resonators; Mechanical Engineering; Mechanical Properties

20070019821 Fermi National Accelerator Lab., Batavia, IL, USA, Pacific Northwest National Lab., Richland, WA, USA
Photoinjectors R&D For Future Light Sources & Linear Colliders
Piot, P.; January 2006; 5 pp.; In English
Report No.(s): DE2007-897054; FERMILAB-06-305-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Linac-driven light sources and proposed linear colliders require high brightness electron beams. In addition to the small emittances and high peak currents, linear colliders also require spin-polarization and possibly the generation of asymmetric beam in the two transverse degrees of freedom. Other applications (e.g., high-average-power free-electron lasers) call for high duty cycle and/or (e.g., electron cooling) angular-momentum-dominated electron beams. We review ongoing R&D programs aiming at the production of electron beams satisfying these various requirements. We especially discuss R&D on photoemission electron sources (with focus on radiofrequency guns) along with the possible use of emittance-manipulation techniques.
NTIS
Brightness; Electron Beams; Light Sources; Research and Development

20070019824 Brookhaven National Lab., Upton, NY, USA, Brookhaven National Lab., Upton, NY, USA
Unique Description for Single Transverse Spin Asymmetries in DIS and Hadronic Collisions
Yuan, F.; Dec. 01, 2006; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2007-897798; BNL-77354-2006-CP; No Copyright; Avail.: Department of Energy Information Bridge

We derive a unique formula for the single-transverse-spin asymmetry in semi-inclusive hadron production in deep inelastic scattering, valid for all transverse momentum region. Based on this, we further study the integrated asymmetry weighted with transverse-momentum. They can be evaluated in terms of the twist-three quark-gluon correlation functions, which are responsible for the single spin asymmetry in single inclusive hadron production in hadronic collisions. By using the fitted twist-three functions from the hadronic collision data, we find a consistent description for SSAs in deep inelastic scattering. This demonstrates that we have a unique picture for SSAs in these two processes, and shall provide important guidelines for future studies.
NTIS
Asymmetry; Collisions; Hadrons; Inelastic Scattering

20070019826 Brookhaven National Lab., Upton, NY, USA
Future of Spin Physics at BNL
Aronson, S.; Deshpande, A.; Jan. 01, 2007; 12 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2007-897800; BNL-77377-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The Relativistic Heavy Ion Collider (RHIC) at BNL is the world's only polarized proton-proton collider. Collisions at center-of-mass energies up to 500 GeV and beam polarizations approaching 70% (longitudinal or transverse) are provided to two experiments, STAR and PHENIX, at luminosities (ge) 10(sup 32)/cm(sup 2)/sec. Transverse polarized beam has also been provided to the BRAHMS experiment. Measurements that bear on the important question of the spin content of the nucleon are beginning to appear. Over the next 10 years, as the performance of polarized proton running at RHIC is further developed, the Spin Physics program at RHIC will provide definitive measurements of the contributions to the proton's spin of the gluon, the sea quarks and the orbital motion of the partons in the proton's wave function. We plan to extend the reach of our study of the role of spin in QCD with the development of 'eRHIC', which will provide polarized e-p collisions to a new detector.
NTIS
High Energy Interactions; Spin

20070019843 Lawrence Livermore National Lab., Livermore, CA USA
Particle and Energy Transport in the SOL and DIII-D and NSTX
Boedo, J. A.; Maqueda, R. J.; January 2006; 10 pp.; In English
Report No.(s): DE2007-897947; No Copyright; Avail.: National Technical Information Service (NTIS)

The far scrape-off layer (SOL) radial transport and plasma-wall contact is mediated by intermittent and ELM-driven transport. Experiments to characterize the intermittent transport and ELMs have been performed in both DIII-D and NSTX under similar conditions. Both intermittent transport and ELMs are comprised of filaments of hot, dense plasma (n(sub e)

(approx) 1 x 10(sup 13) cm(sup -3), T(sub e) (approx) 400 eV) originating at the edge, transport both particles and heat into the SOL by convection, increasing wall interaction and causing sputtering and impurity release. Both intermittent filaments and ELMs leave the pedestal region at speeds of (approx)0.5-3 km/s, losing heat and particles by parallel transport as they travel through the SOL. The intermittency shows many similarities in NSTX and DIII-D, featuring similar size (2-5 cm), large convective radial velocity, 'holes' inside and peaks outside the LCFS which quickly decay and slow down with radius. Whereas in DIII-D the intermittency decays in both intensity and frequency in H-mode, it chiefly decays in frequency in NSTX. In the low collisionality (v* = (pi)R(sub q(sub 95))/(lambda)(sub c)) (v* (approx) 0.1, N(sub G) (approx) 0.3) case, the ELMs impact the walls quite directly and account for (approx)90% of the wall particle flux, decreasing to (approx)30% at (v* (approx) 1.0, N(sub G) \g 0.6).
NTIS
Energy Transfer; Particle Energy; Tokamak Devices

20070019863 Lawrence Livermore National Lab., Livermore, CA USA
Results from the CDX-U Lithium Wall and NSTX Lithium Pallet Injection and Evaporation Experiments
Majeski, R.; Kugel, H.; Bell, M. G.; Bell, R. E.; Beiersdorfer, P.; January 2006; 10 pp.; In English
Report No.(s): DE2007-897942; UCRL-CONF-225210; No Copyright; Avail.: National Technical Information Service (NTIS)

CDX-U has been operated with the vacuum vessel wall and limiter surfaces nearly completely coated with lithium, producing dramatic improvements to plasma performance. Discharges achieved global energy confinement times up to 6 ms, exceeding previous CDX-U results by a factor of 5, and ITER98P(y,1) scaling by 2-3. Lithium wall coatings up to 1000 (angstrom) thick were applied between discharges by electron-beam-induced evaporation of a lithium-filled limiter and vapor deposition from a resistively heated oven. The e-beam power was modest (1.6 kW) but it produced up to 60 MW/m(sup 2) power density in a 0.3 cm(sup 2) spot; the duration was up to 300 s. Convective transport of heat away from the beam spot was so effective that the entire lithium inventory (140 g) was heated to evaporation (400-500 C) and there was no observable hot spot on the lithium surface within the beam footprint. These results are promising for use of lithium plasma-facing components in reactor scale devices. Lithium coating has also been applied to NSTX carbon plasma-facing surfaces, to control the density rise during long-duration H-modes for non-inductive current sustainment. First, lithium pellets were injected into sequences of Ohmically heated helium plasmas in both center stack limiter (CSL) and lower single-null divertor (LSND) configurations to deposit a total of 25-30 mg of lithium on the respective plasma contact areas. In both cases, the first subsequent L mode, deuterium discharge with NBI showed a reduction in the volume-average density by a factor (approx)3 compared to similar discharges before the lithium coating. Recently, a lithium evaporator was installed aimed toward the graphite tiles of the lower center stack and divertor. Twelve depositions, ranging from about 10 mg to 5 g of lithium, were performed. The effects on LSND L-mode, double-null divertor (DND) H-mode, and DND reversed-shear plasmas were variable but, immediately after coating, there were decreases in the density and significant increases in electron and ion temperature, neutron rate, confinement time, and edge flow velocity, and reductions in H-mode ELM frequency. For several days of operation after lithium coating, the ratio of oxygen to carbon emission was lower than with boronization.
NTIS
Evaporation; Injection; Lithium; Walls

20070019937 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, California Univ., Berkeley, CA, USA
Nanocrystals with Linear and Branched Topology
Alivisatos, A. P., Inventor; Milliron, D., Inventor; Manna, L., Inventor; Hughes, S. M., Inventor; 7 Jul 04; 19 pp.; In English
Contract(s)/Grant(s): DEACO376SF00098
Patent Info.: Filed Filed 7 Jul 04; US-Patent-Appl-SN-10-887 013
Report No.(s): PB2007-105316; No Copyright; Avail.: CASI: A03, Hardcopy

Disclosed herein are nanostructures comprising distinct dots and rods coupled through potential barriers of tuneable height and width, and arranged in three dimensional space at well defined angles and distances. Such control allows investigation of potential applications ranging from quantum information processing to artificial photosynthesis.
NTIS
Nanocrystals; Patent Applications; Topology

20070019948 Battelle Columbus Labs., OH USA
Fast Faraday Cup with High Band Width
Deibelg, C. E., Inventor; 26 Mar 04; 11 pp.; In English
Contract(s)/Grant(s): DEAC0500OR22725
Patent Info.: Filed Filed 26 Mar 04; US-Patent-Appl-SN-10-810 088
Report No.(s): PB2007-105309; No Copyright; Avail.: CASI: A03, Hardcopy

A circuit card stripline Fast Faraday cup quantitatively measures the picosecond time structure of a charged particle beam. The stripline configuration maintains signal integrity, and stitching of the stripline increases the bandwidth. A calibration procedure ensures the measurement of the absolute charge and time structure of the charged particle beam.
NTIS
Circuit Boards; Patent Applications; Faraday Effect

20070019951 Lawrence Livermore National Lab., Livermore, CA USA
DIII-D Studies of Massive Gas Injection Fast Shutdowns for Disruption Mitigation
Hollmann, E. M.; Jernigan, T. C.; Antar, G.; Bakhtiari, M.; Boedo, J. A.; Oct. 02, 2006; 10 pp.; In English
Report No.(s): DE2007-897961; UCRL-PROC-224897; No Copyright; Avail.: National Technical Information Service (NTIS)

Injection of massive quantities of gas is a promising technique for fast shutdown of ITER for the purpose of avoiding divertor and first wall damage from disruptions. Previous experiments using massive gas injection (MGI) to terminate discharges in the DIII-D tokamak have demonstrated rapid shutdown with reduced wall heating and halo currents (relative to natural disruptions) and with very small runaway electron (RE) generation (1). Figure 1 shows time traces which give an overview of shutdown time scales. Typically, of order 5 x 10(sup 22) Ar neutrals are fired over a pulse of 25 ms duration into stationary (non-disrupting) discharges. The observed results are consistent with the following scenario: within several ms of the jet trigger, sufficient Ar neutrals are delivered to the plasma to cause the edge temperature to collapse, initiating the inward propagation of a cold front. The exit flow of the jet (Fig. 1(a)) has a (approx) 9 ms rise time; so the quantity of neutrals which initiates the edge collapse is small (\h10(sup 20)). When the cold front reaches q (approx) 2 surface, global magnetohydrodynamic (MHD) modes are destabilized (2), mixing hot core plasma with edge impurities. Here, q is the safety factor. Most (\g90%) of the plasma thermal energy is lost via impurity radiation during this thermal quench (TQ) phase. Conducted heat loads to the wall are low because of the cold edge temperature. After the TQ, the plasma is very cold (of order several eV), so conducted wall (halo) currents are low, even if the current channel contacts the wall. The plasma current profile broadens and begins decaying resistively. The decaying current generates a toroidal electric field which can accelerate REs; however, RE beam formation appears to be limited in MGI shutdowns. Presently, it is thought that the conducted heat flux and halo current mitigation qualities of the MGI shutdown technique will scale well to a reactor-sized tokamak. However, because of the larger RE gain from avalanching and the presence of a RE seed population due to Compton scattered fast electrons, it is possible that a RE beam can be formed well into the CQ, after the flux surfaces initially destroyed by the TQ MHD have had time to heal. Crucial MGI issues to be studied in present devices are therefore the formation, amplification, and transport of RE and the transport of impurities into the core plasma (important because the presence of impurities can, via collisional drag, help suppress RE amplification). In the study of impurity transport, both neutral delivery (directly driven into the core by the jet pressure) and ion delivery (mixed into the core by MHD) are of interest, as both contribute to RE drag.
NTIS
Gas Injection; Shutdowns

20070019960 Lawrence Livermore National Lab., Livermore, CA USA
Results from the UCLA/FNPL Underdense Plasma Lens Experiment
Thompson, M. C.; Badakov, H.; Rosenzweig, J. B.; Travish, G.; Edwards, H.; Apr. 19, 2006; 11 pp.; In English
Report No.(s): DE2007-898000; UCRL-PROC-220699; No Copyright; Avail.: National Technical Information Service (NTIS)

A gaussian underdense plasma lens with peak density 5 x 10(sup 12) cm(sup -3) and a full width half maximum (FWHM) length of 2.2 cm has been used to focus a relativistic electron beam. This plasma lens is equivalent in strength to a quadrupole magnet with a 150 T/m field gradient. The lens focused a 15 MeV, 16 nC electron beam with initial dimensions (sigma)(sub x,y) (approx) 650 (micro)m and (sigma)(sub z) (approx) 6.5 mm onto an optical transition radiation (OTR) screen (approx)2 cm downstream of the lens. The average transverse area of the plasma focused electron beam was typically demagnified by a factor of 23. The evolution of the beam envelope in the area near the beam waist was measured for both round beams and

asymmetric beams with x:y aspect ratios as large as 1:5. The light from the OTR screen in the round beam case was also imaged into a streak camera in order to directly measure the correlation between z and (sigma)(sub r) within the beam.
NTIS
Lenses; Plasmas (Physics)

20070019965 Lawrence Livermore National Lab., Livermore, CA USA
Non-molecular Phases of HF and H2O Under Detonation-like Conditions
Fried, L. E.; Goodman, N.; Kuo, I. F. W.; Mundy, C. J.; Jul. 11, 2006; 12 pp.; In English
Report No.(s): DE2007-898005; UCRL-PROC-222768; No Copyright; Avail.: National Technical Information Service (NTIS)

Energetic materials are known to produce simple molecular species, such as HF and H(sub 2)O, during detonation. The behavior of such species under conditions of simultaneous high pressure and temperature are unknown. The predicted high pressure superionic phases of water and HF are investigated via ab initio molecular dynamics. We study water at densities of 2.0-3.0 g/cc (34 -115 GPa) along the 2000 K isotherm. We find that extremely rapid (superionic) diffusion of protons occurs in a fluid phase at pressures between 34 and 58 GPa. A transition to a stable body-centered cubic (bcc) O lattice with superionic proton conductivity is observed between 70 and 75 GPa. We find that all molecular species at pressures greater than 75 GPa are too short lived to be classified as bound states. Up to 95 GPa, we find a solid superionic phase characterized by covalent O-H bonding. Above 95 GPa, a transient network phase is found characterized by symmetric O-OH hydrogen bonding with nearly 50% covalent character. Ab initio molecular dynamics H simulations of HF were conducted at densities of 1.8-4.0 g/cc along the 900 K isotherm. According to our simulations, a unique form of (symmetric) hydrogen bonding could play a significant role in superionic conduction. Our work shows that the Chapman-Jouget and Zeldovich-von Neumann Doring (ZND) states of some energetic materials are close to the molecular to non-molecular transition.
NTIS
Detonation; Water

20070019968 Stanford Linear Accelerator Center, CA, USA, Warwick Univ., Coventry, UK
Looking for Exotica at the B Factories
Mohanty, G. B.; Jan. 22, 2007; 12 pp.; In English
Report No.(s): DE2007-898141; SLAC-PUB-12317; No Copyright; Avail.: National Technical Information Service (NTIS)

Current experiments at the B factories, designed to perform precision measurements of matter-antimatter asymmetry in the B meson system, have a much broader physics reach especially in the sector of quarkonium spectroscopy. Here we present a minireview on the new charmonium-like states observed at the B factories including the X(3872) and Y (4260).
NTIS
Antimatter; Asymmetry; Charm (Particle Physics); Matter (Physics)

20070019970 Stanford Linear Accelerator Center, CA, USA, London Univ., UK
Measurements of sin2Beta and cos2Beta from b -\g cc(bar)s Decays at BaBar
George, K. A.; Jan. 2007; 5 pp.; In English
Report No.(s): DE2007-898142; SLAC-PUB-12316; No Copyright; Avail.: Department of Energy Information Bridge

The Standard Model (SM) of particle physics describes charge conjugation-parity (CP) violation as a consequence of a complex phase in the three-generation Cabibbo-Kobayashi-Maskawa (CKM) quark-mixing matrix. In this framework, measurements of CP asymmetries in the proper-time distribution of neutral B decays to CP eigenstates containing a charmonium and K0 meson provide a direct measurement of sin2.
NTIS
Standard Model (Particle Physics); Charm (Particle Physics)

20070019971 Stanford Linear Accelerator Center, CA, USA
Start-to-end Beam Optics Development and Multi-Particle Tracking for the ILC Undulator-based Positron Source
Zhou, F.; Batygin, Y.; Nosochkov, Y.; Sheppard, J. C.; Woodley, M. D.; January 2006; 18 pp.; In English
Report No.(s): DE2007-898144; No Copyright; Avail.: National Technical Information Service (NTIS)

Undulator-based positron source is adopted as the ILC baseline design. Complete optics to transport the positron beam having large angular divergence and large energy spread from an immersed thin Ti target to the entrance of the 5 GeV damping ring injection line is developed. Start-to-end multi-particle tracking through the beamline is performed including the optical

matching device, capture system, transport system, superconducting booster linac, spin rotators, and energy compressor. It shows that 49.8% of the positrons from the target are captured within the damping ring 6-D acceptance + = 0.09 x y A A m and .E OE .z = (-25MeV)OE(-3.46cm) at the entrance of the damping ring injection line. The field and alignment errors and orbit correction are analyzed.
NTIS
Positrons; Optical Equipment; Linear Accelerators

20070019972 Stanford Linear Accelerator Center, CA, USA
Searches for D0 - Anti-D0 Mixing, Rare Charm and Tau Decays
Swan, S. K.; Jan. 2007; 4 pp.; In English
Report No.(s): DE2007-898145; SLAC-PUB-12321; No Copyright; Avail.: Department of Energy Information Bridge
The author discusses the results on D0-D0 mixing through hadronic as well as semi-leptonic charm decays, rare flavor-changing neutral currents in the charm sector and the lepton flavor violating t decaying to charged lighter leptons. The results from both BABAR and Belle are presented in this review.
NTIS
Hadrons; Charm (Particle Physics); Neutral Currents

20070019974 Stanford Linear Accelerator Center, CA, USA, British Columbia Univ., Vancouver, British Columbia, Canada
Rare B decays in Collider Experiments
Cuhadar-Doenzelmann, T.; Jan. 27, 2007; 3 pp.; In English
Report No.(s): DE2007-898156; SLAC-PUB-12325; No Copyright; Avail.: Department of Energy Information Bridge
The recent results on the semileptonic and leptonic rare B decays from the collider experiments are reviewed. Additionally, the recent measurements of lepton flavor violation in o decays are presented.
NTIS
Leptons; Particle Decay

20070019975 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Nucleon Structure and Generalized Parton Distributions
Voutier, E.; Jun. 2006; 11 pp.; In English
Report No.(s): DE2007-898316; JLAB-PHY-07-605; No Copyright; Avail.: Department of Energy Information Bridge
This paper discusses a selected part of the experimental program dedicated to the study of Generalized Parton Distributions, a recently introduced concept which provides a comprehensive framework for investigations of the partonic structure of the nucleon. Particular emphasis is put on the Deeply Virtual Compton Scattering program performed at the Jefferson Laboratory. The short and long term future of this program is also discussed in the context of the several experimental efforts aiming at a complete and exhaustive mapping of Generalized Parton Distributions.
NTIS
Nucleons; Partons

20070020043 Fermi National Accelerator Lab., Batavia, IL, USA, Argonne National Lab., IL USA
Linear Lattic Modeling of the Recycler Ring at FERMILAB
Xiao, M.; Valishev, A.; Nagaslaev, V. P.; Sajaev, V.; January 2006; 3 pp.; In English
Report No.(s): DE2007-897069; No Copyright; Avail.: National Technical Information Service (NTIS)
Substantial differences are found in tunes and beta functions between the existing linear model and the real storage ring. They result in difficulties when tuning the machine to new lattice conditions. We are trying to correct the errors by matching the model into the real machine using Orbit Response Matrix (ORM) Fit method. The challenges with ORM particularly in the Recycler ring and the results are presented in this paper.
NTIS
Storage Rings (Particle Accelerators); Linearity; Mathematical Models

20070020045 Fermi National Accelerator Lab., Batavia, IL, USA
Coherent Instabilities at the FNAL Booster
Lebedov, V.; Burov, A.; Pellico, W.; Yang, X.; January 2006; 6 pp.; In English
Report No.(s): DE2007-897070; FERMILAB-CONF-06-205-AD; No Copyright; Avail.: National Technical Information Service (NTIS)
This paper presents results of experimental and theoretical investigations of transverse beam stability at injection to

Fermilab Booster and discusses a novel scheme for transition crossing allowing to avoid the longitudinal emittance growth related to the transition. At reduced chromaticity a multibunch high order head-tail mode develops with growth time of 12 turns at fractional part of tune close to zero. An estimate of the growth rate based on known sources of impedance results in significantly smaller value and cannot explain observed instability growth rate.
NTIS
Stability; Coherent Radiation

20070020048 Fermi National Accelerator Lab., Batavia, IL, USA
Summary I: Accelerator Ion Sources, Fundamentals and Diagnostics
Moehs, D. P.; Oct. 01, 2006; 5 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2007-899354; FERMILAB-CONF-06-376-AD; No Copyright; Avail.: Department of Energy Information Bridge

The 11th International Symposium on the Production and Neutralization of Negative Ions and Beams was held in Santa Fe, New Mexico on September 12-15, 2006 and was hosted by Los Alamos National Laboratory. This summary covers the first three oral sessions of the symposium.
NTIS
Diagnosis; Ion Sources

20070020057 Fermi National Accelerator Lab., Batavia, IL, USA, National Lab. for High Energy Physics, Ibaraki, Japan
Induction Barrier RF and Applications in Main Injector
Chou, W.; Wildman, D.; Takagi, A.; January 2006; 6 pp.; In English
Report No.(s): DE2007-897072; FERMILAB-CONF-06-222; No Copyright; Avail.: National Technical Information Service (NTIS)

Two induction barrier rf systems have been designed and fabricated at Fermilab and installed in the Main Injector. They use the nanocrystal magnetic alloy called Finemet for the cavities and high voltage fast MOSFET switches for the modulators. Each system delivers (+-)10 kV square pulses at 90 kHz. They have been used for adiabatic beam stacking (beam compression), machine acceptance measurement and gap cleaning in the injection area for magnet protection, and will be tested for fast beam stacking for doubling the proton flux on the NuMI production target. The systems work reliably and cost much less than a resistive barrier rf system. Comparison with a similar system built at KEK reveals many similarities and also some important differences. This work is partially funded by the US-Japan collaborative agreement.
NTIS
Injectors; Radio Frequencies

20070020058 Fermi National Accelerator Lab., Batavia, IL, USA, National Lab. for High Energy Physics, Ibaraki, Japan, Stanford Linear Accelerator Center, USA
ILC Beam Delivery WG Summary: Optics, Collimation and Background
Angal-Kalimin, D.; Jackson, F.; Mokhov, N. V.; Kuroda, S.; Seryi, A. A.; Jul. 18, 2006; 11 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-897073; FERMILAB-CONF-06-230; No Copyright; Avail.: National Technical Information Service (NTIS)

The paper summarizes the work of the Beam Delivery working group (WG4) at Snowmass 2005 workshop, focusing on status of optics, layout, collimation and detector background. The strawman layout with two interaction regions was recommended at the first ILC workshop at KEK in November 2004. Two crossing-angle designs were included in this layout. The design of the ILC BDS has evolved since the first ILC workshop. The progress on the BDS design including the collimation system, and extraction line design have been reviewed and the design issues were discussed during the WG4 sessions at the Snowmass, and are described in this paper.
NTIS
Collimation; Optics; Accelerators

20070020059 Fermi National Accelerator Lab., Batavia, IL, USA, European Organization for Nuclear Research, Geneva, Switzerland

Closing Talk: QCD Moriond 2006

Ellis, R. K.; January 2006; 12 pp.; In English

Report No.(s): DE2007-897075; FERMILAB-CONF-06-222; CERN-PH-TH/2006-123; No Copyright; Avail.: National Technical Information Service (NTIS)

The author comments on some of the theoretical work presented at QCD Moriond, 2006.

NTIS

Quantum Chromodynamics; Mathematical Models

20070020060 Fermi National Accelerator Lab., Batavia, IL, USA, Santander Univ., Cantabria, Santander, Spain, Paris VI Univ., France

B Mixing and Lifetimes at the Tevatron

Gomez-Ceballos, G.; Peidra, J.; January 2006; 7 pp.; In English

Report No.(s): DE2007-897076; FERMILAB-CONF-06-178; No Copyright; Avail.: National Technical Information Service (NTIS)

The Tevatron collider at Fermilab provides a very rich environment for the study of b-hadrons. Both the D0 and CDF experiments have collected a sample of about 1 fb(sup -1). They report results on three topics: b-hadron lifetimes, polarization amplitudes and the decay width difference in B(sub s)(sup 0) (yields) J/(psi)(phi), and B(sub s)(sup 0) mixing.

NTIS

Particle Accelerators; Particle Decay

20070020062 Fermi National Accelerator Lab., Batavia, IL, USA, Chicago Univ., Chicago, IL USA, Argonne National Lab., IL USA

Photoinjector Production of a Flat Beam with Transverse Emittance Ratio of 100

Piot, P.; Sun, Y. E.; Kim, K. J.; January 2006; 3 pp.; In English

Report No.(s): DE2007-897055; FERMILAB-CONF-06-306-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

The generation of a flat electron beam directly from a photoinjector is an attractive alternative to the electron damping ring as envisioned for linear colliders. It also has potential applications to light sources such as the generation of ultrashort x-ray pulses or Smith-Purcell free electron lasers. In this paper, we report on the experimental generation of a flat beam with a measured transverse emittance ratio of 100 (+-) 20 for a bunch charge of (approx-equal) 0.5 nC. The experimental data, obtained at the Fermilab/NICADD Photoinjector Laboratory, are compared with numerical simulations and the expected scaling laws. Possible improvement of the experiment along with application for such a flat beams are discussed.

NTIS

Damping; Electron Beams; Emittance

20070020063 Fermi National Accelerator Lab., Batavia, IL, USA

Channeling Collimation Studies at the Fermilab Tevatron

Carrigan, R. A.; Drozhdin, A. I.; Filler, R. P.; Mokhov, N. V.; Shitltsev, V. D.; January 2006; 9 pp.; In English

Report No.(s): DE2007-897056; FERMILAB-CONF-06-309-AD; No Copyright; Avail.: Department of Energy Information Bridge

Bent crystal channeling has promising advantages for accelerator beam collimation at high energy hadron facilities such as the LHC. This significance has been amplified by several surprising developments including multi-pass channeling and the observation of enhanced deflections over the entire arc of a bent crystal. The second effect has been observed both at RHIC and recently at the Tevatron. Results are reported showing channeling collimation of the circulating proton beam halo at the Tevatron. Parenthetically, this study is the highest energy proton channeling experiment ever carried out. The study is continuing.

NTIS

Collimation; Collimators; Particle Accelerators

20070020064 Fermi National Accelerator Lab., Batavia, IL, USA, Lancaster Univ., UK
Wakefield Calculation for Superconducting TM(sub 110) Cavity Without Azimuthal Symmetry
Bellantoni, L.; Burt, G.; January 2006; 44 pp.; In English
Report No.(s): DE2007-897058; FERMILAB-TM-2356; No Copyright; Avail.: National Technical Information Service (NTIS)

The 3.9GHz TM(sub 110) mode deflecting cavity developed at FNAL has many applications, including use as a longitudinal bunch profile diagnostic, and as a crab cavity candidate for the ILC. These applications involve beams with substantial time structure. For the 13-cell version intended for the bunch profile application, long-range wakes have been evaluated in the frequency domain and short-range wakes have been evaluated in the time domain. Higher-order interactions of the main field in the cavity with the beam have also been parameterized. Pedagogic derivations are included as appendices.
NTIS
Azimuth; Cavities; Cavity Resonators; Superconductivity; Superconductors (Materials); Symmetry

20070020065 Fermi National Accelerator Lab., Batavia, IL, USA, Michigan Univ., Ann Arbor, MI, USA
Beam Intensity Upgrade at FERMILAB
Marchionni, A.; January 2006; 5 pp.; In English
Report No.(s): DE2007-897059; FERMILAB-CONF-06-225; No Copyright; Avail.: National Technical Information Service (NTIS)

The performance of the Fermilab proton accelerator complex is reviewed. The coming into operation of the NuMI neutrino line and the implementation of slip-stacking to increase the anti-proton production rate has pushed the total beam intensity in the Main Injector up to (approx) 3 x 10(sup 13) protons/pulse. A maximum beam power of 270 kW has been delivered on the NuMI target during the first year of operation. A plan is in place to increase it to 350 kW, in parallel with the operation of the Collider program. As more machines of the Fermilab complex become available with the termination of the Collider operation, a set of upgrades are being planned to reach first 700 kW and then 1.2 MW by reducing the Main Injector cycle time and by implementing proton stacking.
NTIS
Antiprotons; Injectors

20070020066 Fermi National Accelerator Lab., Batavia, IL, USA, Maryland Univ., College Park, MD, USA
W and Z Production at the Tevatron
Sanders, M. P.; January 2006; 6 pp.; In English
Report No.(s): DE2007-897060; FERMILAB-CONF-06-318; No Copyright; Avail.: National Technical Information Service (NTIS)

In this paper, recent experimental results on W and Z boson production at the Tevatron are described. These results not only provide tests of the standard model, but are also sensitive to proton parton distribution functions.
NTIS
Bosons; Particle Accelerators

20070020068 Fermi National Accelerator Lab., Batavia, IL, USA
Combination of CDF and D0 Results on the Mass of the Top Quark. August 2006. Volume 2
Aug. 11, 2006; 13 pp.; In English
Report No.(s): DE2007-897065; FERMILAB-TM-2355-E; No Copyright; Avail.: Department of Energy Information Bridge

We summarize the top-quark mass measurements from the CDF and D0 experiments at Fermilab. We combine published Run-I (1992-1996) measurements with the most recent preliminary Run-II (2001-present) measurements using up to 1 fb(sup -1) of data. Taking correlated uncertainties properly into account the resulting preliminary world average mass of the top quark is M(sub t) = 171.4 (+-) 1.2(stat) (+-) 1.8(syst) GeV/c(sup 2), which corresponds to a total uncertainty of 2.1 GeV/c(sup 2). The top-quark mass is now known with a precision of 1.2%.
NTIS
Quarks; Precision

20070020069 Fermi National Accelerator Lab., Batavia, IL, USA, Rockefeller Univ., New York, NY, USA
Jets at CDF
Gallinaro, M.; January 2006; 5 pp.; In English
Report No.(s): DE2007-897066; FERMILAB-CONF-06-271-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Recent jet results in p(bar p) collisions at (radical)s = 1.96 TeV from the CDF experiment at the Tevatron are presented. The jet inclusive cross section is compared to next-to-leading order QCD prediction in different rapidity regions. The b-jet inclusive cross section is measured exploiting the long lifetime and large mass of B-hadrons. Jet shapes, W+jets and W/Z+photon cross sections are also measured and compared to expectations from QCD production.
NTIS
Collisions; Hadrons; Shapes

20070020070 Fermi National Accelerator Lab., Batavia, IL, USA, Argonne National Lab., IL USA
Measurement and Correction of linear Optics an Coupling at Tevatron Complex
Lebedev, V.; Nagaslaev, V.; Valishev, A.; Sajaev, V.; January 2006; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-897077; FERMILB-CONF-06-206; No Copyright; Avail.: Department of Energy Information Bridge

The optics measurements have played important role in improving the performance of Tevatron collider. Until recently, most of them were based on the differential orbit measurements with data analysis, which neglects measurement inaccuracies such as differences in differential responses of beam position monitors, their rolls, etc. To address these complications we have used a method based on the analysis of many differential orbits. That creates the redundancy in the data allowing to get more detailed understanding of the machine. In this article we discuss the progress with Tevatron optics correction, its present status and future improvements.
NTIS
Particle Accelerators; Positrons

20070020071 Fermi National Accelerator Lab., Batavia, IL, USA
Modern Description of Semileptonic Meson Form Factors
Hill, R. J.; January 2006; 14 pp.; In English
Report No.(s): DE2007-897078; FERMILAB-CONF-06-155-T; No Copyright; Avail.: National Technical Information Service (NTIS)

The author describes recent advances in our understanding of the hadronic form factors governing semileptonic meson transitions. The resulting framework provides a systematic approach to the experimental data, as a means of extracting precision observables, testing nonperturbative field theory methods, and probing a poorly understood limit of QCD.
NTIS
Form Factors; Mesons

20070020072 Fermi National Accelerator Lab., Batavia, IL, USA, Northwestern Univ., Evanston, IL USA
DO Hot Topics
Buchholz, D.; January 2006; 6 pp.; In English
Report No.(s): DE2007-897079; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors present recent D0 results based on approximately 1 fb(sup -1) of p(bar p) collisions at (radical)s = 1.96 TeV recorded at the Fermilab Tevatron. Preliminary results on a search for the flavor changing neutral current process D(sup +) (yields) (pi)(sup +)(mu)(sup +)(mu)(sup -), a measurement of the Cp violation parameter in B mixing, (epsilon)(sub B), and a two sided limit on the B(sub s) oscillation frequency (Delta)m(sub s) are presented. The limits on (epsilon)(sub B) and (Beta)(D(sup +) (yields) (pi)(sup +)(mu)(sup +)(mu)(sup -)) are the world's best limits. The two sided bound on (Delta)m(sub s) is the first direct indication by a single experiment that (Delta)m(sub s) is bounded from above.
NTIS
Neutral Currents; Collisions; CP Violation

20070020073 Fermi National Accelerator Lab., Batavia, IL, USA

Superconducting Solenoid Magnet Test Results

Carcagno, R.; Dimarco, J.; Feher, S.; Ginsburg, C. M.; Hess, C.; January 2006; 4 pp.; In English

Report No.(s): DE2007-897046; FERMILAB-CONF-06-293; No Copyright; Avail.: Department of Energy Information Bridge

Superconducting solenoid magnets suitable for the room temperature front end of the Fermilab High Intensity Neutrino Source (formerly known as Proton Driver), an 8 GeV superconducting H- linac, have been designed and fabricated at Fermilab, and tested in the Fermilab Magnet Test Facility. We report here results of studies on the first model magnets in this program, including the mechanical properties during fabrication and testing in liquid helium at 4.2 K, quench performance, and magnetic field measurements. We also describe new test facility systems and instrumentation that have been developed to accomplish these tests.

NTIS

Helium; Magnetic Fields; Solenoids; Superconducting Magnets

20070020074 Fermi National Accelerator Lab., Batavia, IL, USA

Designing Focusing Solenoids for Superconducting RF Accelerators

Davis, G.; Kashikhin, V. V.; Page, T.; Terechkine, I.; Tompkins, J.; January 2006; 4 pp.; In English

Report No.(s): DE2007-897038; FERMILAB-CONF-06-290-TD; No Copyright; Avail.: Department of Energy Information Bridge

The design of a focusing solenoid for use in a superconducting RF linac requires resolving a range of problems with conflicting requirements. Providing the required focusing strength contradicts the goal of minimizing the stray field on the surfaces of adjacent superconducting RF cavities. The requirement of a compact solenoid, able to fit into a gap between cavities, contradicts the need of mechanical support necessary to restrain electromagnetic forces that can result in coil motion and subsequent quenching. In this report we will attempt to address these and other issues arising during the development of focusing solenoids. Some relevant test data will also be presented.

NTIS

Cavities; Radio Frequencies; Solenoids; Superconductivity

20070020077 Lawrence Livermore National Lab., Livermore, CA USA

Public Release of a One Dimensional Version of the Photon Clean Method (PCM1D)

Carpenter, M. H.; Oct. 18, 2006; 4 pp.; In English

Contract(s)/Grant(s): W-7405-ENG-48

Report No.(s): DE2007-894786; UCRL-SR-225370; No Copyright; Avail.: Department of Energy Information Bridge

The authors announce the public release of a one dimensional version of the Photon Clean Method (PCM1D). This code is in the general class of 'inverse Monte Carlo' methods and is specifically designed to interoperate with the public analysis tools available from the Chandra Science Center and the HEASARC. The tool produces models of event based data on a photon by photon basis. The instrument models are based on the standard ARF and RMF fits files. The resulting models have a high number of degrees of freedom of order the number of photons detected providing an alternative analysis compared to the usual method of fitting models with only a few parameters. The original work on this method is described in ADASS 1996 (Jernigan and Vezie).

NTIS

Photons; Monte Carlo Method

20070020078 Idaho Univ., Moscow, ID, USA

Coupling of Realistic Real Estimates with Genomics for Assessing Contaminant Attenuation and Long-Term Plume Containment

Crawford, R. L.; Dec. 13, 2006; 89 pp.; In English

Contract(s)/Grant(s): DE-FG07-02ER63500

Report No.(s): DE2007-896845; No Copyright; Avail.: National Technical Information Service (NTIS)

Coupling of Realistic Real Estimates with Genomics for Assessing Contaminant Attenuation and Long-Term Plume Containment.

NTIS

Containment; Contaminants; Estimates; Liquids; Plumes

20070020079 Fermi National Accelerator Lab., Batavia, IL, USA
Negative Hydrogen Ion Source Research and Beam Parameters for Accelerators
Zoilkin, T. V.; January 2006; 8 pp.; In English
Report No.(s): DE2007-897026; FERMILAB-TM-2360-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

H(sup -) beams are useful for multi-turn charge-exchange stripping injection into circular accelerators. Studies on a modified ion source for this purpose are presented. This paper includes some theory about a H(sup -) magnetron discharge, ion-electron emission, emittance and problems linked with emittance measurement and calculations. Investigated parameters of the emittance probe for optimal performance give a screen voltage of 150 V and a probe step of about 5 mil. Normalized 90% emittance obtained for this H(sup -) source is 0.22 (pi) mm-mr, for an extraction voltage of 18 kV at a beam energy of 30 keV and a beam current of 11 mA.
NTIS
Hydrogen Ions; Ion Sources; Negative Ions

20070020081 Fermi National Accelerator Lab., Batavia, IL, USA
Rare Decays of Heavy Flavor at the Tevatron
Krutelyov, V.; Oct. 31, 2006; 6 pp.; In English
Report No.(s): DE2007-897027; FERMILAB-CONF-06-348-E; No Copyright; Avail.: National Technical Information Service (NTIS)

In this report the author reviews recent results in the field of rare decays at the Tevatron CDF II and D0 experiments. The presentation is focused on rare decays of charm and bottom mesons with two muons in the final state. This includes improvements over the previously available limits on the following branching ratios: (Beta)(D(sup +) (yields) (pi)(sup +)(mu)(sup +) (mu)(sup -)) \h 4.7 x 10(sup -6), (Beta)(B(sub s)(sup 0) (yields) (phi)(mu)(sup +) (mu)(sup -)) \h 3.2 x 10(sup -6), (Beta)(B(sub s)(sup 0) (yields) (mu)(sup +)(mu)(sup -)) \h 1 x 10(sup -7), and (Beta)(B(sub d)(sup 0) (yields) (mu)(sup +)(mu)(sup -)) \h 3 x 10(sup -8) all at the 90% confidence level. Also reported are the first direct observation of D(sub s)(sup +) (yields) (phi)(pi)(sup +) (yields) (mu)(sup +)(mu)(sup -)(pi)(sup +) with a significance above background of over 7 standard deviations and evidence of D(sup +) (yields) (phi)(pi)(sup +) (yields) (mu)(sup +)(mu)(sup -)(pi)(sup +) with a significance of 3.1 and (Beta)(D(sup +) (yields) (phi)(pi)(sup +) (yields) (mu)(sup +)(mu)(sup -)(pi)(sup +)) = (1.75 (+-) 0.7 (+-) 0.5) x 10(sup -6).
NTIS
Mesons; Particle Accelerators

20070020082 Fermi National Accelerator Lab., Batavia, IL, USA, Istituto Nazionale di Fisica Nucleare, Pisa, Italy
CDF II Detector and Trigger for B Physics
Donati, S.; January 2006; 4 pp.; In English
Report No.(s): DE2007-897020; FERMILAB-CONF-06-351-E; No Copyright; Avail.: Department of Energy Information Bridge

In this paper the authors review the elements of the CDF detector and trigger most relevant for B physics analyses.
NTIS
Actuators; Detectors

20070020083 Bonn Univ., Germany
Measurement of the Mass of the Top Quark in Dilepton Final States with the DO-Detector
Brandt, O.; Sep. 2006; 118 pp.; In English
Report No.(s): DE2007-897028; No Copyright; Avail.: National Technical Information Service (NTIS)

In the Standard Model (SM) the top quark mass is a fundamental parameter. Its precise measurement is important to test the self-consistency of the SM. Additionally, it offers sensitivity to New Physics beyond the Standard Model. In proton anti-proton collisions at a centre-of-mass energy of (radical)s = 1.96 TeV t(bar t) quarks are pair-produced, each decaying into a W boson and a b quark. In the dilepton channel both W bosons decay leptonically. Because of the presence of two neutrinos in the final state the kinematics are underconstrained. A so-called Neutrino Weighting algorithm is used to calculate a weight for the consistency of a hypothesized top quark mass with the event kinematics. To render the problem solvable, the pseudorapidities of the neutrinos are assumed. The Maximum Method, which takes the maximum to the weight distribution

as input to infer the top quark mass, is applied to approximately 370 pb(sup -1) of Run-II data, recorded by the D0 experiment at the Tevatron. The e(mu)-channel of the 835 pb(sup -1) dataset is analyzed.
NTIS
Algorithms; Quarks

20070020084 Fermi National Accelerator Lab., Batavia, IL, USA, Argonne National Lab., IL USA, Northern Illinois Univ., De Kalb, IL, USA
Summary of Beam Quality Diagnostics and Control Working Group
Lewellen, J.; Piot, P.; January 2006; 12 pp.; In English
Report No.(s): DE2007-897021; FERMILAB-CONF-06-331-AD; No Copyright; Avail.: Department of Energy Information Bridge

The working group on beam quality, diagnostics, and control at the 12th Advanced Accelerator Concepts Workshop held a series of meetings during the Workshop. The generation of bright charged-particle beams (in particular electron and positron beams), along with state-of-the-art beam diagnostics and synchronization were discussed.
NTIS
Diagnosis; Quality Control

20070020085 Illinois Univ., Urbana, IL, USA, Duke Univ., Durham, NC, USA, Oxford Univ., Oxford, UK
Search for Excited and Exotic Muons at CDF
Gerberich, H.; Hays, C.; Kotwal, A.; January 2006; 3 pp.; In English
Report No.(s): DE2007-897022; No Copyright; Avail.: Department of Energy Information Bridge

The authors present a search for the production of excited or exotic muons ((mu)*) via the reaction (bar p) + p (yields) (mu)* + (mu) (yields) (mu)(gamma)+(mu) using 371 pb(sup -1) of data collected with the Run II CDF detector. In this signature-based search, we look for a resonance in the (mu)(gamma) mass spectrum. The data are compared to standard model and detector background expectations, and with predictions of excited muon production. We use these comparisons to set limits on the (mu)* mass and compositeness scale (Lambda) in contact interaction and gauge-mediated models.
NTIS
Muons; Measuring Instruments; Mass Spectra

20070020086 Fermi National Accelerator Lab., Batavia, IL, USA, Valencia Univ., Spain
Top Pair Production Cross Section at Square Root of s Equals 1.96 TEV and a Search V Plus A Current in Top Quark Decay
Carbrea, S.; Sep. 01, 2006; 5 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2007-897030; FERMILAB-CONF-06-356-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Possible effects from physics beyond the Standard Model have been investigated in top quark decays from a data sample enriched in t(bar t) events produced in p(bar p) collisions at (radical)s = 1.96 TeV with an integrated luminosity of approximately 700 pb(sup -1) and collected with the CDF II detector. The combined t(bar t) production cross section measurement 7.3 (+-) 0.9 pb agrees with the QCD NLO predictions: 6.7 (+-) 0.8 pb assuming m(sub top) = 175 GeV/c(sup 2). The fraction of the V + A current in top quark decay, f(sub V+A), is determined using the invariant mass of the charged lepton and the bottom quark jet in the decay chain t (yields) Wb (yields) (ell)(nu)b (where (ell) = e or (mu)). The measured value f(sub V+A) = - 0.06 (+-) 0.25 under the assumption m(sub top) = 175 GeV/c(sup 2) is in agreement with the Standard Model. They set an upper limit on f(sub V+A) of 0.29 at the 95% confidence level.
NTIS
Pair Production; Particle Decay; Quarks

20070020087 Fermi National Accelerator Lab., Batavia, IL, USA, Oxford Univ., Oxford, UK
W Boson Measurements at the Tevatron
Hays, C. P.; January 2006; 8 pp.; In English
Report No.(s): DE2007-897031; FERMILAB-CONF-06-358-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors present recent Tevatron Run II results from CDF and D0 on the production and decay properties of the W boson.

NTIS
Bosons; Particle Accelerators

20070020088 Fermi National Accelerator Lab., Batavia, IL, USA, Rockefeller Univ., New York, NY, USA
High Q(sup 2) QCD Physics at the Tevatron
Convery, M. E.; January 2006; 6 pp.; In English
Report No.(s): DE2007-897032; FERMILAB-CON-06-355-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Results in QCD physics at the Tevatron from the D0 and CDF collaborations are presented, including results in jet production, photon production, W/Z bosons plus jets, and heavy-flavor jets. The importance of these topics in tuning Monte-Carlo simulations, constraining the parton distribution functions, and measuring cross sections of QCD processes which contribute significant backgrounds to searches for new and important physics is discussed.

NTIS
Bosons; Particle Accelerators; Quantum Chromodynamics

20070020089 Fermi National Accelerator Lab., Batavia, IL, USA, Tsukuba Univ., Ibaraki, Japan
B Masses and Lifetimes at the Tevatron
Uozumi, S.; January 2006; 6 pp.; In English
Report No.(s): DE2007-897033; FERMILAB-CONF-06-349-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors review recent results of B(sup ++) masses, mass and lifetime of B(sub c)(sup +) meson, and lifetimes of B(sub s)(sup 0) and (Lambda)(sub b)(sup 0) hadrons from Tevatron Run II.

NTIS
Particle Accelerators; Elementary Particles

20070020090 Department of Energy, Washington, DC USA
Study of B(sub s) Mixing at the CDFII Experiment with a Newly Developed Opposite Side beta-Flavour Tagging Algorithm Using Kaons
January 2006; 182 pp.; In English
Report No.(s): DE2007-897034; No Copyright; Avail.: National Technical Information Service (NTIS)

This thesis describes the development, calibration and performance evaluation of an Opposite-side b flavor tagger using K mesons at a p(bar p) hadron collider. In particular, this work is performed using data collected by the Collider Detector at Fermilab (CDF) during the Run II of the Tevatron hadron collider running at (radical)s = 1.96 TeV. b flavor tagging consists of the determination of the flavor of the b quark contained within a hadron. This information is vital to perform any time-dependent measurement involving flavor asymmetries in b hadron decays and flavor oscillations, where it is necessary to know whether a b or (bar b) was contained in a hadron when it was produced. Although at a hadron collider the biggest challenge is probably to perform an effective selection of interesting events in real time and with the best signal-to-background ratio, the statistical significance of any time-dependent measurement is proportional to the effectiveness with which the selected data sample is tagged.

NTIS
Algorithms; Kaons; Marking; Quarks

20070020091 Fermi National Accelerator Lab., Batavia, IL, USA
Electrical Production Testing of the DO Silicon Microstrip Tracker Detector Modules
Mar. 28, 2006; 43 pp.; In English
Report No.(s): DE2007-897036; FERMILAB-TM-2348-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The D0 Silicon Microstrip Tracker (SMT) is the innermost system of the D0 detector in Run 2. It consists of 912 detector

units, corresponding to 5 different types of assemblies, which add up to a system with 792,576 readout channels. The task entrusted to the Production Testing group was to thoroughly debug, test and grade each detector module before its installation in the tracker. This note describes the production testing sequence and the procedures by which the detector modules were electrically tested and characterized at the various stages of their assembly.
NTIS
Modules; Particle Accelerators; Semiconductors (Materials); Silicon

20070020092 Fermi National Accelerator Lab., Batavia, IL, USA, Pittsburgh Univ., PA, USA
New Results on the B(sup -)(sub c) Meson at the Tevatron
Rahaman, M. A.; January 2006; 4 pp.; In English
Report No.(s): DE2007-897035; FERMILAB-CONF-06-339-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors present recent results on B(sub c)(sup -) meson from the Tevatron. The B(sub c)(sup -) meson has been observed in semileptonic decays, B(sub c)(sup -) (yields) J/(psi)(ell)(sup -) (nu)X, both by CDF and D0 experiments at a significance larger than 5(sigma). The D0 experiment has used the candidates in B(sub c)(sup -) (yields) J/(psi)(mu)(sup -) (nu)X decay to extract the mass and lifetime of B(sub c)(sup -) meson. The CDF experiment has used both electron and muon channel candidates in B(sub c)(sup -) (yields) J/(psi)(ell)(sup -) (nu)X decays to measure the relative production times branching ratio with respect to B(sup -) (yields) J/(psi)K(sup -) decay and also measured the lifetime of B(sub c)(sup -) meson in electron channel as (tau)(B(sub c)(sup -)) = 0.463(sub -0.055)(sup +0.073) (+-) 0.036 ps. The CDF experiment has also observed B(sub c)(sup -) (yields) J/(psi)(pi)(sup -) decay with a significance exceeding 6.5(sigma) and has measured the mass of B(sub c)(sup -) meson as M(B(sub c)(sup -)) = 6276.5 (+-) 4.0 (+-) 2.7 MeV/c(sup 2).
NTIS
Mesons; Particle Accelerators

20070020093 Fermi National Accelerator Lab., Batavia, IL, USA
Measurement of B(sub s) Oscillations at CDF
January 2006; 5 pp.; In English
Report No.(s): DE2007-897037; FERMILAB-CONF-06-328; No Copyright; Avail.: National Technical Information Service (NTIS)

The first precise measurement of the B(sub s)(sup 0) - (bar B)(sub s)(sup 0) oscillation frequency (Delta)m(sub s) with the CDFII experiment is summarized in this talk. The measurement is performed with 1 fb(sup -1) of data collected at the Fermilab Tevatron hadron collider. They find a signal consistent with flavor oscillations; the probability that such a signal is originated by random fluctuations is 0.2%. They measure (Delta)m(sub s) = 17.31(sub -0.18)(sup +0.33)(stat.) (+-) 0.07(syst.)ps(sup -1). After a brief theoretical overview, the author describes the experimental technique and shows the results of the CDF analysis and the (V(sub td)/V(sub ts)) value we infer from this measurement.
NTIS
Oscillations; Frequencies

20070020094 Fermi National Accelerator Lab., Batavia, IL, USA
SUSY-QCD Coupling Relation
Freitas, A.; Skands, P. Z.; January 2006; 4 pp.; In English
Report No.(s): DE2007-897039; No Copyright; Avail.: Department of Energy Information Bridge

In order to establish supersymmetry at future colliders, it is not sufficient to discover new particles, but the identity of gauge couplings and the corresponding Yukawa couplings between gauginos, sfermions and fermions needs to be verified. In detailed studies it was found that the SUSY-Yukawa couplings of the electroweak sector can be studied with great precision at the ILC, but a similar analysis for the Yukawa coupling of the SUSY-QCD sector proves to be far more challenging. Here a first phenomenological study for determining this coupling is presented, using a method which combines information from LHC and ILC.
NTIS
Quantum Chromodynamics; Supersymmetry

20070020095 Fermi National Accelerator Lab., Batavia, IL, USA, Oak Ridge National Lab., TN USA, Deutsches Elektronen-Synchrotron, Hamburg, Germany, Brookhaven National Lab., Upton, NY USA

Ion Source Choices An H Source for the High Intensity Neutrino Source

Mochs, D. P.; Welton, R. F.; Stockli, M. P.; Peters, J.; Alessi, J.; January 2006; 5 pp.; In English

Report No.(s): DE2007-897044; FERMILAB-CONF-06-311-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

The High Intensity Neutrino Source (HINS) program at Fermilab (formerly the Proton Driver) aims to develop a multi-mission linear accelerator (LINAC) capable of accelerate H(sup -) ions to 8 GeV. This paper touches on the ion source requirements for the HINS and discusses long pulse length testing of three ion sources which appear to have the capability of meeting these requirements.

NTIS

Ion Sources; Neutrinos; Source Programs; Linear Accelerators

20070020096 Fermi National Accelerator Lab., Batavia, IL, USA

Status of High Energy Electron Cooling in FNAL's Recycler Ring

Prost, L. R.; Burov, A.; Carlson, K.; Gattuso, C.; Hu, M.; January 2006; 3 pp.; In English

Report No.(s): DE2007-897043; FERMILAB-CONF-06-317-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Electron cooling of 8 GeV antiprotons at Fermilab's Recycler storage ring is now routinely used in the collider operation. It requires a 0.1-0.5 A, 4.3 MeV DC electron beam to increase the longitudinal phase-space density of the circulating antiproton beam. This paper discusses the latest status of the electron cooler and its mode of operation within the context of Fermilab's accelerator complex. In addition, we will show preliminary results that demonstrate electron cooling of the transverse phase-space of the antiproton beam.

NTIS

Cooling; High Energy Electrons

20070020097 Fermi National Accelerator Lab., Batavia, IL, USA

Supersymmetry Searches at the Tevatron

Portell, X.; January 2006; 6 pp.; In English

Report No.(s): DE2007-897045; FERMILAB-CONF-06-326; No Copyright; Avail.: National Technical Information Service (NTIS)

CDF and D0 detectors have already collected 1.3 fb(sup -1) of data delivered by the Tevatron collider at 1.96 TeV center-of-mass energy. We present here the various analyses that are currently testing the possibility of a supersymmetric extension of the Standard Model. No evidence for such processes have been found in luminosities that range from 300 to 800 pb(sup -1) and different limits on the different supersymmetric models are set. Constraints coming from indirect searches are also presented.

NTIS

Particle Accelerators; Supersymmetry; Center of Mass

20070020098 Fermi National Accelerator Lab., Batavia, IL, USA, Rochester Univ., NY USA

MINERVA: A Dedicated Neutrino Scattering Experiment at NuMI

McFarland, K. S.; January 2006; 6 pp.; In English

Report No.(s): DE2007-897080; FERMILAB-CONF-06-199-E; No Copyright; Avail.: National Technical Information Service (NTIS)

MINERvA is a dedicated neutrino cross-section experiment planned for the near detector hall of the NuMI neutrino beam at Fermilab. I summarize the detector design and physics capabilities of the experiment.

NTIS

Neutrino Beams; Neutrinos

20070020099 Massachusetts Inst. of Tech., Cambridge, MA, USA

Search for the Pentquark Partners: Theta++, SigmaO and NO

Qiang, Q.; Jul. 2006; 4 pp.; In English

Report No.(s): DE2007-897141; No Copyright; Avail.: Department of Energy Information Bridge

A high resolution search (sigma = 1.5 MeV) for pentaquarks was performed in Jefferson Lab Hall A using two

HRS+Septum configuration. The following electro-production channels were studied at forward angles: ep --\g e(prime)K X and ep --\g e(prime)pi+X, for three narrow (Gamma \h 8 MeV) hypothesis pentaquark states: Sigma0, Theta++ and N0. The missing mass spectra showed no significant signal therefore 90% C.L. upper limits of differential cross-section were evaluated using Monte Carlo technique.
NTIS
Quarks; High Resolution; Charged Particles

20070020100 Fermi National Accelerator Lab., Batavia, IL, USA, Istituto Nazionale di Fisica Nucleare, Pisa, Italy, Siena Univ., Italy
CKM physics at CDF
Squillacioti, P.; Oct. 01, 2006; 4 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2007-897019; FERMILAB-CONF-06-362-E; No Copyright; Avail.: Department of Energy Information Bridge

A precise knowledge of the CKM matrix elements is one of the primary goals of the CDF experiment. The Tevatron collider at Fermilab, operating at (radical)s = 1.96, collected 1 fb(sup -1) of data corresponding to a huge b(bar b) uample. In this paper the recent measurements performed in the CKM sector will be presented.
NTIS
Particle Accelerators; Particle Interactions

20070020105 South Dakota State Dept. of Health, Pierre, SD, USA, Stanford Univ., CA, USA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
New Developments in Charge Transfer Multiplet Calculations: Projection Operations, Mixed-Spin States and pi-Bonding
de Grout, F. M. F.; Hocking, R. K.; Piamonteze, C.; Hedman, B.; Hodgon, K. O.; Jan. 02, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2007-896946; SLAC-PUB-12220; No Copyright; Avail.: Department of Energy Information Bridge

This paper presents a number of new additions to the charge transfer multiplet calculations as used in the calculation of L edge X-ray absorption spectra of 3d and 4d transition metal systems, both oxides and coordination compounds. The focus of the paper is on the consequences of the optimized spectral simulations for the ground state, where we make use of a recently developed projection technique. This method is also used to develop the concept of a mixed-spin ground state, i.e. a state that is a mixture of a high-spin and low-spin state due to spin-orbit coupling combined with strong covalency. The charge transfer mechanism to describe (pi)-bonding uses the mixing of the metal-to-ligand charge transfer (MLCT) channel in addition to the normal CT channel and allows for the accurate simulation of (pi)-bonding systems, for example cyanides.
NTIS
Bonding; Charge Transfer; Energy Levels; Particle Spin; Quantum Numbers; Transferring

20070020107 Stanford Linear Accelerator Center, CA, USA
Electron Beam Alignment Strategy in the LCLS Undulators
Nuhn, H. D.; Emma, P. J.; Gassner, G. L.; LeCocq, C. M.; Peter, E.; Jan. 03, 2007; 8 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2007-896941; SLAC-PUB-12098; No Copyright; Avail.: Department of Energy Information Bridge

The x-ray FEL process puts very tight tolerances on the straightness of the electron beam trajectory (2 (micro)m rms) through the LCLS undulator system. Tight but less stringent tolerances of 80 (micro)m rms vertical and 140 (micro)m rms horizontally are to be met for the placement of the individual undulator segments with respect to the beam axis. The tolerances for electron beam straightness can only be met through beam-based alignment (BBA) based on electron energy variations. Conventional alignment will set the start conditions for BBA. Precision-fiducialization of components mounted on remotely adjustable girders and the use of beam-finder wires (BFW) will satisfy placement tolerances. Girder movement due to ground motion and temperature changes will be monitored continuously by an alignment monitoring system (ADS) and remotely corrected. This stabilization of components as well as the monitoring and correction of the electron beam trajectory based on

BPMs and correctors will increase the time between BBA applications. Undulator segments will be periodically removed from the undulator Hall and measured to monitor radiation damage and other effects that might degrade undulator tuning.
NTIS
Alignment; Electron Beams; Free Electron Lasers

20070020108 Stanford Linear Accelerator Center, Stanford, CA, USA, University of Southern California, Los Angeles, CA, USA
Energy Measurements of Trapped Electrons from a Plasma Wakefield Accelerator
Kirby, N.; Auerbech, D.; Berry, M.; Blumenfeld, J.; Claylon, C. E.; Jan. 03, 2007; 7 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2007-896940; SLAC-PUB-12164; No Copyright; Avail.: National Technical Information Service (NTIS)

Recent electron beam driven plasma wakefield accelerator experiments carried out at SLAC indicate trapping of plasma electrons. More charge came out of than went into the plasma. Most of this extra charge had energies at or below the 10 MeV level. In addition, there were trapped electron streaks that extended from a few GeV to tens of GeV, and there were mono-energetic trapped electron bunches with tens of GeV in energy.
NTIS
Electron Beams; Electrons; Plasma Accelerators; Plasmas (Physics)

20070020110 Stanford Linear Accelerator Center, CA, USA
In-Situ Cleaning of Metal Photo-Cathodes in rf Guns
Schmerge, J. F.; Castro, J. M.; Clendenin, J. E.; Colby, E. R.; Dewel, D. H.; Jan. 03, 2007; 5 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2007-896939; SLAC-PUB-12206; No Copyright; Avail.: Department of Energy Information Bridge

Metal cathodes installed in rf guns typically exhibit much lower quantum efficiency than the theoretical limit. Experimenters often use some sort of in situ technique to 'clean' the cathode to improve the QE. The most common technique is laser cleaning where the laser is focused to a small spot and scanned across the cathode surface. However, since the laser is operated near the damage threshold, it can also damage the cathode and increase the dark current. The QE also degrades over days and must be cleaned regularly. We are searching for a more robust cleaning technique that cleans the entire cathode surface simultaneously. In this paper we describe initial results using multiple techniques such as several keV ion beams, glow discharge cleaning and back bombarding electrons. Results are quantified in terms of the change in QE and dark current.
NTIS
Cathodes; Cleaning; Photocathodes; Radio Frequencies

20070020114 Fermi National Accelerator Lab., Batavia, IL, USA
Curved Track Segment Finding Using Tiny Triplet Finder (TTF)
Wu, J.; Wang, M.; Gottschalk, E.; Shi, Z.; January 2006; 5 pp.; In English
Report No.(s): DE2007-897234; FERMILAB-CONF-06-416-E; No Copyright; Avail.: National Technical Information Service (NTIS)

We describe the applications of a track segment recognition scheme called the Tiny Triplet Finder (TTF) that involves the grouping of three hits satisfying a constraint forming of a track segment. The TTF was originally developed solving straight track segment finding problem, however, it is also suitable in many curved track segment finding problems. The examples discussed in this document are among popular detector layouts in high-energy/nuclear physics experiments. Although it is not practical to find a universal recipe for arbitrary detector layouts, the method of the TTF application is illustrated via the discussion of the examples. Generally speaking, whenever the data item to be found in a pattern recognition problem contains two free parameters, and if the constraint connecting the measurements and the two free parameters has an approximate shift invariant property, the Tiny Triplet Finder can be used.
NTIS
Atomic Energy Levels; Pattern Recognition; Nuclear Physics

20070020115 Fermi National Accelerator Lab., Batavia, IL, USA
Inclusive Jet Production using the k(sub T) Algorithm at CDF
Lefevre, R.; Nov. 2006; 4 pp.; In English
Report No.(s): DE2007-897233; FERMILAB-CONF-06-420-E; No Copyright; Avail.: National Technical Information Service (NTIS)

This contribution presents preliminary results on the inclusive jet production in p(bar p) collisions at (radical)s = 1.96 TeV.

The measurements are carried out using the longitudinally invariant k(sub T) algorithm. The inclusive jet cross sections are measured as a function of the jet transverse momentum in five jet rapidity regions for jets in the ranges 54 \h p(sub T)(sup jet) \h 700 GeV/c and (y(sup jet)) \h 2.1. The results are based on 1.0 fb(sup -1) of data collected at CDF during the Run II of the Tevatron. They are in good agreement with next-to-leading order perturbative QCD predictions after including the non-perturbative corrections necessary to account for underlying event and hadronization effects.
NTIS
Algorithms; Particle Accelerators; Particle Collisions

20070020116 Fermi National Accelerator Lab., Batavia, IL, USA, New Mexico Univ., Albuquerque, NM, USA
Search for Chargino-Neutralino Production at the Collider Detector at Fermilab
Strologas, J.; Nov. 2006; 4 pp.; In English
Report No.(s): DE2007-897232; FERMILAB-CONF-06-424-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The chargino-neutralino production is one of the most promising SUSY processes that could be observed at the Tevatron. Cross sections of the order of 0.1 pb have not been excluded yet under the mSUGRA scenario, whereas the trilepton signature of the process is not contaminated by significant standard model backgrounds. We report on the status of CDF search for chargino-neutralino production at the Tevatron by presenting the results of five multilepton subanalyses as well as the result of their combination which leads to our current lower limit on the chargino mass of 127 GeV/c(sup 2) and upper limit on the production cross section times branching ratio to leptons of 0.25 pb at 95% confidence level.
NTIS
Particle Accelerators; Detectors; Standard Model (Particle Physics); Particle Production

20070020117 Fermi National Accelerator Lab., Batavia, IL, USA, Rockefeller Univ., New York, NY, USA
Diffraction at the Tevetron: CDF Results
Goulianos, K.; Nov. 2006; 10 pp.; In English
Report No.(s): DE2007-897229; FERMILAB-CONF-06-429-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The diffractive program of the CDF Collaboration at the Fermilab Tevatron p(bar p) Collider is reviewed with emphasis on recent results from Run II at (radical)s = 1.96 TeV. Updated results on the x(sub B(sub j)) and Q(sup 2) dependence of the diffractive structure function obtained from dijet production, and on the slope parameter of the t-distribution of diffractive events as a function of Q(sup 2) in the range 1 GeV(sup 2) \h Q(sup 2) \h 10(sup 4) GeV(sup 2), are presented and compared with theoretical expectations. Results on cross sections for exclusive dijet and diphoton production are also presented and used to calibrate theoretical estimates for exclusive Higgs production at the Large Hadron Collider.
NTIS
Diffraction; Particle Accelerators

20070020121 Fermi National Accelerator Lab., Batavia, IL, USA
Critical Speed Measurements in the Tevatron Cold Compressors
DeGraff, B.; Bossert, R.; Martinez, A.; Soyars, W. M.; Jan. 2006; 7 pp.; In English
Report No.(s): DE2007-897189; FERMILAB-CONF-05-636-AD; No Copyright; Avail.: Department of Energy Information Bridge

The Fermilab Tevatron cryogenic system utilizes high-speed centrifugal cold compressors, manufactured by Ishikawajima-Harima Heavy Industries Co. Ltd. (IHI), for high energy operations. Nominal operating range for these compressors is 43,000 to 85,000 rpm. Past foil bearing failures prompted investigation to determine if critical speeds for operating compressors fall within operating range. Data acquisition hardware and software settings will be discussed for measuring liftoff, first critical and second critical speeds. Several tests provided comparisons between an optical displacement probe and accelerometer measurements. Vibration data and analysis of the 20 Tevatron ring cold compressors will be presented.
NTIS
Compressors; Critical Velocity; Particle Accelerators; Cryogenics

20070020122 Fermi National Accelerator Lab., Batavia, IL, USA
Tevatron-for-LHC Report: Preparations for Discoveries
Abdullin, S.; Acosta, D.; Asai, S.; Atramentov, O.; Baer, H.; Aug. 31, 2006; 215 pp.; In English
Report No.(s): DE2007-897186; FERMILAB-CONF-06-284-T; No Copyright; Avail.: National Technical Information Service (NTIS)

This is the 'TeV4LHC' report of the 'Physics Landscapes' Working Group, focused on facilitating the start-up of physics explorations at the LHC by using the experience gained at the Tevatron. We present experimental and theoretical results that can be employed to probe various scenarios for physics beyond the Standard Model.
NTIS
Hadrons; Particle Accelerators

20070020123 Fermi National Accelerator Lab., Batavia, IL, USA
Searches for New Phenomena at the Tevatron and at HERA
Meyer, A.; Jul. 2006; 20 pp.; In English
Report No.(s): DE2007-897179; FERMILAB-CONF-06-404-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Recent results on searches for new physics at Run II of the Tevatron and highlights from HERA are reported. The searches cover many different final states and a wide range of models. All analyses have at this point led to negative results, but some interesting anomalies have been found.
NTIS
Particle Accelerators; Storage Rings (Particle Accelerators)

20070020124 Fermi National Accelerator Lab., Batavia, IL, USA, Kansas Univ., Lawrence, KS, USA
Search for the Single Top Quarks Produced in s-Channel via Electroweak Interactions at s=1.96 at the Tevatron
Jabeen, S.; Jan. 2006; 263 pp.; In English
Report No.(s): DE2007-897174; FERMILAB-THESIS-2006-24; No Copyright; Avail.: National Technical Information Service (NTIS)

The author presents a search for single top quarks produced in the s-channel electroweak production mode. The search is performed in the electron+jets decay channels, with one or more secondary-vertex tagged jets to indicate the presence of a b-jet and hence improving the signal: background ratio. Separation between signal and background is further enhanced by the use of Feed Forward Neural networks. 360 pb(sup -1) of Run II data used for this analysis was delivered by the Tevatron, and collected by D0 between August 2002 and August 2004. The resulting 95% confidence level upper limit is 4 pb.
NTIS
Electroweak Interactions (Field Theory); Particle Accelerators; Quarks

20070020128 Fermi National Accelerator Lab., Batavia, IL, USA, Siena Univ., Italy
Measurement of the Branching Fraction Ratio B--\g D K/B--\gD pi with the CDF II Detector
Squillacioti, P.; Nov. 2006; 164 pp.; In English
Report No.(s): DE2007-897226; FERMILAB-THESIS-2006-27; No Copyright; Avail.: National Technical Information Service (NTIS)

In this thesis the author has described the first measurement performed at a hadron collider of the branching fraction of the Cabibbo-suppressed mode B(sup +) (yields) (bar D)(sup 0) K(sup +). The analysis has been performed with 360 pb(sup -1) of data collected by the CDF II detector.
NTIS
Particle Accelerators; Hadrons

20070020130 Fermi National Accelerator Lab., Batavia, IL, USA, State Univ. of New York, Albany, NY, USA
Search for 3rd Generation Vector Leptoquarks in the Di-tau Di-jet Channel in Proton Antiproton Collisions at square root(s)=1.96
Forrester, S. S.; Dec. 2006; 222 pp.; In English
Report No.(s): DE2007-897225; FERMILAB-THESIS-2006-28; No Copyright; Avail.: National Technical Information Service (NTIS)

We search for third generation vector leptoquarks (V LQ3) produced in colliding p(bar p) beams operating at (radical)s

= 1.96 TeV at the CDF experiment in Run II of the Fermilab Tevatron. We use 322 pb(sup -1) of data to search for the V LQ3 signal in the di-tau plus di-jet channel. For the first time, the full matrix element is used in the Monte Carlo simulation of this signal. With no events observed in the signal region, we set a 95% C.L. upper limit on the V LQ3 pair production cross section of (sigma) \h 344fb, assuming Yang-Mills couplings and Br(V LQ3 (yields) b(tau)) = 1, and a lower limit on the V LQ3 mass of m(sub V LQ3) \g 317 GeV=c(sup 2). If theoretical uncertainties on the cross section are applied in the least favorable manner the results are (sigma) \h 360fb and m(sub V LQ3) \g 294 GeV=c(sup 2). The Minimal coupling V LQ3 result is an upper limit on the cross section of (sigma) \h 493fb ((sigma) \h 610fb) and the lower limit on the mass is m(sub V LQ3) \g 251 GeV=c(sup 2) (m(sub V LQ3) \g 223 GeV=c(sup 2)) for the nominal (1(sigma) varied) theoretical expectation.
NTIS
Antiprotons; Particle Accelerators; Particle Collisions; Proton-Antiproton Interactions

20070020132 Fermi National Accelerator Lab., Batavia, IL, USA, Florida State Univ., Tallahassee, FL, USA
Measurement of the Inclusive Jet Cross Section Using the Midpoint Algorithm in Run II at the Collider Detector at FERMILAB (CDF)
Craig, R.; January 2006; 138 pp.; In English
Report No.(s): DE2007-897224; FERMILAB-THESIS-2006-29; No Copyright; Avail.: National Technical Information Service (NTIS)

A measurement is presented of the inclusive jet cross section using the Midpoint jet clustering algorithm in five different rapidity regions. This is the first analysis which measures the inclusive jet cross section using the Midpoint algorithm in the forward region of the detector. The measurement is based on more than 1 fb(sup -1) of integrated luminosity of Run II data taken by the CDF experiment at the Fermi National Accelerator Laboratory. The results are consistent with the predictions of perturbative quantum chromodynamics.
NTIS
Algorithms; Particle Accelerators

20070020134 Fermi National Accelerator Lab., Batavia, IL, USA
High-Intensity Beam Collimation and Targetry
Mokhov, N. V.; Nov. 2006; 5 pp.; In English
Report No.(s): DE2007-897220; FERMILAB-CONF-06-438-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Principles, design criteria and realization of reliable collimation systems for the high-power accelerators and hadron colliders are described. Functionality of collimators as the key elements of the machine protection system are discussed along with the substantial progress on the crystal collimation front. The key issues are considered in design of high-power target systems and achieving their best performance. Simulation code requirements are presented.
NTIS
Collimation; Particle Accelerators; Targets

20070020136 Fermi National Accelerator Lab., Batavia, IL, USA
Beam Diagnostics, Collimation, Injection/Extraction, Targetry. Accidents and Commissioning: Working Group C&G Summary Report
Mokhov, N. V.; Hasegawa, K.; Henderson, S.; Schmidt, R.; Tomizawa, M.; Nov. 2006; 7 pp.; In English
Report No.(s): DE2007-897219; FERMIL-CONF-06-06-433-AD; No Copyright; Avail.: Department of Energy Information Bridge

The performance of accelerators with high beam power or high stored beam energy is strongly dependent on the way the beam is handled, how beam parameters are measured and how the machine is commissioned. Two corresponding working groups have been organized for the Workshop: group C 'Beam diagnostics, collimation, injection/extraction and targetry' and group G 'Commissioning strategies and procedures'. It has been realized that the issues to be discussed in these groups are interlaced with the participants involved and interested in the above topics, with an extremely important subject of beam-induced accidents as additional topic. Therefore, we have decided to combine the group sessions as well as this summary report. Status, performance and outstanding issues of each the topic are described in the sections below, with additional observations and proposals by the joint group at the end.
NTIS
Beam Injection; Collimation; Diagnosis; Extraction; Particle Accelerators

20070020138 Fermi National Accelerator Lab., Batavia, IL, USA, Florida State Univ., Tallahassee, FL, USA
Searches for GMSB, AMSB and Split SUSY with the D0 Detector
Gershtein, Y.; January 2006; 4 pp.; In English
Report No.(s): DE2007-897218; FERMILAB-CONF-06-385-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors report on the recent searches for supersymmetry with gauge-mediated or anomaly-mediated breaking, as well as the search for split supersymmetry.

NTIS
Particle Accelerators; Supersymmetry; Detectors

20070020139 Fermi National Accelerator Lab., Batavia, IL, USA, Arizona Univ., Tucson, AZ, USA
Time-Integrated Charge Asymmetries at D0
Cheu, E.; January 2006; 6 pp.; In English
Report No.(s): DE2007-897217; FERMILAB-CONF-06-397-E; No Copyright; Avail.: Department of Energy Information Bridge

The authors have measured the time-integrated charge asymmetries in dimuon events and semileptonic B(sub s) decays. These results are the most precise semileptonic charge asymmetries in B decays to date. We combine these results with measurements from the decay B(sub s) (yields) J/(psi)(phi) to determine the CP-violating phase (phi)(sub s). They find (phi)(sub s) = -0.56(sub -0.41)(sup +0.44).

NTIS
Asymmetry; Particle Decay; Muons

20070020142 Fermi National Accelerator Lab., Batavia, IL, USA
Thermal Analysis of SC Quadrupoles in Accelerator Interaction Regions
Novitski, I.; Zlobin, A. V.; Aug. 2006; 5 pp.; In English
Report No.(s): DE2007-897195; FERMILAB-CONF-06-319-TD; No Copyright; Avail.: National Technical Information Service (NTIS)

This paper presents results of a thermal analysis and operation margin calculation performed for NbTi and Nb(sub 3)Sn low-beta quadrupoles in collider interaction regions. Results of the thermal analysis for NbTi quadrupoles are compared with the relevant experimental data. An approach to quench limit measurements for Nb(sub 3)Sn quadrupoles is discussed.

NTIS
Particle Accelerators; Quadrupoles; Thermal Analysis

20070020143 Fermi National Accelerator Lab., Batavia, IL, USA
Design, Fabrication, and Test of an SRF Cryomodule Prototype at Fermilab
Soyars, W.; Darve, C.; Nicol, T.; Rowe, A.; January 2006; 7 pp.; In English
Report No.(s): DE2007-897190; FERMILAB-CONF-05-638-AD; No Copyright; Avail.: Department of Energy Information Bridge

In support of the Charged Kaons at the Main Injector (CKM) experiment, an SRF cryomodule was designed, assembled, and tested at Fermilab. The cryomodule prototype consists of a single niobium 13-cell 3.9 GHz superconducting RF cavity installed in its horizontal cryostat. The prototype was simplified to hold an additional dummy cavity in place of a second 13-cell SRF cavity. Although this cryomodule was originally intended for beamline deflection in the CKM experiment, this first preliminary test aims to compliment existing vertical 3-cell 3.9 GHz SRF cavity testing and also to gain expertise in the field of SRF testing. The cryomodule's thermal and mechanical design is reported. The test process and instrumentation is described. The first operational cooldown with RF powering is discussed and some cryogenic results are given.

NTIS
Cryogenics; Fabrication; Particle Accelerators; Prototypes

20070020147 Smith, Gambrell and Russel, Washington, DC, USA
Methods and Devices for High-Throughput Dielectrophoretic Concentration
Simmons, B. A., Inventor; McGraw, G. J., Inventor; Salmi, A., Inventor; Flechtner, G. J., Inventor; Cummings, E. B., Inventor; 11 Mar 05; 22 pp.; In English

Patent Info.: Filed Filed 11 Mar 05; US-Patent-Appl-SN-11-076 971
Report No.(s): PB2007-101755; No Copyright; Avail.: CASI: A03, Hardcopy

Disclosed herein are methods and devices for assaying and concentrating analytes in a fluid sample using dielectrophoresis. As disclosed, the methods and devices utilize substrates having a plurality of pores through which analytes can be selectively prevented from passing, or inhibited, on application of an appropriate electric field waveform. The pores of the substrate produce nonuniform electric field having local extrema located near the pores. These nonuniform fields drive dielectrophoresis, which produces the inhibition. Arrangements of electrodes and porous substrates support continuous, bulk, multi-dimensional, and staged selective concentration.

NTIS

Patent Applications; Electrophoresis

20070020149 Foley and Lardner, LLP, Madison, WI, USA, Wisconsin State Univ., Eau Claire, WI, USA

Intersubband Mid-Infrared Electroluminescent Semiconductor Devices

Botez, D., Inventor; Mirabedini, A. R., Inventor; Xu, D. P., Inventor; Mawst, L. J., Inventor; 21 Dec 04; 11 pp.; In English
Contract(s)/Grant(s): N660010318900
Patent Info.: Filed Filed 21 Dec 04; US-Patent-Appl-SN-11-021 095
Report No.(s): PB2007-105861; No Copyright; Avail.: CASI: A03, Hardcopy

A semiconductor laser and light emitting device is defined. The device comprises an electron injector and an active region adjacent to the electron injector. The active region includes at least one deep quantum well with barrier layers adjacent to either side of the quantum well or wells such that electrons injected from the electron injector into a high energy level of the quantum well relax to a lower energy level with the emission of a photon and are transmitted out to a region beyond the last barrier layer of the active region. The electron injector includes quantum well layers. The bottom of each deep quantum well or wells in the active region is lower in energy than the bottoms of the quantum well layers in the electron injector. The device may further comprise at least two stages wherein each stage contains an electron injector and an active region. The stages are separated by semiconductor layers that allow the transfer of electrons from the active region of one stage to the electron injector of the next stage.

NTIS

Electroluminescence; Patent Applications; Semiconductor Devices; Semiconductor Lasers

20070020178 Argonne National Lab., IL USA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, Geneva Univ., Geneva, Switzerland

MUCOOL RF Program

Norem, J.; Bross, A.; Moretti, A.; Norris, B.; Qian, Z.; Jun. 26, 2006; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2007-897175; FERMILAB-CONF-06-387-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Efficient muon cooling requires high RF gradients in the presence of high (3T) solenoidal fields. The Muon Ionization Cooling Experiment (MICE) also requires that the x-ray production from these cavities is low, in order to minimize backgrounds in the particle detectors that must be located near the cavities. These cavities require thin Be windows to ensure the highest fields on the beam axis. In order to develop these cavities, the MUCOOL RF Program was started about 6 years ago. Initial measurements were made on a six-cell cavity and a single-cell pillbox, both operating at 805 MHz. We have now begun measurements of a 201 MHz pillbox cavity. This program has led to new techniques to look at dark currents, a new model for breakdown and a general model of cavity performance based on surface damage. The experimental program includes studies of thin Be windows, conditioning, dark current production from different materials, magnetic-field effects and breakdown.

NTIS

Cavities; Cooling; Ionization; Muons; Particle Accelerators; Radio Frequencies

20070020179 Fermi National Accelerator Lab., Batavia, IL, USA

Tau identification at D0

Galea, C.; Dec. 01, 2006; 9 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-897558; FERMILAB-CONF-06-462-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The author describes methods to identify (tau) leptons produced in high energy p(bar p) collisions ((radical)s = 1.96 GeV)

at the Tevatron, using the D0 detector. Different procedures used for discrimination against background particles misidentified as taus are also discussed. Finally, we present some physics results obtained by applying these methods to illustrate their performance.
NTIS
Leptons; Particle Accelerators

20070020180 Fermi National Accelerator Lab., Batavia, IL, USA, Rockefeller Univ., New York, NY, USA
Heavy Flavor Production at the Tevatron
Hatakeyama, K.; Oct. 01, 2006; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-897562; FERMILAB-CONF-06-463-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Results on the inclusive b-jet production, Z + b-jet production, and b-jet production from W + b(bar b) process at the Tevatron are presented.
NTIS
Particle Accelerators; Physics; Production

20070020182 Fermi National Accelerator Lab., Batavia, IL, USA
Feasibility Study of Nb3Al Rutherford Cable for High Field Accelerator Magnet Application
Yamada, R.; Kikuchi, A.; Ambrosio, G.; Andreev, N.; Barzi, E.; Aug. 01, 2006; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-897564; FERMILAB-CONF-06-294-TD; No Copyright; Avail.: Department of Energy Information Bridge

Feasibility study of Cu stabilized Nb(sub 3)Al strand and Rutherford cable for the application to high field accelerator magnets are being done at Fermilab in collaboration with NIMS. The Nb(sub 3)Al strand, which was developed and manufactured at NIMS in Japan, has a non-copper Jc of about 844 A/mm(sup 2) at 15 Tesla at 4.2 K, a copper content of 50%, and filament size of about 50 microns. Rutherford cables with 27 Nb(sub 3)Al strands of 1.03 mm diameter were fabricated and tested. Quench tests on a short cable were done to study its stability with only its self field, utilizing a high current transformer. A pair of 2 meter long Nb(sub 3)Al cables was tested extensively at CERN at 4.3 and 1.9 K up to 11 Tesla including its self field with a high transport current of 20.2 kA. In the low field test we observed instability near splices and in the central region. This is related to the flux-jump like behavior, because of excessive amount of Nb in the Nb(sub 3)Al strand. There is possibility that the Nb in Nb(sub 3)Al can cause instability below 2 Tesla field regions. We need further investigation on this problem. Above 8 Tesla, we observed quenches near the critical surface at fast ramp rate from 1000 to 3000 A/sec, with quench velocity over 100 m/sec. A small racetrack magnet was made using a 14 m of Rutherford cable and successfully tested up to 21.8 kA, corresponding to 8.7 T.
NTIS
Feasibility; High Field Magnets; Magnets

20070020183 Fermi National Accelerator Lab., Batavia, IL, USA
Handling Collision Debris In Quad-and Dipole-First LHC IR Options
Mokhov, N. V.; Rakhno, I. L.; Dec. 01, 2006; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-897567; FERMILAB-CONF-06-474-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Detailed MARS15 Monte Carlo energy deposition calculations are performed for two main designs of the LHC interaction regions (IR) capable to achieve a luminosity of 10(sup 35) cm(sup -2) s(sup -1): a traditional quadrupole-first scheme and the one with a dual-bore inner triplet with separation dipoles placed in front of the quadrupoles. It is shown that with the appropriate design of the Nb3Sn magnets, IR layout and a number of protective measures implemented, both schemes are feasible for the LHC luminosity upgrade up to 10(sup 35) cm(sup -2) s(sup -1).
NTIS
Collisions; Debris; Magnets; Quadrupoles; Dipoles

20070020184 Fermi National Accelerator Lab., Batavia, IL, USA
Radiation Damage to Scintillator in the D0 Luminosity Monitor
Casey, B.; DeVaughan, K.; Enari, Y.; Partridge, R.; Yacoob, S.; Dec. 01, 2006; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-897568; FERMILAB-CONF-06-469-E; No Copyright; Avail.: National Technical Information Service (NTIS)

We report the result of evaluating radiation damage to Bicron BC408 plastic scintillator used in the D0 Luminosity Monitor during Run IIa. The Luminosity Monitor provides pseudo-rapidity coverage over the range 2.7 \h ((eta)) \h 4.4, with the radiation dose in Run IIa estimated to be 0.5 MRad for the region closest to the beams. We find the light yield is degraded by 10-15% due to radiation damage by comparing new and old scintillator in four observables: (1) visual inspection, (2) optical transmittance, (3) response to the radioactive source of (sup 90)Sr and (4) light yield for cosmic rays.
NTIS
Luminosity; Radiation Damage; Scintillation Counters

20070020185 California Univ., Berkeley, CA USA
Measurement of the Top Quark Mass with a Matrix Element Method
Gibson, A. P.; Dec. 01, 2006; 194 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-897576; FERMILAB-THESIS-2006-31; No Copyright; Avail.: Department of Energy Information Bridge

The authors present a measurement of the mass of the top quark. The event sample is selected from proton-antiproton collisions, at 1.96 TeV center-of-mass energy, observed with the CDF detector at Fermilab's Tevatron. They consider a 318 pb(sup -1) dataset collected between March 2002 and August 2004. They select events that contain one energetic lepton, large missing transverse energy, exactly four energetic jets, and at least one displaced vertex b tag. The analysis uses leading-order t(bar t) and background matrix elements along with parameterized parton showering to construct event-by-event likelihoods as a function of top quark mass. From the 63 events observed with the 318 pb(sup -1) dataset they extract a top quark mass of 172.0 (+-) 2.6(stat) (+-) 3.3(syst) GeV/c(sup 2) from the joint likelihood. The mean expected statistical uncertainty is 3.2 GeV/c(sup 2) for m(sub t) = 178 GTeV/c(sup 2) and 3.1 GeV/c(sup 2) for m(sub t) = 172.5 GeV/c(sup 2). The systematic error is dominated by the uncertainty of the jet energy scale.
NTIS
Matrix Methods; Quarks

20070020187 Fermi National Accelerator Lab., Batavia, IL, USA
Using the Fermilab Proton Source for a Muon to Electron Conversion Experiment
Ankenbrandt, C.; Bogert, D.; DeJongh, F.; Greer, S.; McGinnis, D.; Sep. 09, 2006; 18 pp.; In English
Report No.(s): DE2007-897587; FERMILAB-TM-2368-AD-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The Fermilab proton source is capable of providing 8 GeV protons for both the future long-baseline neutrino program (NuMI), and for a new program of low energy muon experiments. In particular, if the 8 GeV protons are rebunched and then slowly extracted into an external beamline, the resulting proton beam would be suitable for a muon-to-electron conversion experiment designed to improve on the existing sensitivity by three orders of magnitude. We describe a scheme for the required beam manipulations. The scheme uses the Accumulator for momentum stacking, and the Debuncher for bunching and slow extraction. This would permit simultaneous operation of the muon program with the future NuMI program, delivering 10(sup 20) protons per year at 8 GeV for the muon program at the cost of a modest ((approx)10%) reduction in the protons available to the neutrino program.
NTIS
Electrons; Muons; Proton Beams; Protons

20070020254 Fermi National Accelerator Lab., Batavia, IL, USA
FPGA Curved Track Fitter with Very Low Resource Usage
Wu, J.; Wang, M.; Gottschalk, E.; Chi, Z.; January 2006; 6 pp.; In English
Report No.(s): DE2007-897236; FERMIL-CONF-06-417-E; No Copyright; Avail.: Department of Energy Information Bridge

Standard least-squares curved track fitting process is tailored for FPGA implementation. The coefficients in the fitting

matrices are carefully chosen so that only shift and accumulation operations are used in the process. The divisions and full multiplications are eliminated. Comparison in an application example shows that the fitting errors of the low resource usage implementation are less than 4% bigger than the fitting errors of the exact least-squares algorithm. The implementation is suitable for low-cost, low-power applications such as high energy physics detector trigger systems.
NTIS
Field-Programmable Gate Arrays; Detectors

20070020255 Manchester Univ., UK
Standard Model Higgs Searches and Perspectives at the Tevatron
Soeldner-Rembold, S.; Oct. 2006; 7 pp.; In English
Report No.(s): DE2007-897172; FERMILAB-CONF-06-360-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The status and perspectives of Standard Model Higgs searches at the Tevatron experiments CDF and D0 are discussed.
NTIS
Particle Accelerators; Higgs Bosons

20070020256 Rochester Univ., NY USA
QCD and Top-Quark Results from the Tevatron
Zielinski, M.; Oct. 2006; 12 pp.; In English
Report No.(s): DE2007-897171; FERMILAB-CONF-06-369; No Copyright; Avail.: National Technical Information Service (NTIS)

Selected recent QCD and top-quark results from the Tevatron are reviewed, aiming to illustrate progression from basic studies of QCD processes to verification of perturbative calculations and Monte Carlo simulation tools, and to their applications in more novel and complex cases, like top-quark studies and searches for new physics.
NTIS
Particle Accelerators; Quantum Chromodynamics; Quarks

20070020257 Oklahoma Univ., Norman, OK, USA
Search for the Rare Decay KL-\gpiO piO gamma
Smith, D. E.; Aug. 2006; 178 pp.; In English
Report No.(s): DE2007-897170; FERMILAB-THESIS-2006-20; No Copyright; Avail.: National Technical Information Service (NTIS)

This thesis describes a search for the rare decay K(sub L) (yields) (pi)(sup 0)(pi)(sup 0)(gamma) using data from the KTeV experiment, using the topology K(sub L) (yields) (pi)(sup 0)(pi)(sub D)(sup 0)(gamma) (where (pi)(sub D)(sup 0) (yields) (gamma)e(sup +)e(sup -)). Due to Bose statistics and the real nature of the photon, the K(sub L) (yields) (pi)(sup 0)(pi)(sup 0)(gamma) decay can proceed at lowest order only by the Cp conserving direct emission of an E2 photon. The decay vanishes to O(p(sup 4)) in chiral perturbation theory and is a probe of the theory to the sixth order. The primary background to this decay consists of K(sub L) (yields) (pi)(sup 0)(pi)(sup 0)(pi)(sub D)(sup 0) events with one lost photon. The upper limit for the decay K(sub L) (yields) (pi)(sup 0)(pi)(sup 0)(gamma) presented in this thesis is 2.32 x 10(sup -7) at the 90% confidence level. This upper limit was derived from both 1997 and 1999 data, using a blind analysis. The upper limit was derived from a Feldman-Cousins method, based on a weighted total of 0.53 data events in the signal region with an expected K(sub L) (yields) (pi)(sup 0)(pi)(sup 0)(pi)(sub D)(sup 0) background of 0.37 (+-) 0.28 events. The previous upper limit for this decay was 5.6 x 10(sup -6) at the 90% confidence level.
NTIS
Perturbation Theory; Decay; Conservation

20070020258 Fermi National Accelerator Lab., Batavia, IL, USA, Trinity Coll., Dublin, Ireland
Improved Action for Heavy Quarks
Kronfeld, A. S.; Oktay, M. B.; Oct. 2006; 6 pp.; In English
Report No.(s): DE2007-897169; FERMILAB-CONF-06-371-T; No Copyright; Avail.: Department of Energy Information Bridge

The authors extend the Fermilab method for heavy quarks to include all interactions of dimension six in the action. We discuss a subtlety in the power counting, which implies that, for heavy quarks, certain interactions of dimension seven are

commensurate with some of those of dimension six. We then present tree-level matching conditions obtained from calculating the Compton scattering amplitude for (lattice) QCD. When the matching conditions have been applied, the improved action removes (tree-level) discretization errors of order a(sup 2)p(sup 3)/m(sub Q) and a(sup 3)p(sup 3).
NTIS
Quarks; Electron Scattering; Counting; Scattering Amplitude

20070020259 Fermi National Accelerator Lab., Batavia, IL, USA, Bergische Univ., Wuppertal, Germany
Top Pair Production III: Testing the Standard Model in Top Quark Decays
Wicke, D.; Oct. 2006; 4 pp.; In English
Report No.(s): DE2007-897168; FERMILAB-CONF-06-375-E; No Copyright; Avail.: National Technical Information Service (NTIS)

With its discovery in 1995 by the CDF and D0 collaborations the top quark completed the set of quarks expected by the Standard Model. It is predicted to have the same quantum numbers and couplings as the other up-type quarks. Albeit, only very few of these properties have been verified so far. This article summarizes the existing measurements of top quark properties in the pair production mode.
NTIS
Pair Production; Particle Decay; Quarks; Couplings

20070020260 Northern Illinois Univ., De Kalb, IL, USA, Fermi National Accelerator Lab., Batavia, IL, USA, State Univ. of New York, Stony Brook, NY, USA
Extruded Scintillator for the Calorimetry Applications
Dyshkant, A.; Rykalin, V.; Pla-Dalmau, A.; Beznosko, D.; Aug. 2006; 8 pp.; In English
Report No.(s): DE2007-897166; FERMILAB-CONF-06-281; No Copyright; Avail.: National Technical Information Service (NTIS)

An extrusion line has been installed and successfully operated at FNAL (Fermi National Accelerator Laboratory) in collaboration with NICADD (Northern Illinois Center for Accelerator and Detector Development). This new Facility will serve to further develop and improve extruded plastic scintillator. Recently progress has been made in producing co-extruded plastic scintillator, thus increasing the potential HEP applications of this Facility. The current R&D work with extruded and co-extruded plastic scintillator for a potential ALICE upgrade, the ILC calorimetry program and the MINERvA experiment show the attractiveness of the chosen strategy for future experiments and calorimetry. We extensively discuss extruded and co-extruded plastic scintillator in calorimetry in synergy with new Solid State Photomultipliers. The characteristics of extruded and co-extruded plastic scintillator will be presented here as well as results with non-traditional photo read-out.
NTIS
Extruding; Heat Measurement; Scintillation Counters

20070020261 Paris XI Univ., Orsay, France
Search for Supersymmetry in Trilepton Final States with the D0 Detector
Hohlfeld, M.; Oct. 2006; 4 pp.; In English
Report No.(s): DE2007-897163; FERMILAB-CONF-06-393E; No Copyright; Avail.: National Technical Information Service (NTIS)

The data taken by the D0 experiment at the proton-antiproton collider Tevatron has been used to search for signatures with two or more leptons and missing transverse energy as they are expected for the decay of pair produced Charginos and Neutralinos. No excess above the Standard Model prediction has been observed and the results have been used to set mass limits for these particles.
NTIS
Particle Accelerators; Supersymmetry

20070020262 Fermi National Accelerator Lab., Batavia, IL, USA, Northwestern Univ., Evanston, IL USA
Wire Bond Vibration of Forward Pixel Tracking Detector of CMS
Atac, M.; Gobbi, B.; Kwan, S.; Pischalnikov, Y.; Spencer, E.; Oct. 2006; 12 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH3000
Report No.(s): DE2007-897158; FERMILAB-TM-2363-E; No Copyright; Avail.: Department of Energy Information Bridge

Wire bonds of the Forward Pixel (FPix) tracking detectors are oriented in the direction that maximizes Lorentz Forces

relative to the 4 Tesla field of the Compact Muon Solenoid (CMS) Detector's magnet. The CMS Experiment is under construction at the Large Hadron Collider at CERN, Geneva, Switzerland. We were concerned about Lorentz Force oscillating the wires at their fundamental frequencies and possibly fracturing or breaking them at their heels, as happened with the CDF wire bonds. This paper reports a study to understand what conditions break such bonds.
NTIS
Joints (Junctions); Particle Accelerators; Pixels; Vibration; Wire

20070020264 Hamilton, Brook, Smith and Reynolds, Concord, MA, USA
Thin, Flexible Actuator Array to Produce Complex Shapes and Force Distributions
Biggs, S. J., Inventor; Daverman, R. D., Inventor; 11 Mar 05; 23 pp.; In English
Contract(s)/Grant(s): N66001-02-C-8802
Patent Info.: Filed Filed 11 Mar 05; US-Patent-Appl-SN-11-078 195
Report No.(s): PB2007-101751; No Copyright; Avail.: CASI: A03, Hardcopy

An actuator includes a bistable mechanism having a tension beam and a compression beam defined by a relief slit in a flexible substrate; and a first shape memory element that upon heating actuates the actuator from a first position to a second position. A heat source can be thermally coupled to actuate the first shape memory element, or the first shape memory element can be heated by passing current through the element. The actuators can be formed in an array. Such arrays can be useful for tactile displays, massagers, and the like. Also included are methods of operation and manufacturing.
NTIS
Actuators; Force Distribution; Patent Applications; Shapes

20070020292 Clark-Atlanta Univ., GA, USA
Electron Impact Excitation of Forbidden and Allowed Transitions in O(II)
Tayal, S. S.; Journal of Physics B: Atomic, Molecular and Optical Physics; October 17, 2006; ISSN 0953-4075; Volume 39, pp. 4393-4407; In English
Contract(s)/Grant(s): NAG5-13340; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1088/0953-4075/39/21/005

The B-spline R-matrix method is used to investigate the electron impact excitation of forbidden and allowed transitions in singly ionized oxygen. The relativistic effects have been incorporated in the Breit-Pauli Hamiltonian. Flexible non-orthogonal sets of radial functions are used to obtain accurate target description and to represent the scattering functions. The 47 fine-structure levels of the 2s(sup 2)2p(sup 3), 2s2p(sup 4), 2s(sup 2)2p(sup 2)3s, 2s(sup 2)2p(sup 2)3p and 2s(sup 2)2p(sup 2)3d configurations have been included in the scattering calculation. A calculation with 62 levels in the close-coupling expansion using the Breit-Pauli R-matrix (BPRM) method with orthogonal radial functions has also been carried out to check electron correlation, relativistic and channel coupling effects. The present results are in good agreement with the previous 16-level BPRM calculation by Montenegro et a1 (2006 J. Phys. B: At. Mol. Opt. Phys. 39 1863-77) for the forbidden transitions, but differ from the 21-level BPRM calculation by McLaughlin and Bell (1998 J. Phys. B: At. Mol. Opt. Phys. 31 4317-29). Our cross sections for the first forbidden (sup 4)S(sup o)-(sup 2)D(sup o)and resonance (sup 4)S(sup o)-2s(sup 2)p(sup 4) (sup 4)P transitions are in reasonably good agreement with the electron energy-loss and merged-beams experiment.
Author
Electron Impact; Atomic Excitations; Forbidden Transitions; Relativistic Effects; Oxygen; Ionized Gases; Electron Beams

20070020322 North Carolina Agricultural and Technical State Univ., Greensboro, NC, USA
Growth and Properties of Lattice Matched GaAsSbN Epilayer on GaAs for Solar Cell Applications
Bharatan, Sudhakar; Iyer, Shanthi; Matney, Kevin; Collis, Ward J.; Nunna Kalyan; Li, Jia; Wu, Liangjin; McGuire, Kristopher; McNeil, Laurie E.; Materials Research Society Symposium Proceedings; 2006; Volume 891, pp. 361-366; In English
Contract(s)/Grant(s): NAG3-2782
Report No.(s): Paper No. 0891-EE10-36; Copyright; Avail.: Other Sources; Abstract Only

The growth and properties of GaAsSbN single quantum wells (SQWs) are investigated in this work. The heterostructures were grown on GaAs substrates in an elemental solid source molecular beam epitaxy (MBE) system assisted with a RF plasma nitrogen source. A systematic study has been carried out to determine the influence of various growth conditions, such as the growth temperature and the source shutter-opening sequence, on the quality of the grown layers and the incorporation of N and Sb. The effects of ex situ and in situ annealing under As overpressure on the optical properties of the layers have also been

investigated. Substrate temperature in the range of 450-470 C was found to be optimum. Simultaneous opening of the source shutters was found to yield sharper QW interfaces. N and Sb incorporations were found to depend strongly upon substrate temperatures and source shutter opening sequences. A significant increase in PL intensity with a narrowing of PL line shape and blue shift in emission energy were observed on annealing the GaAsSbN/GaAs SQW, with in situ annealing under As overpressure providing better results, compared to ex situ annealing.
Author
Gallium Arsenides; Quantum Wells; Molecular Beam Epitaxy; Radio Frequencies; Nitrogen Plasma; Optical Properties; Annealing

20070020368 Lord Corp., Cary, NC, USA
Magnetostrictive Wavelet Method for Measuring Pulse Propagation Time
Southward, S. C., Inventor; Jolly, M. R., Inventor; Ferguson, M. K., Inventor; Fowler, L. P., Inventor; 14 Oct 04; 43 pp.; In English
Contract(s)/Grant(s): F 135F-35
Patent Info.: Filed Filed 14 Oct 04; US-Patent-Appl-SN-10-965 085
Report No.(s): PB2007-102417; No Copyright; Avail.: CASI: A03, Hardcopy

A magnetostrictive sensor system and a method of measuring a magnetostrictive sensor pulse is provided. The measurement system and method includes providing a digital buffer circuit connected with an analog to digital converter to an analog waveform detector for receiving a magnetostrictive pulse waveform from a magnetostrictive waveguide. A template waveform is provided, and a returned magnetostrictive pulse waveform is received into the digital buffer circuit. The received pulse waveform is compared with the template waveform to determine an arrival time of the returned magnetostrictive pulse waveform. Providing the template waveform includes providing a synthesized return waveform generated to simulate a characteristic magnetostrictive return pulse waveform of the magnetostrictive system. The magnetostrictive sensor system includes a magnetostrictive waveguide, an analog waveform detector for receiving a magnetostrictive pulse waveform from the magnetostrictive waveguide, a comparing correlating processor with a template waveform for comparing the received magnetostrictive pulse waveform with the template waveform to determine an arrival time of the returned magnetostrictive pulse waveform.
NTIS
Magnetostriction; Patent Applications; Time Measurement; Waveforms; Wavelet Analysis

20070020383 Fermi National Accelerator Lab., Batavia, IL, USA, Padua Univ., Italy
Bs Mixing at the Tevatron
Lucchesi, D.; Aug. 01, 2006; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH030002
Report No.(s): DE2007-897273; FERMIL-CONF-06-262-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The measurement of the B(sub s) mixing oscillation frequency, (Delta)m(sup s), has been the main goal for both experiments CDF and D0 which are running at the Tevatron collider. With 1 fb(sup -1) of data collected during the last four years D0 set a lower and upper limit on this frequency, 17 \h (Delta)m(sub s) \h 21 ps(sup -1). CDF measured (Delta)m(sub s) with a precision better than 2% and the probability that the data could randomly fluctuate to mimic such a signature is 0.2%.
NTIS
Mesons; Particle Accelerators

20070020385 Fermi National Accelerator Lab., Batavia, IL, USA, Academy of Sciences (USSR), Novosibirsk, Russian Federation
Electron Beam Generation in Tevatron Electron Lenses
Kamerdzhiev, V.; Kuznetsov, G.; Shiltsev, V.; Solyak, N.; Tiunov, M.; Aug. 01, 2006; 7 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-897266; FERMILAB-CONF-06-308-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

New type of high perveance electron guns with convex cathode has been developed. Three guns described in this article are built to provide transverse electron current density distributions needed for Electron Lenses for beam-beam compensation in the Tevatron collider. The current distribution can be controlled either by the gun geometry or by voltage on a special control

electrode located near cathode. We present the designs of the guns and report results of beam measurements on the test bench. Because of their high current density and low transverse temperature of electrons, electron guns of this type can be used in electron cooling and beam-beam compensation devices.
NTIS
Electron Beams; Electron Optics; Lenses; Particle Accelerators

20070020387 California Univ., San Diego, CA, USA, European Organization for Nuclear Research, Geneva, Switzerland, California Univ., Los Angeles, CA, USA, Fermi National Accelerator Lab., Batavia, IL, USA
CMS DAQ Event Builder Based on Gigabit Ethernet
Pieri, M.; Maron, G.; Brett, A.; Cano, E.; Cittolin, S.; Jun. 01, 2006; 7 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-897264; FERMILAB-CONF-06-449-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The CMS Data Acquisition system is designed to build and filter events originating from approximately 500 data sources from the detector at a maximum Level 1 trigger rate of 100 kHz and with an aggregate throughput of 100 GByte/s. For this purpose different architectures and switch technologies have been evaluated. Events will be built in two stages: the first stage, the FED Builder, will be based on Myrinet technology and will pre-assemble groups of about 8 data sources. The next stage, the Readout Builder, will perform the building of full events. The requirement of one Readout Builder is to build events at 12.5 kHz with average size of 16 kBytes from 64 sources. In this paper we present the prospects of a Readout Builder based on TCP/IP over Gigabit Ethernet. Various Readout Builder architectures that we are considering are discussed. The results of throughput measurements and scaling performance are outlined as well as the preliminary estimates of the final performance. All these studies have been carried out at our test-bed farms that are made up of a total of 130 dual Xeon PCs interconnected with Myrinet and Gigabit Ethernet networking and switching technologies.
NTIS
Data Acquisition; Ethernet; Detectors

20070020388 Fermi National Accelerator Lab., Batavia, IL, USA
Roll Measurement of Tevatron Dipoles and Quadrupoles
Volk, J. T.; Elementi, L.; Gollwitzer, K.; Jostlein, H.; Norbrega, F.; January 2006; 7 pp.; In English
Report No.(s): DE2007-897260; FERMILAB-CONF-06-335-AD; No Copyright; Avail.: Department of Energy Information Bridge

In 2003 a simple digital level system was developed to allow for rapid roll measurements of all dipoles and quadrupoles in the Tevatron. The system uses a Mitutoyo digital level and a PC running MS WINDOWS XP and LAB VIEW to acquire data on the upstream and downstream roll of each magnet. The system is sufficiently simple that all 1,000 magnets in the Tevatron can be measured in less than 3 days. The data can be quickly processed allowing for correction of rolled magnets by the Fermilab alignment group. Data will be presented showing the state of the Tevatron in 2003 and the changes in rolls as measured in each shutdown since then.
NTIS
Particle Accelerators; Quadrupoles; Roll

20070020389 Fermi National Accelerator Lab., Batavia, IL, USA, Technische Hochschule, Aachen, Germany
Search for R-Parity Violating Supersymmetry with the D0 Detector
Autermann, C.; January 2006; 4 pp.; In English
Report No.(s): DE2007-897261; FERMILAB-CONF-06-367-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Searches for R-parity violating supersymmetry with the D0 detector at the Fermilab Tevatron p(bar p)-collider are presented. In the case of non-zero LL(bar E) couplings (lambda)(sub ijk) (approx.)\g 0.01, multi-lepton final states, and for a small coupling (lambda)(sub 122) \h\h 0.01 di-muon final states are studied. The case of non-zero LQ(bar D) coupling (lambda)(prime)(sub 211) leads to final states with two muons and jets. A total integrated luminosity of 0.38 fb(sup -1) collected between April 2002 and August 2004 is utilized. The observed numbers of events are in agreement with the Standard Model expectation, and limits on R(sub p) supersymmetry are derived, extending significantly previous bounds.
NTIS
Parity; Particle Accelerators; Supersymmetry

20070020391 Fermi National Accelerator Lab., Batavia, IL, USA
Status of the CDF Silicon Detector
Grinstein, S.; May 2006; 4 pp.; In English
Report No.(s): DE2007-897258; FERMILAB-CONF-05-611-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The CDF Run II silicon micro-strip detector is an essential part of the heavy flavor tagging and forward tracking capabilities of the experiment. Since the commissioning period ended in 2002, about 85% of the 730 k readout channels have been consistently provided good data. A summary of the recent improvements in the DAQ system as well as experience of maintaining and operating such a large, complex detector are presented.
NTIS
Particle Accelerators; Semiconductors (Materials); Silicon

20070020392 Fermi National Accelerator Lab., Batavia, IL, USA
B(sup 0)(Sub s) Mixing at CDF
Piedra, J.; January 2006; 8 pp.; In English
Report No.(s): DE2007-897256; FERMILAB-CONF-05-628-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The Tevatron collider at Fermilab provides a very rich environment for the study of b-hadrons. One of the most important analyses within the B physics program of the CDF experiment is B(sub s)(sup 0) mixing. Since the time this school was held, several improvements in the B(sub s)(sup 0) mixing analysis have made possible the measurement of the B(sub s)(sup 0) oscillation frequency, result that has been presented at the FPCP 2006 Conference.
NTIS
Elementary Particles; Hadrons; Particle Accelerators

20070020393 Fermi National Accelerator Lab., Batavia, IL, USA, New Mexico Univ., Albuquerque, NM, USA
Latest Results on Orbitally Excited Strange Bottom Mesons with the CDF II Detector
Gorelov, I. V.; Oct. 2006; 5 pp.; In English
Report No.(s): DE2007-897255; FERMILAB-CONF-06-395-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors present the latest results on the spectroscopy of orbitally excited strange bottom mesons from (approx.) 1 fb(sup -1) of CDF data. The measurements are performed with fully reconstructed B decays collected by the CDF II detector at (radical)s = 1.96 TeV in both the dimuon and the fully hadronic trigger paths.
NTIS
Mesons; Particle Accelerators

20070020394 Fermi National Accelerator Lab., Batavia, IL, USA, Notre Dame Univ., IN, USA
SUSY Higgs Searches at D0, Tevatron
Mal, P. K.; January 2006; 4 pp.; In English
Report No.(s): DE2007-897254; FERMILAB-CONF-06-398-E; No Copyright; Avail.: National Technical Information Service (NTIS)

During Run II of the Tevatron collider, D0 collaboration has made extensive searches for the neutral MSSM Higgs bosons ((phi)), produced in p(bar p) collisions at (radical)s = 1.96 TeV. Two such analyses, addressing inclusive (phi) production with (phi) (yields) (tau)(sup +)(tau)(sup -), and associated (phi)b(b) production with (phi) (yields) b(bar b) are reported here. No excess of events above the background expectation has been observed in any of these analyses. The results are combined to set constraints on the MSSM parameter space.
NTIS
Higgs Bosons; Particle Accelerators

20070020395 Fermi National Accelerator Lab., Batavia, IL, USA, Centre National de la Recherche Scientifique, Orsay, France

Search for Physics beyond the Standard Model at the Tevatron

Grivaz, J. F.; January 2006; 10 pp.; In English

Report No.(s): DE2007-897252; FERMILAB-CONF-06-402-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Recent searches for physics beyond the standard model at the Tevatron are reported, with emphasis on supersymmetry.

NTIS

Particle Accelerators; Standard Model (Particle Physics)

20070020396 Fermi National Accelerator Lab., Batavia, IL, USA, Ohio State Univ., Columbus, OH, USA

Search for Low Mass Higgs at the Tevatron

Kilminster, B.; Oct. 2006; 4 pp.; In English

Report No.(s): DE2007-897251; FERMILAB-CONF-06-407-E; No Copyright; Avail.: National Technical Information Service (NTIS)

We present CDF and D0 searches for a Standard Model Higgs boson produced associatively with a W or Z boson at (radical)s = 1.96 TeV using up to 1 fb(sup -1) of analyzed Tevatron data collected from February 2002 to February 2006. For Higgs masses less than 135 GeV/c(sup 2), as is favored by experimental and theoretical constraints, W(sup (+-)) H (yields) (ell)(sup (+-))(nu)b(bar b), ZH (yields) (ell)(sup +)(ell)(sup -) b(bar b), and ZH (yields) (nu)(bar (nu))b(bar b) are the most sensitive decay channels to search for the Higgs boson. Both CDF and D0 have analyzed these three channels and found no evidence for Higgs production, and therefore set upper limits on the Higgs production cross-section. While the analyses are not yet sensitive to Standard Model Higgs production, improvements in analysis techniques are increasing sensitivity to the Higgs much faster than added luminosity alone.

NTIS

Higgs Bosons; Mass; Particle Accelerators

20070020397 Fermi National Accelerator Lab., Batavia, IL, USA, European Organization for Nuclear Research, Geneva, Switzerland

Update on the Next-to-Leading order Monte Carol MCFM

Ellis, R. K.; January 2006; 4 pp.; In English

Report No.(s): DE2007-897249; FERMILAB-CONF-06-445-T; No Copyright; Avail.: National Technical Information Service (NTIS)

The current status of the parton level, next-to-leading order Monte Carlo program MCFM is described.

NTIS

Elementary Particles; Monte Carlo Method; Quantum Theory

20070020398 Fermi National Accelerator Lab., Batavia, IL, USA, Liverpool Univ., UK

Rare B Decays at CDF

Farrington, S. M.; January 2006; 4 pp.; In English

Report No.(s): DE2007-897248; FERMILAB-CONF-405-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The confidence level limits of the CDF search for the B(sub s)(sup 0) and B(sub d)(sup 0) (yields) (mu)(sup +)(mu)(sup -) rare decays and the branching ratio measurement of B(sub s)(sup 0) (yields) D(sub s)(sup +) D(sub s)(sup -) are presented.

NTIS

Particle Accelerators; Decay

20070020399 Fermi National Accelerator Lab., Batavia, IL, USA, Helsinki Univ., Helsinki, Finland

Status and Performance of the CDF Run II Silicon Detector (FERMILAB-CONF-06-390-E)

Maki, T.; Oct. 2006; 5 pp.; In English

Report No.(s): DE2007-897247; FERMILAB-CONF-06-390E; No Copyright; Avail.: National Technical Information Service (NTIS)

The CDF silicon detector is one of the largest silicon detectors in operation. It has a total of 722,432 electronic channels,

and it covers a sensor surface area of 6 m(sup 2). The detector has been operating reliably for five years, and it has recorded 1.5 fb(sup -1) of data. This article discusses experiences of operating such a large, complex system as well as the longevity of the detector.
NTIS
Particle Accelerators; Silicon

20070020401 Brookhaven National Lab., Upton, NY USA
Beam-Induced Damage to the Tevatron Components and What has been Done About it
Mokhov, N. V.; Czarapata, P. C.; Drozhdin, A. I.; Still, D. A.; Samulyak, R. V.; Nov. 2006; 5 pp.; In English
Report No.(s): DE2007-897246; FERMILAB-CONF-06/415-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

A beam-induced damage to the Tevatron collimators happened in December 2003 was induced by a failure in the CDF Roman Pot detector positioning during the collider run. Possible scenarios of this failure resulted in an excessive halo generation and superconducting magnet quench have been studied via realistic simulations using the STRUCT and MARS14 codes. It is shown that the interaction of a misbehaved proton beam with the collimators result in a rapid local heating and a possible damage. A detailed consideration is given to the ablation process for the collimator material taking place in high vacuum. It is shown that ablation of tungsten (primary collimator) and stainless steel (secondary collimator) jaws results in creation of a groove in the jaw surface as was observed after the December's accident. The actions undertaken to avoid such an accident in future are described in detail.
NTIS
Damage; Particle Accelerators

20070020409 Fermi National Accelerator Lab., Batavia, IL, USA
Cryogenics for the Supercondcuting Module Test Facility
Klebaner, A. L.; Theilacker, J. C.; Jan. 01, 2006; 8 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-897278; FERMILAB-CONF-05-639-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

A group of laboratories and universities, with Fermilab taking the lead, are constructing a superconducting cryomodule test facility (SMTF) in the Meson Detector Building (MDB) area at Fermilab. The facility will be used for testing and validating designs for both pulsed and CW systems. A multi phase approach is taken to construct the facility. For the initial phase of the project, cryogens for a single cavity cryomodule will be supplied from the existing Cryogenic Test Facility (CTF) that houses three Tevatron satellite refrigerators. The cooling capacity available for cryomodule testing at MDB results from the liquefaction capacity of the CTF cryogenic system. A cryogenic distribution system to supply cryogens from CTF to MDB is under construction. This paper describes plans, status and challenges of the initial phase of the SMTF cryogenic system.
NTIS
Cryogenics; Particle Accelerators; Superconducting Cavity Resonators; Test Facilities

20070020414 Kansas State Univ., Manhattan, KS, USA, Brookhaven National Lab., Upton, NY USA
Readout System for Arrays of Frisch-ring CdZnTe Detectors
Cui, Y.; Bolotnikov, A. E.; Camarda, G. S.; DeGeronimo, G.; OConnor, P.; Oct. 29, 2006; 7 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2007-897475; BNL--77141-2006-CP; No Copyright; Avail.: Department of Energy Information Bridge

Frisch-ring CdZnTe detectors have demonstrated good energy resolution for identifying isotopes, \h1% FWHM at 662 keV, and good efficiency for detecting gamma rays. We will fabricate and test at Brookhaven National Laboratory an integrated module of a 64-element array of 6 x 6 x 12 mm(sup 3) Frisch-ring detectors, coupled with a readout electronics system. It supports 64 readout channels, and includes front-end electronics, signal processing circuit, USB interface and high-voltage power supply. The data-acquisition software is used to process the data stream, which includes amplitude and timing information for each detected event. This paper describes the design and assembly of the detector modules, readout electronics, and a conceptual prototype system. Some test results are also reported.
NTIS
Readout; Semiconductors (Materials)

20070020415 Fermi National Accelerator Lab., Batavia, IL, USA, Stanford Linear Accelerator Center, CA, USA
Benchmarking, Crosschecking DFS in the ILC Main Linac
Smith, J. C.; Eliasson, P. E.; Latina, A.; Schulte, D.; Poirier, F.; Jan. 01, 2007; 11 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-897464; SLAC-TN-06-035; No Copyright; Avail.: National Technical Information Service (NTIS)

In an effort to compare beam dynamics and create a 'benchmark' for Dispersion Free Steering (DFS) a comparison was made between different ILC simulation programs while performing DFS. This study consisted of three parts. First, a simple betatron oscillation was tracked through each code. Secondly, a set of component misalignments and corrector settings generated from one program was read into the others to confirm similar emittance dilution. Thirdly, given the same set of component misalignments DFS was performed independently in each program and the resulting emittance dilution was compared. Performance was found to agree exceptionally well in all three studies.
NTIS
Beam Steering; Linear Accelerators

20070020423 California Univ., Santa Cruz, CA, USA
Search for D0-anti-D0 Mixing with the BaBar Experiment
Wilson, M. G.; Jan. 01, 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-897442; SLAC-PUB-12154; No Copyright; Avail.: Department of Energy Information Bridge

The results of searches for D(sup 0)-(bar D)(sup 0) mixing in the decays D(sup 0) (yields) K(sup +)(pi)(sup -)(pi)(sup 0) and D(sup 0) (yields) K(sup +)(pi)(sup -)(pi)(sup +)(pi)(sup -), using 230 fb(sup -1) of e(sup +)e(sup -) collisions collected from the BABAR detector at the PEP-II storage ring at SLAC, are presented. The combination of results from these analyses yields a value for the time-integrated mixing rate R(sub M) = (0.020(sub -0.010)(sup +0.011)(stat.))%, and an upper limit R(sub M) \h 0.042% at the 95% confidence level. The data in these analyses are consistent with the no-mixing hypothesis at the 2.1% confidence level.
NTIS
High Energy Interactions; Confidence Limits

20070020441 Iowa State Univ. of Science and Technology, Ames, IA USA
Structure, Ionic Conductivity and Mobile Carrier Density in Fast Ionic Conducting Chalcogenide Glasses
Yao, W.; Dec. 12, 2006; 148 pp.; In English
Contract(s)/Grant(s): DE-AC02-07CH11358
Report No.(s): DE2007-897364; IS-T 2687; No Copyright; Avail.: Department of Energy Information Bridge

The first section gives the basic research background on the ionic conduction mechanism in glass, polarization in the glass, and the method of determining the mobile carrier density in glass. The proposed work is also included in this section. The second section is a paper that characterizes the structure of MI + M(sub 2)S + (0.1 Ga(sub 2)S(sub 3) + 0.9 GeS(sub 2)) (M = Li, Na, K and Cs) glasses using Raman and IR spectroscopy. Since the ionic radius plays an important role in determining the ionic conductivity in glasses, the glass forming range for the addition of different alkalis into the basic glass forming system 0.1 Ga(sub 2)S(sub 3) + 0.9 GeS(sub 2) was studied. The study found that the change of the alkali radius for the same nominal composition causes significant structure change to the glasses. The third section is a paper that investigates the ionic conductivity of MI + M(sub 2)S + (0.1Ga(sub 2)S(sub 3) + 0.9 GeS(sub 2)) (M = Li, Na, K and Cs) glasses system. Corresponding to the compositional changes in these fast ionic conducting glasses, the ionic conductivity shows changes due to the induced structural changes. The ionic radius effect on the ionic conductivity in these glasses was investigated. The fourth section is a paper that examines the mobile carrier density based upon the measurements of space charge polarization. For the first time, the charge carrier number density in fast ionic conducting chalcogenide glasses was determined. The experimental impedance data were fitted using equivalent circuits and the obtained parameters were used to determine the mobile carrier density. The influence of mobile carrier density and mobility on the ionic conductivity was separated. The fifth section is a paper that studies the structures of low-alkali-content Na(sub 2)S + B(sub 2)S(sub 3) (x (le) 0.2) glasses by neutron and synchrotron x-ray diffraction. Similar results were obtained both in neutron and synchrotron x-ray diffraction experiments. The results provide direct structural evidence that doping B(sub 2)S(sub 3) with Na(sub 2)S creates a large fraction of tetrahedrally coordinated boron in the glass. The final section is the general conclusion of this thesis and the suggested future work that could be conducted to expand upon this research.
NTIS
Boron; Chalcogenides; Glass; Ion Currents

20070020443 Old Dominion Univ., Norfolk, VA, USA, Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

Counting Rules, Holographic Wave Functions, Meromorphization and Quark-Hadron Duality

Radyushkin, A. V.; May 11, 2006; 8 pp.; In English

Contract(s)/Grant(s): DE-AC05-84ER40150

Report No.(s): DE2007-897358; JLAB-THY-07-613; DOE/ER/40150-4199; No Copyright; Avail.: Department of Energy Information Bridge

We start with study of the meson form factor F(sub M) (Q(sup 2)) constructed using recently proposed holographic light-front wave functions. We find that its asymptotic behavior is generated by soft Feynman mechanism rather than by short distance dynamics. In this scenario, both hard and soft contributions are present, and the 'observed' quark counting rules for hadronic form factors is an approximate and transitional phenomenon resulting from long-distance dynamics, Feynman mechanism in its preasymptotic regime.

NTIS

Counting; Hadrons; Holography; Quarks; Wave Functions

20070020478 Jefferson (Thomas) National Accelerator Facility, Newport News, VA, USA

Happex: Starange Quarks in the Proton and 4He

Michaels, R.; Oct. 01, 2006; 6 pp.; In English

Contract(s)/Grant(s): DE-AC05-84ER40150

Report No.(s): DE2007-897294; JLAB-PHY-06-584; DOE/ER/40150-4195; No Copyright; Avail.: Department of Energy Information Bridge

HAPPEX results from our 2005 run for the parity-violating asymmetry A(sub PV) in elastic scattering of 3 GeV electrons off hydrogen and (sup 4)He targets at ((theta)(sub lab)) (approx) 6.0(sup o) are presented. The (sup 4)He result is A(sub PV) = (+6.40 (+-) 0.23 (stat) (+-) 0.12 (syst)) x 10(sup -6). The hydrogen result is A(sub PV) = (-1.58 (+-) 0.12 (stat) (+-) 0.04 (syst)) x 10(sup -6). The asymmetry for hydrogen is a linear combination of G(sub E)(sup s) and G(sub M)(sup s), the strange quark contributions to the electric and magnetic form factors of the nucleon, respectively, and that for (sup 4)He is a function of G(sub E)(sup s) alone. The measurements imply G(sub E)(sup s) + 0.09 G(sub M)(sup s) = 0.007 (+-) 0.011 (+-) 0.006 at \hQ(sup 2)\g = 0.109 GeV(sup 2) and G(sub E)(sup s) = 0.002 (+-) 0.014 (+-) 0.007 at \hQ(sup 2)\g = 0.077GeV(sup 2).

NTIS

Protons; Quarks

20070020479 Fermi National Accelerator Lab., Batavia, IL, USA

Analog Signal Pre-Processing for the Fermilab Main Injectore BPM Upgrade

Saewert, A. L.; Rapisarda, S. M.; Wendt, M.; May 01, 2006; 11 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CH03000

Report No.(s): DE2007-897289; FERMILAB-CONF-06-118-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

An analog signal pre-processing scheme was developed, in the framework of the Fermilab Main Injector Beam Position Monitor (BPM) Upgrade, to interface BPM pickup signals to the new digital receiver based read-out system. A key component is the 8-channel electronics module, which uses separate frequency selective gain stages to acquire 53 MHz bunched proton, and 2.5 MHz anti-proton signals. Related hardware includes a filter and combiner box to sum pickup electrode signals in the tunnel. A controller module allows local/remote control of gain settings and activation of gain stages, and supplies test signals. Theory of operation, system overview, and some design details are presented, as well as first beam measurements of the prototype hardware.

NTIS

Beams (Radiation); Particle Accelerators; Signal Processing

20070020480 Fermi National Accelerator Lab., Batavia, IL, USA

Sonic Helium Detectors in the Fermilab Tevatron

Bossert, R. J.; Jan. 01, 2006; 8 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CH03000

Report No.(s): DE2007-897281; FERMILAB-CONF-05-642-AD; No Copyright; Avail.: Department of Energy Information Bridge

In the Fermilab Tevatron cryogenic system there are many remotely located low-pressure plate relief valves that must vent

large volumes of cold helium gas when magnet quenches occur. These valves can occasionally stick open or not reseat completely, resulting in a large helium loss. As such, the need exists for a detector to monitor the relief valve's discharge area for the presence of helium. Due to the quantity needed, cost is an important factor. A unit has been developed and built for this purpose that is quite inexpensive. Its operating principle is based on the speed of sound, where two closely matched tubes operate at their acoustic resonant frequency. When helium is introduced into one of these tubes, the resulting difference in acoustic time of flight is used to trigger an alarm. At present, there are 39 of these units installed and operating in the Tevatron. They have detected many minor and major helium leaks, and have also been found useful in detecting a rise in the helium background in the enclosed refrigerator buildings. This paper covers the construction, usage and operational experience gained with these units over the last several years.
NTIS
Acoustics; Helium; Particle Accelerators

20070020481 Fermi National Accelerator Lab., Batavia, IL, USA, High Energy Accelerator Research Organization, Ibaraki, Japan, Northern Illinois Univ., De Kalb, IL, USA
Update for the MuCool Test Area
Bross, M.; Cummings, M. A.; Drave, S.; Ishimoto, I.; Klebaner, A.; Jan. 01, 2006; 8 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-897280; FERMILAB-05-641-AD-E-TD; No Copyright; Avail.: National Technical Information Service (NTIS)

Construction of a new facility known as the MuCool Test Area (MTA) has been completed at Fermi National Accelerator Laboratory. This facility supports research in new accelerator technologies for future endeavors such as a Neutrino Factory or Muon Collider. During the summer of 2004, an initial set of tests was completed for the filling of a convection-style liquid hydrogen absorber designed by KEK. The absorber contained 6.2 liquid liters of hydrogen and was tested for a range of heating conditions to quantify the absorber's heat exchanger performance. Future work at Fermilab includes the design, construction, and installation of a forced-flow absorber to be used with other components built to investigate the properties of a muon ionization cooling channel. A Tevatron-style refrigerator/compressor building is to be operational by spring of 2006 in support of the absorber tests and also to provide 5-K helium and liquid nitrogen to a 5-T solenoid magnet, an active element of the future test apparatus. The refrigerator will be configured in such a manner as to meet the 5 K and 14-20-K helium needs of the MTA. This paper reviews the challenges and successes of the past KEK absorber tests as well as looks into the future cryogenic capabilities and intentions of the site.
NTIS
Hydrogen; Muons; Neutrinos; Particle Accelerators

20070020482 Fermi National Accelerator Lab., Batavia, IL, USA
Surge Recovery Techniques for the Tevatron Cold Compressors
Martinez, A.; Klebaner, A. L.; Makara, J. N.; Theilacker, J. C.; Jan. 01, 2006; 8 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-897279; FERMILAB-CONF-05-640-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

The Fermilab Tevatron cryogenic system utilizes high-speed centrifugal cold compressors, made by Ishikawajima-Harima Heavy Industries Co. Ltd. (IHI), for high-energy operations. The compressor is designed to pump 60 g/s of 3.6 K saturated helium vapor at a pressure ratio of 2.8, with an off-design range of 40 to 70 g/s and operating speeds between 40 and 95 krpm. Since initial commissioning in 1993, Tevatron transient conditions such as quench recovery have led to multiple-location machine trips as a result of the cold compressors entering the surge regime. Historically, compressors operating at lower inlet pressures and higher speeds have been especially susceptible to these machine trips and it was not uncommon to have multiple compressor trips during large multiple-house quenches. In order to cope with these events and limit accelerator down time, surge recovery techniques have been implemented in an attempt to prevent the compressors from tripping once the machine entered this surge regime. This paper discusses the different methods of surge recovery that have been employed. Data from tests performed at the Cryogenic Test Facility at Fermilab as well as actual Tevatron operational data were utilized. In order to aid in the determination of the surge region, a full mapping study was undertaken to characterize the entire pressure field of the cold compressor.
NTIS
Compressors; Particle Accelerators; Surges

20070020492 Lawrence Livermore National Lab., Livermore, CA USA

Feasibility of Single Molecule DNA Sequencing Using Surface-Enhanced Raman Scattering

Talley, C. E.; Reboredo, F.; Chan, J.; Lane, S. M.; Feb. 07, 2006; 29 pp.; In English

Report No.(s): DE2007-899105; UCRL-TR-218737; No Copyright; Avail.: Department of Energy Information Bridge

We have used a combined theoretical and experimental approach in order to asses the feasibility of using surface-enhanced Raman scattering (SERS) for DNA sequencing at the single molecule level. We have developed a numerical tool capable of calculating the E-field and resulting SERS enhancement factors for metallic structures of arbitrary size and shape. Measurements of the additional SERS enhancement by combining SERS with coherent antistokes Raman scattering (CARS) show that only modest increases in the signal are achievable due to thermal damage at higher laser powers. Finally, measurements of the SERS enhancement from nanoparticles coated with an insulating layer show that the SERS enhancement is decreased by as much as two orders of magnitude when the molecule is not in contact with the metal surface.

NTIS

Deoxyribonucleic Acid; Molecules; Raman Spectra; Sequencing

20070020497 Lawrence Livermore National Lab., Livermore, CA USA

Electron Production and Collective Field Generation in Intense Particle Beams

Molvik, A. W.; Vay, J. L.; Cohen, R.; Friedman, A.; Lee, E.; Feb. 09, 2006; 32 pp.; In English

Report No.(s): DE2007-899098; UCRL-TR-218811; No Copyright; Avail.: National Technical Information Service (NTIS)

Electron cloud effects (ECEs) are increasingly recognized as important, but incompletely understood, dynamical phenomena, which can severely limit the performance of present electron colliders, the next generation of high-intensity rings, such as PEP-II upgrade, LHC, and the SNS, the SIS 100/200, or future high-intensity heavy ion accelerators such as envisioned in Heavy Ion Inertial Fusion (HIF). Deleterious effects include ion-electron instabilities, emittance growth, particle loss, increase in vacuum pressure, added heat load at the vacuum chamber walls, and interference with certain beam diagnostics. Extrapolation of present experience to significantly higher beam intensities is uncertain given the present level of understanding.

NTIS

Electron Beams; Electrons; Particle Beams

20070020500 Lawrence Livermore National Lab., Livermore, CA USA

Thermal Modeling Tool for a Spherical Capsule in a Sputtering Chamber

Wemhoff, A. P.; Feb. 13, 2006; 21 pp.; In English

Report No.(s): DE2007-899096; UCRL-TR-218917; No Copyright; Avail.: National Technical Information Service (NTIS)

It is known that a film's temperature during a sputtering process greatly influences its mechanical structure. Currently, there is no known tool to effectively model the temperature history of a sputtered film on a spherical capsule in a sputtering chamber. Therefore, a tool has been developed that allows for the prediction of this temperature history using a lumped capacitance approximation for the capsule. This tool has been developed as part of LLNL's Diablo II multi-mechanics code to allow for the coupling of the capsule mechanics with the finite element-based sputtering chamber mechanics. The tool incorporates three forms of heat transfer: contact heat transfer between the capsule and the walls, enclosure radiation among all surfaces, and adsorption of chamber gas on all surfaces. The physics of the system have been validated by determining less than 1% difference in simulated results of twelve test runs to values determined via analytical or finite difference approaches, and validation of eight further tests involving capsule motion provide confidence in the model.

NTIS

Sputtering; Enclosure

71
ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution*. For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion and Power*.

20070019986 Christie, Parker and Half, LLP, Pasadena, CA, USA
Acoustic Immunosensor for Detecting Neurotransmitter GABA
Muthuswamy, J., Inventor; Zhou, A., Inventor; 13 Aug 04; 23 pp.; In English
Contract(s)/Grant(s): NIH-IR43NS046088-01; NIH-R21NS41681
Patent Info.: Filed Filed 13 Aug 04; US-Patent-Appl-SN-10-917 910
Report No.(s): PB2007-104264; No Copyright; Avail.: CASI: A03, Hardcopy

Acoustic impedance immunosensors are disclosed that are capable of real-time measurement of GABA in a buffer solution. Several embodiments include a bio-specific recognition layer on a quartz crystal surface, where the bio-recognition layer is formed by molecular self-assembly on a gold electrode surface. Various real time measurements can be made by examining the impedance parameters of the quartz crystal on which the bio-specific recognition layer is located as it interacts with GABA. In one embodiment, the invention includes an electrochemical cell that possesses a working electrode. The working electrode including a layer of piezoelectric material, at least one electrode layer fixed to the piezoelectric material and a bio-specific recognition layer formed on the electrode layer and including anti-GABA. In addition, an electrochemical workstation is connected to at least one electrode of the electrochemical cell and an impedance analyzer is connected to the working electrode.
NTIS
Acoustic Impedance; Detection; Neurotransmitters

72
ATOMIC AND MOLECULAR PHYSICS

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

20070020291 Drake Univ., Des Moines, IA, USA
Low-Energy Elastic Electron Scattering by Atomic Oxygen
Zatsarinny O.; Bartschat, K.; Tayal, S. S.; Journal of Phyics B: Atomic, Molecular and Optical Physics; February 15, 2006; ISSN 0953-4075; Volume 39, pp. 1237-1249; In English
Contract(s)/Grant(s): NAG5-13340; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1088/0953-4075/39/5/021

The B-spline R-matrix method is employed to investigate the low-energy elastic electron scattering by atomic oxygen. Flexible non-orthogonal sets of radial functions are used to construct the target description and to represent the scattering functions. A detailed investigation regarding the dependence of the predicted partial and total cross sections on the scattering model and the accuracy of the target description is presented. The predicted angle-integrated elastic cross sections are in good agreement with experiment, whereas significant discrepancies are found in the angle-differential elastic cross sections near the forward direction. .The near-threshold results are found to strongly depend on the treatment of inner-core short-range correlation effects in the target description, as well as on a proper account of the target polarizability. A sharp increase in the elastic cross sections below 1 eV found in some earlier calculations is judged to be an artifact of an unbalanced description of correlation in the N-electron target structure and the (N+l)-electron-collision problems.
Author
Elastic Scattering; Electron Scattering; N Electrons; Oxygen Atoms; Scattering Functions

20070020330 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Collisions of Electrons with Atomic Oxygen: Current Status
Johnson, P. V.; Kanik, I.; Tayal, S. S.; Canadian Journal of Physics; June 2005; ISSN 1208-6045; Volume 83, No. 6, pp. 589-616; In English
Contract(s)/Grant(s): NAG5-13340; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1139/P05-034

In 1990, two significant reviews of electron-atomic-oxygen collision processes were published. Since that time, a large

volume of both experimental and theoretical research into these processes has occurred. These data are reviewed and recommendations regarding existing data sets and future research in this area are made. Attention is given to the challenges associated with handling atomic oxygen in terms of both experiment and theory.
Author
Atoms; Atomic Collisions; Oxygen Atoms; Electron Scattering; Electrons

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*.

20070019693 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Operation of Terahertz Quantum-cascade Lasers at 164 K in Pulsed Mode and at 117 K in Continuous-wave Mode
Williams, Benjamin S.; Kumar, Sushil; Hu, Qing; Reno, John L.; Optics Express; May 02, 2005; Volume 13, No. 9, pp. 3331-3339; In English; Original contains black and white illustrations
Contract(s)/Grant(s): DE-AC04-94AL8500; NNG04GC11G
Report No.(s): OSP-6895896; Copyright; Avail.: Other Sources

We report the demonstration of a terahertz quantum-cascade laser that operates up to 164 K in pulsed mode and 117 K in continuous-wave mode at approximately 3.0 THz. The active region was based on a resonant-phonon depopulation scheme and a metal-metal waveguide was used for modal confinement. Copper to copper thermocompression wafer bonding was used to fabricate the waveguide, which displayed improved thermal properties compared to a previous indium-gold bonding method.
Author
Continuous Radiation; Quantum Cascade Lasers; Quantum Well Lasers

20070019839 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Broadband Performance of TPF's High-contrast Imaging Testbed: Modeling and Simulations
Sidick, Erkin; Kuhnert, Andreas C.; Trauger, John T.; May 24, 2006; 11 pp.; In English; SPIE Astronomical Telescopes and Instrumentation, 24-31 May 2006, Orlando, FL, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39998

The broadband performance of the high-contrast imaging testbed (HCIT) at JPL is investigated through optical modeling and simulations. The analytical tool is an optical simulation algorithm developed by combining the HCIT's optical model with a speckle-nulling algorithm that operates directly on coronagraphic images, an algorithm identical to the one currently being used on the HCIT to actively suppress scattered light via a deformable mirror. It is capable of performing full three-dimensional end-to-end near-field diffraction analysis on the HCIT's optical system. By conducting speckle-nulling optimization, we clarify the HCIT's capability and limitations in terms of its broadband contrast performance under various realistic conditions. Considered cases include non-ideal occulting masks, such as a mask with optical density and wavelength dependent parasitic phase-delay errors (i.e., a not band-limited occulting mask) and the one with an optical-density profile corresponding to a measured, non-standard profile, as well as the independently measured phase errors of all optics. Most of the information gathered on the HCIT's optical components through measurement and characterization over the last several years at JPL has been used in this analysis to make the predictions as accurate as possible. The best contrast values predicted so far by our simulations obtainable on the HCIT illuminated with a broadband light having a bandwidth of 80nm and centered at 800nm wavelength are Cm=1.1x10-8 (mean) and C4=4.9x10-8 (at 4(lamda)/D), respectively. In this paper we report our preliminary findings about the broadband light performance of the HCIT.
Author
Broadband; Algorithms; Contrast; High Frequencies; Imaging Techniques; Optical Density; Simulation; Performance Prediction; Diffraction; Coronagraphs

20070019840 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

The Sensitivity of Shaped Pupil Coronagraphs to Optical Aberrations

Green, Joseph J.; Shaklan, Stuart B.; Vanderbei, Robert J.; Kasdin, N. Jeremy; June 21, 2004; 10 pp.; In English; Astronomical Telescopes and Instrumentation, Glasgow, Scotland, June 21-25, 2004, 21-25 Jun. 2004, Glasgow, Scotland, UK; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39950

Unlike focal-plane coronagraphs that use occulting spots and Lyot stops to eliminate diffraction, pupil-plane coronagraphs operate by shaping the pupil to redirect the diffracted stellar light into a tight core. As in focal-plane coronagraphs, the optical aberrations in the telescope must be sufficiently corrected to enable high contrast imaging. However, in shaped-pupil coronagraphs, the low-order aberrations resulting from misalignment and optical figure drift have a much smaller influence upon the contrast at at the inner working angle. These weaker sensitivities greatly relax the strict low-order wavefront stability required for high-contrast imaging the cost of some throughput. In this paper, we present the simulated performance of the concentric ring shaped pupil concepts comparing them to focal-plane coronagraphs that are optimized for the same inner working angles.

Author

Coronagraphs; Focusing; Pupils; Wave Fronts; Diffraction; Aberration; Telescopes; Misalignment; Imaging Techniques

20070019847 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Target Selection and Imaging Requirements for JWST Fine Phasing

Green, Joseph J.; Dean, Bruce H.; Ohara, Catherine M.; Zhang, Yan; June 21, 2004; 10 pp.; In English; SPIE Astronomical Telescopes and Instrumentation2004, 21 Jun. 2004, Glasgow, Scotland, UK; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39945

To achieve and maintain the fine alignment of its segmented primary mirror the James Webb Space Telescope (JWST) plans to use focus-diverse wavefront sensing (WFS) techniques with science camera imagery. The optical requirements for JWST are such that the error contribution from the WFS itself must be limited 10nm rms over all the controllable degrees of freedom of the telescope. In this paper, we will explore the requirements on the target selection and imaging requirements necessary to achieve the desired level of WFS accuracy. Using Monte Carlo simulations we explore the WFS error as a function of wavefront aberrations level, defocus-diversity level, optical bandwidth and imaging signal-to-noise ratio to establish the key imaging requirements. By taking into account practical integration time limits along with the distribution of the defocused point-spread functions, we establish the bright and faint star magnitude limits suitable for WFS target selection.

Author

James Webb Space Telescope; Segmented Mirrors; Imaging Techniques; Alignment; Wave Fronts; Defocusing; Monte Carlo Method; Detection

20070019856 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Image Formation in High Contrast Optical Systems: The Role of Polarization

Breckinridge, James B.; June 21, 2004; 10 pp.; In English; Astronomical Telescopes and Instrumentation, 21-25 Jun. 2004, Glasgow, Scotland, UK; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39953

To find evidence of life in the Universe outside our solar system is one of the most compelling and visionary adventures of the 21st century. The technologies to create the telescopes and instruments that will enable this discovery are now within the grasp of mankind. Direct imaging of a very faint planet around a neighboring bright star requires high contrast or a hypercontrast optical imaging system capable of controlling unwanted radiation within the system to one part in ten to the 11th. This paper identifies several physical phenomena that affect image quality in high contrast imaging systems. Polarization induced at curved metallic surfaces and by anisotropy in the deposition process (Smith-Purcell effect) along with beam shifts introduced by the Goos-Hachen effect are discussed. A typical configuration is analyzed, and technical risk mitigation concepts are discussed.

Author

Image Contrast; Imaging Techniques; Polarization; Telescopes; Image Resolution

20070019933 Lawrence Livermore National Lab., Livermore, CA USA
Two-Sided Pyramid Wavefront Sensor in the Direct Phase Mode
Phillion, D.; Baker, K.; Apr. 20, 2006; 13 pp.; In English
Report No.(s): DE2007-897956; UCRL-PROC-220733; No Copyright; Avail.: National Technical Information Service (NTIS)

The two-sided pyramid wavefront sensor has been extensively simulated in the direct phase mode using a wave optics code. The two-sided pyramid divides the focal plane so that each half of the core only interferes with the speckles in its half of the focal plane. A relayed image of the pupil plane is formed at the CCD camera for each half. Antipodal speckle pairs are separated so that a pure phase variation causes amplitude variations in the two images. The phase is reconstructed from the difference of the two amplitudes by transforming cosine waves into sine waves using the Hilbert transform. There are also other corrections which have to be applied in Fourier space. The two-sided pyramid wavefront sensor performs extremely well: After two or three iterations, the phase error varies purely in y. The two-sided pyramid pair enables the phase to be completely reconstructed. Its performance has been modeled closed loop with atmospheric turbulence and wind. Both photon noise and read noise were included. The three-sided and four-sided pyramid wavefront sensors have also been studied in direct phase mode. Neither performs nearly as well as does the two-sided pyramid wavefront sensor.
NTIS
Pyramids; Wave Fronts

20070019943 Fish and Richardson, Minneapolis, MN, USA
Optical System for Generating Three-Dimensional Images
Crossaairt, D. S., Inventor; Thomas, M., Inventor; Dorval, R. K., Inventor; Flavlora, Y. E., Inventor; 7 Mar 05; 12 pp.; In English
Contract(s)/Grant(s): 70NASNB13028
Patent Info.: Filed Filed 7 Mar 05; US-Patent-Appl-SN-11-073 913
Report No.(s): PB2007-105339; No Copyright; Avail.: CASI: A03, Hardcopy

In general, in one aspect, the invention features systems that include a spatial light modulator, a scanning optical component configured to direct light from the spatial light modulator along a plurality of different paths, a projection optical assembly including a plurality of projection lens modules corresponding to the plurality of different paths, wherein each projection lens module is configured to receive light from the spatial light modulator directed along the corresponding path and projects an image of the spatial light modulator to a common image space.
NTIS
Light Modulators; Patent Applications

20070019959 Urbano (Micheal J.), Bethlehem, PA, USA
Phase Matched Parametric Light Generation in Monolithically Integrated Intersubband Optical Devices
Beyanin, A., Inventor; Vicko, A., Inventor; Gmachi, C. F., Inventor; Malis, D., Inventor; Sergent, A. M., Inventor; 29 Mar 04; 11 pp.; In English
Contract(s)/Grant(s): DAAD1040C0096
Patent Info.: Filed Filed 29 Mar 04; US-Patent-Appl-SN-10-312 328
Report No.(s): PB2007-105337; No Copyright; Avail.: CASI: A03, Hardcopy

An optical device comprises a cavity resonator and an intracavity ridge waveguide. The ridge waveguide includes a monolithically integrated intersubband core region and a nonlinear mixing region (NMR). In response to external pumping energy the core region generates laser light at a first frequency and in a first transverse mode. In response to the laser light the NMR generates parametric light at a second frequency and in a second transverse mode. For phase matching the effective refractive index versus ridge width characteristics of the modes of the laser and the parametric light intersect one another at a phase matching width and so that, at greater widths, the effective refractive index of the mode of the higher frequency light is less than that of the lower frequency light. For true phase matching the width of the ridge is made to be essentially equal to the phase matching width.
NTIS
Cavity Resonators; Optical Equipment; Patent Applications; Waveguides

20070019964 Lawrence Livermore National Lab., Livermore, CA USA

Hard X-ray Imaging for Measuring Laser Absorption Spatial Profiles on the National Ignition Facility

Dewald, E. L.; Jones, O. S.; Landen, O. L.; Suter, L.; Amendt, P.; May 05, 2006; 15 pp.; In English

Report No.(s): DE2007-897970; UCRL-CONF-221138; No Copyright; Avail.: National Technical Information Service (NTIS)

Hard x-ray ('Thin wall') imaging will be employed on the National Ignition Facility (NIF) to spatially locate laser beam energy deposition regions on the hohlraum walls in indirect drive Inertial Confinement Fusion (ICF) experiments, relevant for ICF symmetry tuning. Based on time resolved imaging of the hard x-ray emission of the laser spots, this method will be used to infer hohlraum wall motion due to x-ray and laser ablation and any beam refraction caused by plasma density gradients. In optimizing this measurement, issues that have to be addressed are hard x-ray visibility during the entire ignition laser pulse with intensities ranging from 10(sup 13) to 10(sup 15) W/cm(sup 2), as well as simultaneous visibility of the inner and the outer laser drive cones. In this work we will compare the hard x-ray emission calculated by LASNEX and analytical modeling with thin wall imaging data recorded previously on Omega and during the first hohlraum experiments on NIF. Based on these calculations and comparisons the thin wall imaging will be optimized for ICF/NIF experiments.

NTIS

Ignition; Imaging Techniques; Lasers; X Ray Imagery; X Rays

20070020055 Mattles, Shepherd, Makay, and Bruneau, P.A., Princeton, NJ, USA

Method and System for Operating an Atomic Clock with Alternating Polarization Light

Happer, W., Inventor; Iau, Y. Y., Inventor; Kuzma, N. N., Inventor; Miron, E., Inventor; Post, A. B., Inventor; 7 Feb 05; 20 pp.; In English

Contract(s)/Grant(s): F496200110297

Patent Info.: Filed Filed 7 Feb 05; US-Patent-Appl-SN-11-052 261

Report No.(s): PB2007-105305; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides a method and apparatus for increasing the intensity of coherent population trapping (CPT) resonances, used in atomic clocks and magnetometers, by pumping the atoms with light of alternating polarization. Pumping with such light, characterized by a photon spin vector that alternates in direction at a hyperfine frequency of the atoms at the location of the atoms, is referred to as push-pull pumping. In one embodiment of the system of the present invention, alkali-metal vapor is pumped with alternating circular-polarization D1 laser light that is intensity modulated at appropriate resonance frequencies, thereby exciting CPT resonances, which can be observed as increase in the mean transmittance of the alkali-metal vapor. These resonances are substantially enhanced due to an optically-induced concentration of atoms in the resonant energy sublevels.

NTIS

Atomic Clocks; Patent Applications; Polarized Light; Populations; Trapping

20070020158 Swedish Defence Research Establishment, Linkoeping, Sweden

Characterization of a Micromachined Membrane Deformable Mirror

Larsson, U.; May 2006; 36 pp.; In English

Report No.(s): PB2007-107281; FOI-R-1917-SE; No Copyright; Avail.: CASI: A03, Hardcopy

The purpose of this work was to evaluate a 37 channel micro machined membrane deformable mirror which is a component used in adaptive optics. Several transfer functions with different mirror bias shapes were determined and analyzed. An interferometer was used to measure and to evaluate the transfer functions. The capacity of the mirror to produce wave fronts containing single Zemike coefficients was tested with an open loop scheme. A closed loop scheme was used for one of the transfer functions to construct three different Zemike polynomials. The results show that the mirror has a capacity to produce wave fronts using Zernike polynomials with coefficient values that have the magnitude of a few radians measured relative the bias. The number of the mirror eigen modes used in the wave front reconstruction was found to be of major importance. The closed loop reconstruction scheme enhanced the results in comparison to the open loop scheme.

NTIS

Deformable Mirrors; Membranes; Micromachining

20070020286 Reid (Thelen) and Pries, LLP, San Jose, CA, USA, California Inst. of Tech., Pasadena, CA USA
Ion Exchange Waveguides and Methods Fabrication
Burrows, L. J., Inventor; 16 Aug 04; 13 pp.; In English
Contract(s)/Grant(s): F-19628-95-C-0002
Patent Info.: Filed Filed 16 Aug 04; US-Patent-Appl-SN-10-919 695
Report No.(s): PB2007-102428; No Copyright; Avail.: CASI: A03, Hardcopy

A method for fabricating ion exchange waveguides, such as lithium niobate or lithium tantalate waveguides in optical modulators and other optical waveguide devices, utilizes pressurized annealing to further diffuse and limit exchange of the ions and includes ion exchanging the crystalline substrate with a source of ions and annealing the substrate by pressurizing a gas atmosphere containing the lithium niobate or lithium tantalate substrate above normal atmospheric pressure, heating the substrate to a temperature ranging from about 150 degrees Celsius to about 1000 degrees Celsius, maintaining pressure and temperature to effect greater ion diffusion and limit exchange, and cooling the structure to an ambient temperature at an appropriate ramp down rate. In another aspect of the invention a powder of the same chemical composition as the crystalline substrate is introduced into the anneal process chamber to limit the crystalline substrate from outgassing alkaline earth metal oxide during the anneal period. In yet another aspect of the invention an anneal container is provided that allows for crystalline substrates to be annealed in the presence of powder without contaminating the substrate with the powder during the anneal process. Waveguides manufactured in accordance with the method exhibit superior drift performance.
NTIS
Fabrication; Ion Exchanging; Optical Waveguides; Patent Applications; Waveguides

20070020484 Swedish Defence Research Establishment, Linkoeping, Sweden
Numerical Simulation of a Flashlamp Pumped Nd:YAG Laser (Numerisk Simulering av en Blixlampspumpad Nd:YAG Laser)
Henriksson, M.; Sjoeqvist, L.; Sep. 2005; 56 pp.; In English
Report No.(s): PB2007-103408; FOI-R-1710-SE; No Copyright; Avail.: National Technical Information Service (NTIS)

A numeric model has been developed to identify the critical components and parameters in improving the output beam quality of a flashlamp-pumped Q-switched Nd: YAG laser with a folded Porro-prism resonator and polarization output coupling. The heating of the laser material and accompanying thermo-optical effects are calculated using the finite element partial differential equations package FEMLAB allowing arbitrary geometries and time distributions. The laser gain and the cavity are modeled with the physical optics simulation code GLAD including effects such as gain profile, thermal lensing and stress-induced birefringence, the Pockels cell rise-time and component aberrations. The model is intended to optimize the pumping process of an OPO providing radiation to be used for ranging or active imaging.
NTIS
Flash Lamps; Lasers; Neodymium Lasers; YAG Lasers

20070020493 Lawrence Livermore National Lab., Livermore, CA USA
Acoustic Longitudinal Field NIF Optic Feature Detection Map Using Time-Reversal and MUSIC
Lehman, S. K.; Feb. 27, 2006; 41 pp.; In English
Report No.(s): DE2007-899101; UCRL-TR-219349; No Copyright; Avail.: National Technical Information Service (NTIS)

We developed an ultrasonic longitudinal field time-reversal and MUltiple SIgnal Classification (MUSIC) based detection algorithm for identifying and mapping flaws in fused silica NIF optics. The algorithm requires a fully multistatic data set, that is one with multiple, independently operated, spatially diverse transducers, each transmitter of which, in succession, launches a pulse into the optic and the scattered signal measured and recorded at every receiver. We have successfully localized engineered defects larger than 1 mm in an optic. We confirmed detection and localization of 3 mm and 5 mm features in experimental data, and a 0.5 mm in simulated data with sufficiently high signal-to-noise ratio. We present the theory, experimental results, and simulated results.
NTIS
Acoustics; Ignition; Music; Sound Fields

20070020505 Sandia National Labs., Albuquerque, NM USA
Laser Based Micro Forming and Assembly
Palmer, J. S.; Knorovsky, G. A.; MacCallum, D. O.; Steyskal, M.; Scherzinger, W. M.; Nov. 01, 2006; 65 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-899077; SAND2006-7239; No Copyright; Avail.: National Technical Information Service (NTIS)

It has been shown that thermal energy imparted to a metallic substrate by laser heating induces a transient temperature

gradient through the thickness of the sample. In favorable conditions of laser fluence and absorptivity, the resulting inhomogeneous thermal strain leads to a measurable permanent deflection. This project established parameters for laser micro forming of thin materials that are relevant to MESA generation weapon system components and confirmed methods for producing micrometer displacements with repeatable bend direction and magnitude. Precise micro forming vectors were realized through computational finite element analysis (FEA) of laser-induced transient heating that indicated the optimal combination of laser heat input relative to the material being heated and its thermal mass. Precise laser micro forming was demonstrated in two practical manufacturing operations of importance to the DOE complex: micrometer gap adjustments of precious metal alloy contacts and forming of meso scale cones.
NTIS
Lasers; Forming Techniques

75
PLASMA PHYSICS

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

20070020285 BBWI, Idaho Falls, ID, USA
Plasma Generators, Reactor Systems and Related Methods
Kong, P. C., Inventor; Pink, R. J., Inventor; Lee, J. E., Inventor; 2 Dec 03; 23 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID13727
Patent Info.: Filed Filed 2 Dec 03; US-Patent-Appl-SN-10-727 033
Report No.(s): PB2007-102431; No Copyright; Avail.: CASI: A03, Hardcopy

A plasma generator, reactor and associated systems and methods are provided in accordance with the present invention. A plasma reactor may include multiple sections or modules which are removably coupled together to form a chamber. Associated with each section is an electrode set including three electrodes with each electrode being coupled to a single phase of a three-phase alternating current (AC) power supply. The electrodes are disposed about a longitudinal centerline of the chamber and are arranged to provide and extended arc and generate an extended body of plasma. The electrodes are displaceable relative to the longitudinal centerline of the chamber. A control system may be utilized so as to automatically displace the electrodes and define an electrode gap responsive to measure voltage or current levels of the associated power supply.
NTIS
Patent Applications; Plasma Generators

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*.

20070019976 Yoder (Patrick S.), Houston, TX, USA
Quench Monitoring and Control System and Method of Operating Same
Ryan, D. T., Inventor; Laskaris, E. T., Inventor; Huang, M., Inventor; 30 Mar 04; 8 pp.; In English
Contract(s)/Grant(s): DEFC3602601100
Patent Info.: Filed Filed 30 Mar 04; US-Patent-Appl-SN-10-813 281
Report No.(s): PB2007-105837; No Copyright; Avail.: CASI: A02, Hardcopy

A rotating machine comprising a superconductive coil and a temperature sensor operable to provide a signal representative of superconductive coil temperature. The rotating machine may comprise a control system communicatively coupled to the temperature sensor. The control system may be operable to reduce electric current in the superconductive coil when a signal representative of a defined superconducting coil temperature is received from the temperature sensor.
NTIS
Patent Applications; Superconductivity; Coils; Quenching (Cooling)

20070019993 Myers Bigel Sibley and Sajovec, Raleigh, NC, USA
Nitride-Based Transistors with a Protective Layer and a Low-Damage Recess and Methods of Fabrication Thereof
Sheppard, S. T., Inventor; Smith, R. P., Inventor; Ring, Z., Inventor; 16 Jan 04; 16 pp.; In English
Patent Info.: Filed Filed 16 Jan 04; US-Patent-Appl-SN-10-758 871
Report No.(s): PB2007-104258; No Copyright; Avail.: CASI: A03, Hardcopy

Transistors are fabricated by forming a nitride-based semiconductor barrier layer on a nitride-based semiconductor channel layer and forming a protective layer on a gate region of the nitride-based semiconductor barrier layer. Patterned ohmic contact metal regions are formed on the barrier layer and annealed to provide first and second ohmic contacts. The annealing is carried out with the protective layer on the gate region. A gate contact is also formed on the gate region of the barrier layer. Transistors having protective layer in the gate region are also provided as are transistors having a barrier layer with a sheet resistance substantially the same as an as-grown sheet resistance of the barrier layer.
NTIS
Damage; Fabrication; Nitrides; Recesses; Transistors

20070020181 Fermi National Accelerator Lab., Batavia, IL, USA
Magnetization Anomaly of Nb3Al Strands and Instability of Nb3Al Rutherford Cables
Yamada, R.; Kikuchi, A.; Wake, M.; Aug. 01, 2006; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-897563; FERMILAB-CONF-06-357-TD; No Copyright; Avail.: National Technical Information Service (NTIS)

Using a Cu stabilized Nb(sub 3)Al strand with Nb matrix, a 30 meter long Nb(sub 3)Al Rutherford cable was made by a collaboration of Fermilab and NIMS. Recently the strand and cable were tested. In both cases instability was observed at around 1.5 Tesla. The magnetization of this Nb(sub 3)Al strand was measured first using a balanced coil magnetometer at 4.2 K. Strands showed an anomalously large magnetization behavior around at 1.6 T, which is much higher than the usual B(sub c2) (approx) 0.5 Tesla (4.2 K) of Nb matrix. This result is compared with the magnetization data of short strand samples using a SQUID magnetometer, in which a flux-jump signal was observed at 0.5 Tesla, but not at higher field. As a possible explanation for this magnetization anomaly, the interfilament coupling through the thin Nb films in the strands is suggested. The instability problem observed in low field tests of the Nb(sub 3)Al Rutherford cables is attributed to this effect.
NTIS
Anomalies; Magnetization; Strands

20070020186 Fermi National Accelerator Lab., Batavia, IL, USA
Development of Rutherford-type Cables for High Field Accelerator Magnets at Fermilab
Andreev, N.; Barzi, E.; Borissov, E.; Elementi, L.; Kashikhin, V. S.; Aug. 01, 2006; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-897582; FERMILAB-CONF-06-323-TD; No Copyright; Avail.: National Technical Information Service (NTIS)

Fermilab's cabling facility has been upgraded to a maximum capability of 42 strands. This facility is being used to study the effect of cabling on the performance of the various strands, and for the development and fabrication of cables in support of the ongoing magnet R&D programs. Rutherford cables of various geometries, packing factors, with and without a stainless steel core, were fabricated out of Cu alloys, NbTi, Nb(sub 3)Al, and various Nb(sub 3)Sn strands. The parameters of the upgraded cabling machine and results of cable R&D efforts at Fermilab are reported.
NTIS
High Field Magnets; Alloys; Accelerators

20070020278 OMelveny and Meyers, Irvine, CA, USA, Superconductor Technologies, Inc., Santa Barbara, CA, USA
Growth of In-Situ Thin Films by Reactive Evaporation
Moeckly, B. H., Inventor; Ruby, W. S., Inventor; 1 Dec 03; 24 pp.; In English
Contract(s)/Grant(s): N00014-03-M-00054
Patent Info.: Filed Filed 1 Dec 03; US-Patent-Appl-SN-10-726 232
Report No.(s): PB2007-102434; No Copyright; Avail.: CASI: A03, Hardcopy

A method of forming MgB(sub 2) films in-situ on a substrate includes the steps of (1) depositing boron onto a surface of the substrate in a deposition zone; (2) moving the substrate into a reaction zone containing pressurized, gaseous magnesium;

(3) moving the substrate back into the deposition zone; and (4) repeating steps (1)-(3). In a preferred embodiment of the invention, the substrate is moved into and out of the deposition zone and the reaction zone using a rotatable platen.
NTIS
Borides; Evaporation; Magnesium; Patent Applications; Reactivity; Superconductors (Materials); Thin Films

20070020283 North Carolina Agricultural and Technical State Univ., Greensboro, NC, USA
Influence of Growth Parameters and Annealing on Properties of MBE Grown GaAsSbN SQWs
Wu, Liangjin; Iyer, Shanthi; Nunna, Kalyan; Bharatan, Sudhakar; Li, Jia; Collis, Ward J.; Materials Research Society Symposium Proceedings; 2005; Volume 872, pp. 453-460; In English
Contract(s)/Grant(s): NAG3-2782; Copyright; Avail.: Other Sources; Abstract Only

In this paper we report the growth of GaAsSbN/GaAs single quantum well (SQW) heterostructures by molecular beam epitaxy (MBE) and their properties. A systematic study has been carried out to determine the effect of growth conditions, such as the source shutter opening sequence and substrate temperature, on the structural and optical properties of the layers. The substrate temperatures in the range of 450-470 C were found to be optimal. Simultaneous opening of the source shutters (SS) resulted in N incorporation almost independent of substrate temperature and Sb incorporation higher at lower substrate temperatures. The effects of ex-situ annealing in nitrogen ambient and in-situ annealing under As ovepressure on the optical properties of the layers have also been investigated. A significant increase in photoluminescence (PL) intensity with reduced full width at half maxima (FWHM) in conjunction with a blue shift in the emission energy was observed on 10 annealing the samples. In in-situ annealed samples, the PL line shapes were more symmetric and the temperature dependence of the PL peak energy indicated significant decrease in the exciton localization energy as exhibited by a less pronounced S-shaped curve. The inverted S-shaped curve observed in the temperature dependence of PL FWHM is also discussed. 1.61 micrometer emission with FWHM of 25 meV at 20K has been obtained in in-situ annealed GaAsSbN/GaAs SQW grown at 470 C by SS.
Author
Annealing; Molecular Beam Epitaxy; Quantum Wells; Gallium Arsenides; Antimony; Gallium Nitrides

20070020501 Lawrence Livermore National Lab., Livermore, CA USA
Atomic, Crystal, Elastic, Thermal, Nuclear, and Other Properties of Beryllium
Goldberg, A.; Sep. 29, 2006; 50 pp.; In English
Report No.(s): DE2007-899094; UCRL-TR-224850; No Copyright; Avail.: Department of Energy Information Bridge

This report is part of a series of documents that provide a background to those involved in the construction of beryllium components and their applications.
NTIS
Atoms; Beryllium; Crystals

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*.

20070019692 NASA Johnson Space Center, Houston, TX, USA
Differential Mobility Spectrometry: Preliminary Findings on Determination of Fundamental Constants
Limero, Thomas; Cheng, Patti; Boyd, John; [2007]; 1 pp.; In English; 16th Annual International Conference on Ion Mobility, 22-26 July 2007, Mikkeli, Finland; No Copyright; Avail.: Other Sources; Abstract Only

Instruments, such as the electron capture detector, have been used to derive fundamental constants for compounds, such as electron affinities. Given this historical perspective, it is not surprising that differential mobility spectrometry (DMS) might also provide data on the fundamental constants of some compounds. This paper will present preliminary data from a DMS instrument that illustrate the potential capability of this device to derive some fundamental constants of electron-capturing compounds. Furthermore, this data may also be used to determine the effective temperature in the DMS instrument.
Author
Electron Capture; Spectrometers; Electron Affinity

20070019767 NASA Marshall Space Flight Center, Huntsville, AL, USA

Effect of EMIC Wave Normal Angle Distribution on Relativistic Electron Scattering Based on the Newly Developed Self-consistent RC/EMIC Waves Model by Khazanov et al. [2006]

Khazanov, G. V.; Gallagher, D. L.; Gamayunov, K.; [2007]; 20 pp.; In English; LWS Geostorm CDAW and Conference, 5-9 Mar. 2007, Melbourne, FL, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070019767

It is well known that the effects of EMIC waves on RC ion and RB electron dynamics strongly depend on such particle/wave characteristics as the phase-space distribution function, frequency, wave-normal angle, wave energy, and the form of wave spectral energy density. Therefore, realistic characteristics of EMIC waves should be properly determined by modeling the RC-EMIC waves evolution self-consistently. Such a selfconsistent model progressively has been developing by Khaznnov et al. [2002-2006]. It solves a system of two coupled kinetic equations: one equation describes the RC ion dynamics and another equation describes the energy density evolution of EMIC waves. Using this model, we present the effectiveness of relativistic electron scattering and compare our results with previous work in this area of research.

Author

Electron Scattering; Self Consistent Fields; Ring Currents; Ion Cyclotron Radiation; Relativistic Electron Beams

20070020218 Fermi National Accelerator Lab., Batavia, IL, USA, Illinois Univ., Urbana-Champaign, IL, USA

Measurement of the W Boson and Top-Quark Masses at CDF

Taffard, A.; January 2006; 4 pp.; In English

Report No.(s): DE2007-897241; FERMILAB-CONF-06-428-E; No Copyright; Avail.: Department of Energy Information Bridge

We report on the measurements of the W boson and top-quark masses with the CDF II detector in p(bar p) collisions at (radical)s = 1.96 TeV at the Fermilab Tevatron. We highlight the major features and uncertainties for the W mass measurement. The top-quark mass measurements are presented in each t(bar t) decay channels. The combination of the most precise measurements from CDF to date leads to M(sub top) = 172.4 (+-) 1.5(stat.) (+-) 2.2(sys.) GeV/c(sup 2), corresponding to a relative uncertainty of 1.5%.

NTIS

Bosons; Quarks; Particle Mass

20070020220 Fermi National Accelerator Lab., Batavia, IL, USA, Florida Univ., Gainesville, FL, USA

Studying the Underlying Event at CDF

Field, R. D.; January 2006; 4 pp.; In English

Report No.(s): DE2007-897237; FERMILAB-CONF-06-409-E; No Copyright; Avail.: National Technical Information Service (NTIS)

A study of 'underlying event' in Run 2 at CDF is presented. Several PYTHIA 6.2 tunes (with multiple parton interactions) are examined and compared with HERWIG (without multiple parton interactions) and with the ATLAS PYTHIA tune (with multiple parton interactions) and they are extrapolated to the LHC.

NTIS

Partons; High Energy Interactions; Simulation; Mathematical Models; Hadrons

20070020222 Fermi National Accelerator Lab., Batavia, IL, USA, Ohio State Univ., Columbus, OH, USA

Search for New Phenomena in the CDF Top Quark Sample

Lannon, K.; Oct. 2006; 4 pp.; In English

Report No.(s): DE2007-897240; FERMILAB-CONF-06-427-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The author presents recent results from CDF in the search for new phenomena appearing in the top quark samples. These results use data from p(bar p) collisions at (radical)s = 1.96 TeV corresponding to an integrated luminosity ranging from 195 pb(sup -1) to 760 pb(sup -1). No deviations are observed from the Standard Model expectations, so upper limits on the size of possible new phenomena are set.

NTIS

Quarks; Luminosity; High Energy Interactions

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*.

20070019913 Florida Agricultural and Mechanical Univ., Tallahassee, FL, USA
Enhancement of Resilient Modulus Data for the Design of Pavement Structures in Florida
Ping, W. V.; Ling, C. C.; Jan. 2007; 198 pp.; In English
Report No.(s): PB2007-107862; OMNI-010356; No Copyright; Avail.: National Technical Information Service (NTIS)

The resilient modulus (MR) of pavement materials is an essential parameter for mechanistically based pavement design procedures. However, measuring the resilient modulus of a particular site has been a complex and difficult task. The process, as outlined in the 1993 American Association of State Highway and Transportation Officials (AASHTO) Guide for Design of Pavement Structures, calls for the resilient modulus to be measured using a carefully controlled laboratory test on a small sample of the pavement material. Because the laboratory test is complex and can produce inconsistent results, many highway agencies, such as the Florida Department of Transportation (FDOT), have been hesitant to conduct them. In view of the complexity and difficulty in conducting the resilient modulus measurement, a database is being developed to catalog available MR test results for facilitating soil MR evaluation and pavement design in Florida. The database will enhance the effort in implementing the MR test for design of pavement structures in Florida. However, the current database contains only some 100 data points (over 200 MR tests) of previously tested resilient modulus values. Thus, the capability and usefulness of the database would be limited to a certain level due to an insufficient databank. This project will populate the database with additional MR values. Borrow pits in each district around the state would be potential candidate sites for the MR testing. The additional MR values would be added to the database for future application and analysis.
NTIS
Augmentation; Highways; Modules; Pavements; Transportation

20070019938 Johns Hopkins Univ., Baltimore, MD, USA
Apparatus and Method for Automated Parcel Screening
Harshbarger, S. D., Inventor; Arabian, A. K., Inventor; McLoughlin, M. P., Inventor; Carison, M. A., Inventor; 16 Apr 03; 12 pp.; In English
Contract(s)/Grant(s): N0002498D8154
Patent Info.: Filed Filed 16 Apr 03; US-Patent-Appl-SN-10-510 434
Report No.(s): PB2007-105314; No Copyright; Avail.: CASI: A03, Hardcopy

A system and method for automated handling and identification of parcels sorted by an automated high-speed mail sorting apparatus that identifies parcels that contain hoax or biological threat material comprising an opener and a particle sampler wherein said sampler analyzes air flow created as the parcels are compressed by pinch rollers.
NTIS
Patent Applications; Samples

20070019947 Baker and Botts, New York, NY, USA
Method and Device for Online Dynamic Semantic Video Compression and Video Indexing
Liu, T., Inventor; Kender, J. R., Inventor; 12 Nov 04; 18 pp.; In English
Contract(s)/Grant(s): EIA0071954
Patent Info.: Filed Filed 12 Nov 04; US-Patent-Appl-SN-10-987 696
Report No.(s): PB2007-105325; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates to video data compression and indexing and, more particularly, to a semantic compression and indexing of video data. Video compression and indexing are crucial in multimedia applications. In recent years, a number of video compression and indexing techniques have been developed. One exemplary technique is a key frame selection technique, which selects key frames as indices for video data. The indices are then used for browsing, searching, retrieval and comparison of video data. Currently, the key frame selection techniques are based on video segmentation, frame clustering, or some hybrid thereof.
NTIS
Data Compression; Patent Applications; Video Compression; Video Data

20070020014 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Space-based Networking Technology Developments in the Interplanetary Network Directorate Information Technology Program

Clare, Loren; Clement, B.; Gao, J.; Hutcherson, J.; Jennings, E.; July 19, 2006; 17 pp.; In English; 2nd IEEE International Conference on Space Mission Challenges for Information Technology, 17-21 Jul. 2006, Pasadena, CA, USA; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39904

Described recent development of communications protocols, services, and associated tools targeted to reduce risk, reduce cost and increase efficiency of IND infrastructure and supported mission operations. Space-based networking technologies developed were: a) Provide differentiated quality of service (QoS) that will give precedence to traffic that users have selected as having the greatest importance and/or time-criticality; b) Improve the total value of information to users through the use of QoS prioritization techniques; c) Increase operational flexibility and improve command-response turnaround; d) Enable new class of networked and collaborative science missions; e) Simplify applications interfaces to communications services; and f) Reduce risk and cost from a common object model and automated scheduling and communications protocols. Technologies are described in three general areas: communications scheduling, middleware, and protocols. Additionally developed simulation environment, which provides comprehensive, quantitative understanding of the technologies performance within overall, evolving architecture, as well as ability to refine & optimize specific components.

Derived from text

Information Systems; Applications Programs (Computers); Protocol (Computers); Scheduling

20070020031 TransNow, Seattle, WA, USA

Data Visualization as a Tool for Improved Decision Making within Transit Agencies

Kimpel, T. J.; Feb. 2007; 38 pp.; In English

Report No.(s): PB2007-107297; TNW2006-14; No Copyright; Avail.: CASI: A03, Hardcopy

TriMet, the regional transit provider in the Portland, OR, area has been a leader in bus transit performance monitoring using data collected via automatic vehicle location and automatic passenger counter technologies. This information is collected and archived for offline analysis of transit operations. Performance monitoring at TriMet is structured to address both short and anger term business needs. Two general information dissemination methods are employed: (1) highly interactive, custom software applications allowing agency personnel to query and display information needed for the day-to-day management of operations and (2) static performance reports generated on regular bases (e.g., quarterly, annually) which provide a complete picture of the transit system at multiple summary levels as part of a longer term performance monitoring and evaluation program. While the amount of work undertaken in the area of performance measurement has been considerable, much of the information is not being presently utilized due to the sheer quantity of information available. Efforts to incorporate new data visualization techniques will do much to assist with the identification of operational problems as well as provide insight into potential solutions.

NTIS

Decision Making; Position (Location); Scientific Visualization; Data Acquisition

20070020111 Annon (Alan W.) Law Office, Sunnyvale, CA, USA, California Univ., Berkeley, CA, USA

User Definable Hierarchy for Database Management

Hynn, W., Inventor; Bigos, M., Inventor; Chiang, A., Inventor; Roberts, L., Inventor; 30 Mar 05; 13 pp.; In English

Contract(s)/Grant(s): R43RR1804301

Patent Info.: Filed Filed 30 Mar 05; US-Patent-Appl-SN-11-096 011

Report No.(s): PB2007-105857; No Copyright; Avail.: CASI: A03, Hardcopy

Methods, systems and computer readable media for users of a shared database, file system, or other similar software system to browse files or records in the database according to any of the files' attributes in a standard hierarchical tree structure. Methods, systems and computer readable media that enable users to dynamically define and customize a hierarchy of files according to the quantity and priority of attributes that each user individually desires, such that the records or files are automatically rearranged and reorganized into the user-created hierarchy.

NTIS

Data Base Management Systems; Hierarchies; Patent Applications; Data Bases

20070020248 Shumaker and Sieffert, P.A., Saint Paul, MN, USA
Translation Tool
Palmquist, R. D., Inventor; 16 Dec 04; 12 pp.; In English
Contract(s)/Grant(s): ONR-N00014-03-C-0272
Patent Info.: Filed Filed 16 Dec 04; US-Patent-Appl-SN-11-014 213
Report No.(s): PB2007-104279; No Copyright; Avail.: CASI: A03, Hardcopy

In general, the invention is directed to text translation tools that are especially useful for translation of related electronic documents. Related electronic documents are any documents in electronic form that are related to one another, such as electronic slides, spreadsheet entries, pages of a book, a set of collected text files, and a set of drawings that including text and the like. The invention provides for translating source text from a source document in a source language into target text in a target language. The invention further provides for mapping the target text to target document according to one or more format characteristics of the source text. As a result, the target document preserves some of the 'look and feel' of the source document. In source documents that include one or more graphic elements, the invention supports mapping the graphic elements to the target document.
NTIS
Translating; Spreadsheets; Inventions

20070020253 MacPherson Kwok Chen and Heid, LLP, Irvine, CA, USA
Intelligent Email Services
Richardson, J. T., Inventor; 2 Feb 04; 10 pp.; In English
Contract(s)/Grant(s): MDA-HQ0006-01-C-0001
Patent Info.: Filed Filed 2 Feb 04; US-Patent-Appl-SN-10-771 052
Report No.(s): PB2007-104276; No Copyright; Avail.: CASI: A02, Hardcopy

An intelligent email service for a web-based intranet server such as a ColdFusion server that automatically generates emails is provided. The intelligent email service provides a periodic verification of normal email spooler activity. Should the spooler be malfunctioning, the intelligent email service restarts the spooler and notifies the server's system administrator. The intelligent email service also processes any undeliverable email messages by determining, for each undeliverable email, whether mail server or the email itself was at fault. Should the mail server be at fault, the undelivered email is resent. Otherwise, the faulty email is emailed back to the originating party.
NTIS
Computer Networks; Electronic Mail; Malfunctions

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.

20070019924 Idaho Univ., Moscow, ID, USA
Chassis Dynamometer Testing of Aqueous Ethanol in a Transit Van
Williams, J.; Cordon, D.; Beyerlein, S.; Jan. 2006; 26 pp.; In English
Report No.(s): PB2007-108181; KLK-342; No Copyright; Avail.: National Technical Information Service (NTIS)

This project advanced NIATTs goal of using aqueous ethanol in vehicle transportation. This report describes initial chassis dynamometer testing of transit van converted to aqueous ethanol. A six-mode test was designed to simulate a variety of typical driving conditions using a steady state chassis dynamometer. Previously the transit van was testing using gasoline fuel and spark plugs. The van has been converted to catalytic igniters or use with a 90/10 mix of ethanol/water (Aquanol). Performance, fuel consumption, efficiency, and emissions were all gathered under these six modes and compared to the previous gasoline data.
NTIS
Chassis; Dynamometers; Ethyl Alcohol

20070019925 Idaho Univ., Moscow, ID, USA
Turbocharging a Crank-Case Scavenged and Direct-Injected Two-Stroke Engine for Snowmobile Applications
Bradbury, N.; Den Braven, K.; Findlay, A.; Johnson, J.; Dec. 2006; 28 pp.; In English
Report No.(s): PB2007-108182; KLK-410; No Copyright; Avail.: National Technical Information Service (NTIS)

With the recent advancement in gasoline direct-injection (GDI) technology for lightweight and high-specific power two-stoke engines, turbocharging a small crank-case scavenged GDI engine promises to be an effective way of increasing engine performance while maintaining the lowered emissions and increased fuel economy of GDI two-stroke engines. Along with increasing the power density, a variable geometry turbocharger should allow for an increase in low engine speed engine performance that will allow the engine to be operated at lower engine speeds providing quieter operation and decreased engine wear. Also presented is a method to increase throttle response and increase low speed torque through the use of a reed valve installed in the intake plenum.
NTIS
Engine Parts; Superchargers; Turbocompressors

20070019928 Idaho Univ., Moscow, ID, USA
Advanced Vehicle Technologies for Efficient Powertrain Performance
Odom, E.; Beyerlein, S.; Sagen, J.; Gallup, L.; Jan. 2006; 11 pp.; In English
Report No.(s): PB2007-108183; KLK-420; No Copyright; Avail.: CASI: A03, Hardcopy

Over the last decade, vehicle projects in our capstone design courses have progressively required more sophisticated design and manufacturing processes. At the same time, the general population of engineering students has less hands-on shop experience than their predecessors, the number of required manufacturing-oriented courses has decreased, and the complexity of tools used for detailing designs and handling materials have become more specialized. To remedy this situation, we have implemented a learner-centered approach for creating just-in-time resources that support project learning about vehicle systems. These are housed in an innovative design laboratory known as Mindworks. This project combined efforts of undergraduate students in technical elective courses as well as graduate student mentoring of design projects and thesis work surrounding state-of-the-art structural optimization and geartrain design.
NTIS
Performance; Efficiency; Structural Design

20070020331 NASA Johnson Space Center, Houston, TX, USA
Cutting Edge RFID Technologies for NASA Applications
Fink, Patrick W.; May 7, 2007; 26 pp.; In English; Radio Frequency Identification Conference, 7-8 May 2007, Arlington, VA, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020331

This viewgraph document reviews the use of Radio-frequency identification (RFID) for NASA applications. Some of the uses reviewed are: inventory management in space; potential RFID uses in a remote human outpost; Ultra-Wideband RFID for tracking; Passive, wireless sensors in NASA applications such as Micrometeoroid impact detection and Sensor measurements in environmental facilities; E-textiles for wireless and RFID.
CASI
Radio Frequencies; Identifying; Technology Utilization; NASA Programs

88
SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through\f93*.

20070019842 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Autonomous Detection of Dust Devils and Clouds on Mars
Castano, Andres; Fukunaga, Alex; Biesiadecki, Jeffrey; Neakrase, Lynn; Whelley, Patrick; Greeley, Ronald; Lemmon, Mark; Castano, Rebecca; Chien, Steve; October 8, 2006; 4 pp.; In English; IEEE International Conference on Image Processing, 8-11 Oct. 2006, Atlanta, GA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39920

Acquisition of science in space applications is shifting from teleoperated gathering to an automated on-board analysis

with improvements in the use of on-board memory, CPU, bandwidth and data quality. In this paper, we describe algorithms to autonomously detect dust devils and clouds from a rover and summarize the results. These algorithms meet high hit-to-miss ratios and satisfy strict requirements of CPU, memory usage and bandwidth. The detectors have been scheduled for upload to the Mars Exploration Rovers (MER) in 2006. These are the first autonomous science processes in the rovers.
Author
Dust; Clouds; Mars Atmosphere; Autonomy; Bandwidth; Mars Exploration

20070019853 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Search for Terrestrial Planets with ESA Planet Quest
Shao, Michael; Tanner, Angelle M.; Catanzarite, Joseph H.; May 24, 2006; 6 pp.; In English; SPIE Astronomical Telescopes and Instrumentation, 24-31 May 2006, Orlando, FL, USA; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39911

ESA is an astrometric mission that will be capable of 1 microarcsec relative astrometric accuracy in a single measurement of approx.1000 sec. The search for terrestrial planets in the habitable zone around nearby stars is one of the main science goals of the project. In 2001, NASA through the peer review process selected 10 key projects, two of which had as its goal, the search for terrestrial planets around nearby stars. The two teams, one led by G. Marcy (UC Berkeley) and one lead by M. Shao (JPL), have an extensive preparatory science program underway. This paper describes the status of this activity as well as the technology status of SIM's narrow angle astrometry capability, to reach 1 uas in a single epoch measure and its ability to average multiple epoch measurements to well below 1 uas.
Author
Terrestrial Planets; Sim; Astrometry

20070020005 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Examination of B. subtilis var. niger Spore Killing by Dry Heat Methods
Kempf, Michael J.; Kirschner, Larry E.; May 23, 2004; 19 pp.; In English; American Society for Microbiology, 23-27 May 2004, New Orleans, LA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39986

Dry heat microbial reduction is the only NASA approved sterilization method to reduce the microbial bioburden on space-flight hardware prior to launch. Reduction of the microbial bioburden on spacecraft is necessary to meet planetary protection requirements specific for the mission. Microbial bioburden reduction also occurs if a spacecraft enters a planetary atmosphere (e.g., Mars) and is heated due to frictional forces. Temperatures reached during atmospheric entry events (\g200 C) are sufficient to damage or destroy flight hardware and also kill microbial spores that reside on the in-bound spacecraft. The goal of this research is to determine the survival rates of bacterial spores when they are subjected to conditions similar to those the spacecraft would encounter (i.e., temperature, pressure, etc.). B. subtilis var. niger spore coupons were exposed to a range of temperatures from 125 C to 200 C in a vacuum oven (at \h1 Torr). After the exposures, the spores were removed by sonication, dilutions were made, and the spores were plated using the pour plate method with tryptic soy agar. After 3 days incubation at 32 C, the number of colony-forming units was counted. Lethality rate constants and D-values were calculated at each temperature. The calculated D-values were: 27 minutes (at 125 C), 13 minutes (at 135 C), and \h0.1 minutes (at 150 C). The 125 C and 135 C survivor curves appeared as concavedownward curves. The 150 C survivor curve appeared as a straight-line. Due to the prolonged ramp-up time to the exposure conditions, spore killing during the ramp-up resulted in insufficient data to draw curves for exposures at 160 C, 175 C, and 200 C. Exploratory experiments using novel techniques, with short ramp times, for performing high temperature exposures were also examined. Several of these techniques, such as vacuum furnaces, thermal spore exposure vessels, and laser heating of the coupons, will be discussed.
Author
High Temperature; Dry Heat; Laser Heating; Spores; Friction Factor; Atmospheric Entry; Sterilization; Planetary Protection; Planetary Atmospheres; Microorganisms

20070020007 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
ESA PlanetQuest: Status and Recent Progress
Nematia, Bijan; May 24, 2006; 10 pp.; In English; SPIE Astronomical Telescopes and Instrumentation, 24-31 May 2006, Orlando, FL, USA; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39908

The ESA project is approaching the end of its technology development phase. With the successful completion of a number

of testbeds, including micro-arcsecond stellar interferometry, picometer optical truss metrology, and milli-kelvin thermo-optical characterization, the project is now on a sure footing for the development of requirement for the flight instrument. Here we review the latest technological progress and give a status of the project.
Author
Interferometry; Metrology; Stars; Astronomy; Astrophysics; Sim; Flight Instruments

20070020338 NASA Johnson Space Center, Houston, TX, USA
Crystal Water on Mars: Insights from the Mars Exploration Rovers
Ming, D. W.; Morris, R. V.; Clark, B. C.; [2007]; 1 pp.; In English; Goldschmidt 2007 Conference, 19-24 Aug. 2007, Cologne, Germany
Contract(s)/Grant(s): 361426.04.05; Copyright; Avail.: CASI: A01, Hardcopy

The purpose of this paper is to constrain the total water contents from crystal H2O and OH in several materials analyzed by the Mars Exploration Rovers (MER). Crystal H2O is part of the unit cell and cannot be removed without changing the structure. Minerals that contain only OH in their structures are anhydrous minerals containing hydroxyls, although they are formed as a product of aqueous activity and will decompose with evolution of H2O when heated. The crystal water and OH contents of a bulk material at the MER landing sites can be estimated from mineralogical composition, which is determined by a combination of Fe-mineralogy obtained by the Mossbauer Spectrometer and mineral abundances based upon the chemical composition determined by the Alpha Particle X-ray Spectrometer. Jarosite, along with Ca- and Mg-sulfates, have been suggested as the sulfur-bearing phases in Meridiani Planum outcrop. Models of various hydration states of Fe-, Ca-, and Mg-sulfates and other possible secondary phases suggest that 6 to 22 wt.% of the outcrop may occur as crystal H2O and/or OH (Clark et al., 2005). This estimate of water is consistent with measurements from the Odyssey orbiter, where 7 % H2O-equivalent H was measured down to a depth of approximately 1 m for the region (Feldman et al., 2004).
Author
Mars Exploration; Roving Vehicles; Mars Surface; Mineralogy; Water; Moisture Content; Hydration; Chemical Composition

20070020341 NASA Johnson Space Center, Houston, TX, USA
Orbital Debris Studies at NASA
Stansbery, Gene; Krisko, Paula; Whitlock, Dave; [2007]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

Any discussion of expanding the capabilities of Space Surveillance Networks to include tracking and cataloging smaller objects will require a good understanding of orbital debris. In the current U.S. catalog of over 11,000 objects, more than 50% are classified as 'debris' to include fragmentation debris, operational debris, liquid metal coolant, and Westford needles. If the catalog is increased to 100,000 objects by lowering the tracked object size threshold, almost all of the additional objects will be orbital debris. The Orbital Debris Program Office has been characterizing the small orbital debris environment through measurements and modeling for many years. This presentation will specifically discuss two different studies conducted at NASA. The first study was done in 1992 and examined the requirements and produced a conceptual design for a Collision Avoidance Network to protect the Space Station Freedom from centimeter sized orbital debris while minimizing maneuvers. The second study was conducted last year and produced NASA s estimate of the orbital population for the years 2015 and 2030 for objects 2 cm and larger.
Author
Space Debris; Collision Avoidance; Space Station Freedom; Liquid Metals; Fragmentation

20070020424 NASA Johnson Space Center, Houston, TX, USA
EVA Task Timing and Timeline Planning
Looper, Christopher A.; Ney, Zane A.; [2007]; 9 pp.; In English; International Conference on Environmental Systems, 9-12 Jul. 2007, Chicago, IL, USA; Original contains color illustrations
Report No.(s): 07ICES-54; Copyright; Avail.: Other Sources

EVA timeline development occurs using task execution data generated through underwater training and simulation. This project collected task time data during final training events for several Space Shuttle and International Space Station missions and compared like task time data collected during on-orbit execution. Analysis was performed to compare types of activities and times required for each looking specifically for how activities can be accurately trained from a timeline planning perspective. The data revealed two significant aspects of flight timeline planning; Zero-g task times will match training times for activities that can be accurately simulated with appropriate fidelity hardware; and not all activities can be simulated

sufficiently to produce training task times that will reflect required zero-g times. An approach for timeline planning utilizing this knowledge is also presented.
Author
Extravehicular Activity; International Space Station; Planning; Tasks; Flight Time

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20070019768 NASA Marshall Space Flight Center, Huntsville, AL, USA
A Possible Magnetar Nature for IGR J16358-4726
Patel, S. K.; Zurita, J.; DelSanto, M.; Finger, M.; Kouveliotou, C.; Eichler, D.; Gogus, E.; Ubertini, P.; Walter, R.; Woods, P.; Wilson, C. A.; Wachter, S.; Bazzano, A.; The Astrophysical Journal; March 10, 2007; Volume 657, pp. 994-1003; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG04GH33G; DD3-4023X; I/R/046/04; Copyright; Avail.: Other Sources

We present detailed spectral and timing analysis of the hard X-ray transient IGR J16358-4726 using multisatellite archival observations. A study of the source flux time history over 6 yr suggests that lower luminosity transient outbursts can be occurring in intervals of at most 1 yr. Joint spectral fits of the higher luminosity outburst using simultaneous Chandra ACIS and INTEGRAL ISGRI data reveal a spectrum well described by an absorbed power-law model with a high-energy cutoff plus an Fe line. We detected the 1.6 hr pulsations initially reported using Chandra ACIS also in the INTEGRAL ISGRI light curve and in subsequent XMM-Newton observations. Using the INTEGRAL data, we identified a spin-up of 94 s (P(sup(.)) = 1.6 x 10(exp -4), which strongly points to a neutron star nature for IGR J16358-4726. Assuming that the spin-up is due to disk accretion, we estimate that the source magnetic field ranges between 10(exp 13) and 10(exp 15) G, depending on its distance, possibly supporting a magnetar nature for IGR J16358-4726.
Author
Magnetars; Gamma Ray Sources (Astronomy); Astrophysics; Neutron Stars

20070019819 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Recent Results from the Swift Burst Alert Telescope
Krimm, Hans; [2006]; 1 pp.; In English; Marcel Grossman 11 Conference, 23-29 Jul. 2006, Berlin, Germany
Contract(s)/Grant(s): NCC5-637; No Copyright; Avail.: Other Sources; Abstract Only

The Burst Alert Telescope (BAT) on the Swift Gamma-Ray Burst MIDEX mission has detected more than 125 gamma-ray bursts (GRBs), nearly all of which have been followed up by the narrow-field instruments on Swift through automatic repointing, and by ground and other satellite telescopes after rapid notification. Within seconds of a trigger the BAT produces and relays to the ground a position good to three arc minutes and a four channel light curve. An overview of the properties of BAT bursts and BAT'S performance as a burst monitor will be presented in this talk. BAT is a coded aperture imaging system with a wide (approx.2 sr) field of view consisting of a large coded mask located 1 m above a 5200 sq cm array of 32.768 CdZnTe detectors. All electronics and other hardware systems on the BAT have been operating well since commissioning and there is no sign of any degradation on orbit. The flight and ground software have proven similarly robust and allow the real time localization of all bursts and the rapid derivation of burst light curves, spectra and spectral fits on the ground.
Author
Gamma Ray Bursts; Telescopes; Apertures; Swift Observatory; Field of View; Real Time Operation; Imaging Techniques

20070019837 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
SIMsim: An End-to-end Simulator for the ESA Mission
Murphy, David W.; Meier, David L.; June 24, 2006; 10 pp.; In English; Modeling and Systems Engineering for Astronomy, 24-25 Jun. 2004, Glasgow, Scotland, UK; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39997

In this paper we discuss the use of an innovative ESA simulator, called SIMsim, to perform end-to end simulations of the ESA mission. The inputs to the simulator are a physically-based parameterization of the major ESA error sources and the output is the mission astrometric accuracy for various observing scenarios such as narrow-angle (NA) and wide-angle (WA)

observations. The primary role of SIMsim is to validate the ESA astrometric error budget (AEB), bit it is also being used to study a variety of mission performance issues as well as being a test-bed for prototype data reduction algorithms. SIMsim is giving us confidence that the ESA AEB is a valid estimate of mission performance. It also is illustrating where analytical formulas for estimating certain effects breakdown and a numerical approach has to be adopted.
Author
Astrometry; Parameterization; Errors; Simulators; Interferometers; Estimating

20070019844 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Execution of the Spitzer In-orbit Checkout and Science Verification Plan
Miles, John W.; Linick, Susan H.; Long, Stacia; Gilbert, John; Garcia, Mark; Boyles, Carole; Werner, Michael; Wilson, Robert K.; June 21, 2004; 12 pp.; In English; SPIE Astronomical Telescopes and Instrumentation, 21 Jun. 2004, Glasgow, Scotland, UK; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39960

The Spitzer Space Telescope is an 85-cm telescope with three cryogenically cooled instruments. Following launch, the observatory was initialized and commissioned for science operations during the in-orbit checkout (IOC) and science verification (SV) phases, carried out over a total of 98.3 days. The execution of the IOC/SV mission plan progressively established Spitzer capabilities taking into consideration thermal, cryogenic, optical, pointing, communications, and operational designs and constraints. The plan was carried out with high efficiency, making effective use of cryogen-limited flight time. One key component to the success of the plan was the pre-launch allocation of schedule reserve in the timeline of IOC/SV activities, and how it was used in flight both to cover activity redesign and growth due to continually improving spacecraft and instrument knowledge, and to recover from anomalies. This paper describes the adaptive system design and evolution, implementation, and lessons learned from IOC/SV operations. It is hoped that this information will provide guidance to future missions with similar engineering challenges
Author
Cryogenics; Optical Communication; Systems Engineering; Checkout; Space Infrared Telescope Facility

20070019870 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Measuring Extended Structure in Stars Using the Keck Interferometer Nuller
Koresko, Chris; Colavita, M. Mark; Serabyn, Eugene; Booth, Andrew; Garcia, Jean; May 24, 2006; 11 pp.; In English; SPIE Astronomical Telescopes and Instrumentation, 24-31 May 2006, Orlando, FL, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39956

The Keck Interferometer Nuller is designed to detect faint off-axis mid-infrared light a few tens to a few hundreds of milliarcseconds from a bright central star. The starlight is suppressed by destructive combination along the long (85 m) baseline, which produces a fringe spacing of 25 mas at a wavelength of 10 m, with the central null crossing the position of the star. The strong, variable mid-infrared background is subtracted using interferometric phase chopping along the short (5 m) baseline. This paper presents an overview of the observing and data reduction strategies used to produce a calibrated measurement of the off-axis light. During the observations, the instrument cycles rapidly through several calibration and measurement steps, in order to monitor and stabilize the phases of the fringes produced by the various baselines, and to derive the fringe intensity at the constructive peak and destructive null along the long baseline. The data analysis involves removing biases and coherently demodulating the short-baseline fringe with the long-baseline fringe tuned to alternate between constructive and destructive phases, combining the results of many measurements to improve the sensitivity, and estimating the part of the null leakage signal which is associated with the finite angular size of the central star. Comparison of the results of null measurements on science target and calibrator stars permits the instrumental leakage - the 'system null leakage' - to be removed and the off-axis light to be measured.
Author
Astronomical Interferometry; Stars; Imaging Techniques; Zodiacal Dust

20070020002 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Chandra X-ray Observatory: An Astronomical Facility Available to the World
Smith, Randall K.; June 02, 2006; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020002; http://dx.doi.org/10.1007/s10509-006-9193-x

The Chandra X-ray observatory, one of NASA's 'Great Observatories,' provides high angular and spectral resolution

X-ray data which is freely available to all. In this review I describe the instruments on chandra along with their current calibration, as well as the chandra proposal system, the freely-available Chandra analysis software package CIAO, and the Chandra archive. As Chandra is in its 6th year of operation, the archive already contains calibrated observations of a large range of X-ray sources. The Chandra X-ray Center is committed to assisting astronomers from any country who wish to use data from the archive or propose for observations
Author
X Ray Astrophysics Facility; X Ray Astronomy; Spaceborne Astronomy; Data Products

20070020004 Observatoire de Paris, France, NASA Goddard Space Flight Center, Greenbelt, MD, USA
SN 1987A after 18 Years: Mid-Infrared GEMINI and SPITZER Observations of the Remnant
Bouchet, Patrice; Dwek, Eli; Danziger, John; Arendt, Richard G.; DeBuizer, James M.; Park, Sangwook; Suntzeff, Nicholas B.; Kirshner, Robert P.; Challis, Peter; [2007]; 36 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

We present high resolution 11.7 and 18.3 micron mid-IR images of SN 1987A obtained on day 6526 since the explosion with the Thermal-Region Camera and Spectrograph (T-ReCS) attached to the Gemini South 8m telescope. The 11.7 micron flux has increased significantly since our last observations on day 6067. The images clearly show that all the emission arises from the equatorial ring (ER). Nearly contemporaneous spectra obtained on day 6184 with the MIPS at 24 micron, on day 6130 with the IRAC in 3.6- 8 micron region, and on day 6190 with the IRS in the 12-37 micron instruments on board the Spitzer Space Telescope's show that the emission consists of thermal emission from silicate dust that condensed out in the red giant wind of the progenitor star. The dust temperature is 1662(sup +18) (sub -12) K, and the emitting dust mass is (2.6(sup +2.0 (sub -1.4)) x 10 (exp -6) M(solar). Lines of [Ne II] 12.82 micron and [Ne III] 15.56 pm are clearly present in the Spitzer spectrum, as well as a weak [Si II] 3 34.8 micron line. We also detect two lines near 26 micron which we tentatively ascribe to [Fe II] 25.99 pm and [0 IV] 25.91 micron. Comparison of the mid-IR Gemini 11.7 micron image with X-ray images obtained by Chandra, UV-optical images obtained by HST, and radio synchrotron images obtained by the ATCA show generally good correlation of the images across all wavelengths. Because of the limited resolution of the mid-IR images we cannot uniquely determine the location. or heating mechanism of the dust giving rise to the emission. The dust could be collisionally heated by the X-ray emitting plasma, providing a unique diagnostic of plasma conditions. Alternatively, the dust could be radiatively heated in the dense UV-optical knots that are overrun by the advancing supernova blast wave. In either case the dust-to-gas mass ratio in the circumstellar medium around the supernova is significantly lower than that in the general interstellar medium of the LMC, suggesting either a low condensation efficiency in the wind of the progenitor star, or the efficient destruction of the dust by the SN blast wave. Overall, we are witnessing the interaction of the SN blast wave with its surrounding medium, creating an environment that is rapidly evolving at all wavelengths. Continuous multiwavelength observations of SN 1987A such as these provide unique snapshots of the very early evolution of supernova remnants.
Author
Cosmic Dust; Interstellar Matter; Stellar Envelopes; Supernova Remnants; Supernovae; Red Giant Stars

20070020006 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Spitzer Space Telescope Sequencing Operations Software, Strategies, and Lessons Learned
Bliss, David A.; June 19, 2006; 39 pp.; In English; AIAA 9th International Conference on Spacecraft Operations (SpaceOps), 19-24 Jun. 2006, Rome, Italy; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources ONLINE: http://hdl.handle.net/2014/39947

The Space Infrared Telescope Facility (SIRTF) was launched in August, 2003, and renamed to the Spitzer Space Telescope in 2004. Two years of observing the universe in the wavelength range from 3 to 180 microns has yielded enormous scientific discoveries. Since this magnificent observatory has a limited lifetime, maximizing science viewing efficiency (ie, maximizing time spent executing activities directly related to science observations) was the key operational objective. The strategy employed for maximizing science viewing efficiency was to optimize spacecraft flexibility, adaptability, and use of observation time. The selected approach involved implementation of a multi-engine sequencing architecture coupled with nondeterministic spacecraft and science execution times. This approach, though effective, added much complexity to uplink operations and sequence development. The Jet Propulsion Laboratory (JPL) manages Spitzer s operations. As part of the uplink process, Spitzer s Mission Sequence Team (MST) was tasked with processing observatory inputs from the Spitzer Science Center (SSC) into efficiently integrated, constraint-checked, and modeled review and command products which accommodated the complexity of non-deterministic spacecraft and science event executions without increasing operations costs. The MST developed processes, scripts, and participated in the adaptation of multi-mission core software to enable rapid processing of complex sequences. The MST was also tasked with developing a Downlink Keyword File (DKF) which could instruct Deep

Space Network (DSN) stations on how and when to configure themselves to receive Spitzer science data. As MST and uplink operations developed, important lessons were learned that should be applied to future missions, especially those missions which employ command-intensive operations via a multi-engine sequence architecture.
Author
Space Infrared Telescope Facility; Sequencing; Viewing; Deep Space Network

20070020118 Fermi National Accelerator Lab., Batavia, IL, USA
Running the Sloan Digital Sky Survey Data Archive
Nielsen, E. H.; Stoughton, C.; January 2006; 4 pp.; In English
Report No.(s): DE2007-897227; FERMIL-CONF-06-423-CD; No Copyright; Avail.: Department of Energy Information Bridge

The Sloan Digital Sky Survey (SDSS) Data Archive Server (DAS) provides public access to over 12Tb of data in 17 million files produced by the SDSS data reduction pipeline. Many tasks which seem trivial when serving smaller, less complex data sets present challenges when serving data of this volume and technical complexity. The included output files should be chosen to support as much science as possible from publicly released data, and only publicly released data. Users must have the resources needed to read and interpret the data correctly. Server administrators must generate new data releases at regular intervals, monitor usage, quickly recover from hardware failures, and monitor the data served by the DAS both for contents and corruption. We discuss these challenges, describe tools we use to administer and support the DAS, and discuss future development plans.
NTIS
Digital Data; Sky Surveys (Astronomy); Data Reduction

20070020207 Massachusetts Inst. of Tech., Cambridge, MA, USA
Simplectic Correctors for Canonical Heliocentric N-Body Maps
Wisdom, Jack; The Astronomical Journal; April 2006; Volume 131, No. 1804, pp. 2294-2298; In English
Contract(s)/Grant(s): NNG05GL98G; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1086/500829

Symplectic correctors are developed for n-body maps (symplectic integrators) in canonical heliocentric coordinates. Several correctors are explicitly presented.
Author
Coordinates; Integrators; Many Body Problem; Maps; Correction; Canonical Forms; Solar Orbits

20070020210 NASA Goddard Space Flight Center, Greenbelt, MD, USA, Space Science Inst., Boulder, CO, USA
Cassini Observes the Active South Pole of Enceladus
Porco, C. C.; Helfenstein P.; Thomas, P. C.; Ingersoll, A. P.; Wisdom, J.; West, R.; Neukum, G.; Denk, T.; Wagner, R.; Roatsch, T.; Kieffer, S.; Turtle, E.; McEwen, A.; Johnson, T. V.; Rathbun, J.; Veverka, J.; Wilson, D.; Perry, J.; Spitale, J.; Brahic, A.; Burns, J. A.; DelGenio, A. D.; Dones, L.; Murray, C. D.; Squyres, S.; Science; [2007]; Volume 311, No. 5766, pp. 1393-1401; In English
Contract(s)/Grant(s): NNG05G198G; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1126/science.1123013

Cassini has identified a geologically active province a the south pole of Saturn's moon Enceladus. The shape of Enceladus suggests a possible intense heating epoch in the past by capture into a 1:4 secondary spin/orbit resonance.
Author
Enceladus; Heating; Spin Resonance; Saturn (Planet)

20070020407 NASA Dryden Flight Research Center, Edwards, CA, USA
SOFIA: Stratospheric Observatory For Infrared Astronomy
Kunz, Nans; Bowers, Al; April 16, 2007; 55 pp.; In English; Aging Aircraft 2007, 16-19 Apr. 2007, Palm Springs, CA, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020407

This viewgraph presentation reviews the great astronomical observatories both space and land based that are now operational. It shows the history of the development of SOFIA, from its conception in 1986 through the contract awards in 1996 and through the planned first flight in 2007. The major components of the observatory are shown and there is a

comparison of the SOFIA with the Kuiper Airborne Observatory (KAO), which is the direct predecessor to SOFIA. The development of the aft ramp of the KAO was developed as a result of the wind tunnel tests performed for SOFIA development. Further slides show the airborne observatory layout and the telescope's optical layout. Included are also vies of the 2.5 Meter effective aperture, and the major telescope's components. The presentations reviews the technical challenges encountered during the development of SOFIA. There are also slides that review the wind tunnel tests, and CFD modeling performed during the development of SOFIA. Closing views show many views of the airplane, and views of SOFIA.
CASI
Layouts; SOFIA (Airborne Observatory); Airborne Equipment; Infrared Astronomy; Spaceborne Astronomy

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20070019804 Fermi National Accelerator Lab., Batavia, IL, USA
Standard Model: Alchemy and Astrology
Lykken, J. D.; January 2006; 12 pp.; In English
Report No.(s): DE2007-897050; No Copyright; Avail.: Department of Energy Information Bridge
A brief unconventional review of Standard Model physics, containing no plots.
NTIS
Standard Model (Particle Physics); Strong Interactions (Field Theory)

20070020067 Fermi National Accelerator Lab., Batavia, IL, USA, Maryland Univ., College Park, MD, USA
Getting the Most for NOVA and T2K
Mena, O.; January 2006; 7 pp.; In English
Report No.(s): DE2007-897061; FERMILAB-CONF-06-282; No Copyright; Avail.: National Technical Information Service (NTIS)
The determination of the ordering of the neutrino masses (the hierarchy) is probably a crucial prerequisite to understand the origin of lepton masses and mixings and to establish their relationship to the analogous properties in the quark sector. In this talk, we follow an alternative strategy to the usual neutrino-antineutrino comparison: we exploit the combination of the neutrino-only data from the NOvA and the T2K experiments by performing these two off-axis experiments at different distances but at the same (E)/L, (E) being the mean neutrino energy and L the baseline. This would require a minor adjustment to the proposed off-axis angle for one or both of the proposed experiments.
NTIS
Antineutrinos; Distance; Hierarchies

20070020113 Fermi National Accelerator Lab., Batavia, IL, USA, Florida Univ., Gainesville, FL, USA
Phenomenology of Universal Extra Dimensions
Kong, K.; Matchev, K. T.; January 2006; 4 pp.; In English
Report No.(s): DE2007-897173; FERMILAB-CONF-06-366-T; No Copyright; Avail.: National Technical Information Service (NTIS)
In this proceeding, the phenomenology of Universal Extra Dimensions (UED), in which all the Standard Model fields propagate, is explored. We focus on models with one universal extra dimension, compactified on an S(sub 1)/Z(sub 2) orbifold. We revisit calculations of Kaluza-Klein (KK) dark matter without an assumption of the KK mass degeneracy including all possible coannihilations. The authors then contrast the experimental signatures of low energy supersymmetry and UED.
NTIS
Dark Matter; Phenomenology; Standard Model (Particle Physics)

20070020140 Fermi National Accelerator Lab., Batavia, IL, USA, Washington Univ., Seattle, WA, USA
Developments in Planet Detection using Transit Timing Variations
Steffen, J. H.; Agol, E.; January 2006; 6 pp.; In English
Report No.(s): DE2007-897197; FERMILAB-CONF-06-476-A-CD; No Copyright; Avail.: National Technical Information Service (NTIS)
In a transiting planetary system, the presence of a second planet will cause the time interval between transits to vary. These

transit timing variations (TTV) are particularly large near mean-motion resonances and can be used to infer the orbital elements of planets with masses that are too small to detect by any other means. The author presents the results of a study of simulated data where they show the potential that this planet detection technique has to detect and characterize secondary planets in transiting systems. These results have important ramifications for planetary transit searches since each transiting system presents an opportunity for additional discoveries through a TTV analysis. They present such an analysis for 13 transits of the HD 209458 system that were observed with the Hubble Space Telescope. This analysis indicates that a putative companion in a low-order, mean-motion resonance can be no larger than the mass of the Earth and constitutes, to date, the most sensitive probe for extrasolar planets that orbit main sequence stars. The presence or absence of small planets in low-order, mean-motion resonances has implications for theories of the formation and evolution of planetary systems. Since TTV is most sensitive in these regimes, it should prove a valuable tool not only for the detection of additional planets in transiting systems, but also as a way to determine the dominant mechanisms of planet formation and the evolution of planetary systems.
NTIS
Planet Detection; Planets; Astrophysics

20070020166 NASA Marshall Space Flight Center, Huntsville, AL, USA
Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae
Kaneko, Yuki; Ramirez-Ruiz, Enrico; Granot, Jonathan; Kouveliotou, Chryssa; Woosley, Stan E.; Patel, Sandeep K.; Rol, Evert; In'TZand, Jean J. M.; VanDerHorst, Alexander J.; Wuers, Ralph A. M. J.; Strom, Richard; The Astrophysical Journal; January 2007; Volume 654, pp. 385-402; In English; Original contains color illustrations
Contract(s)/Grant(s): G05-6056Z; DE-AC03-76SF00515; DE-FC02-01ER41176; NNGO5GG08G; PF3-40028; 639.043.302; HPRN-CT-2002-00294; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1086/508324

We present a detailed spectral analysis of the prompt and afterglow emission of four nearby long-soft gamma-ray bursts (GRBs 980425,030329,031203, and 060218) that were spectroscopically found to be associated with Type Ic supernovae and compare them to the general GRB population. For each event, we investigate the spectral and luminosity evolution and estimate the total energy budget based on broadband observations. The observational inventory for these events has become rich enough to allow estimates of their energy content in relativistic and subrelativistic form. The result is a global portrait of the effects of the physical processes responsible for producing long-soft GRBs. In particular, we find that the values of the energy released in mildly relativistic outflows appears to have a significantly smaller scatter than those found in highly relativistic ejecta. This is consistent with a picture in which the energy released inside the progenitor star is roughly standard, while the fraction of that energy that ends up in highly relativistic ejecta outside the star can vary dramatically between different events.
Author
Gamma Ray Bursts; Spectrum Analysis; Supernovae; Afterglows; Ejecta; Luminosity

20070020263 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku
Yaqoob, Tahir; Murphy, Kendrah D.; Griffiths, Richard E.; Haba, Yoshito; Inoue, Hajime; Itoh, Takeshi; Kelley, Richard; Kokubun, Motohide; Markowitz, Alex; Mushotzky, Richard; Okajima, Takashi; Ptak, Andrew; Reeves, James; Selemitos, Peter J.; Takahashi, Tadayuki; Terashima, Yuichi; [2006]; 37 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

We present detailed time-averaged X-ray spectroscopy in the 0.5-10 keV band of the Seyfert 1.9 galaxy NGC 2992 with the Suzaku X-ray Imaging Spectrometers (XIS). The source had a factor approximately 3 higher 2-10 keV flux (approximately 1.2 x l0(exp -11) erg per square cm per s) than the historical minimum and a factor approximately 7 less than the historical maximum. The XIS spectrum of NGC 2992 can be described by several components. There is a primary continuum, modeled as a power-law with a photon index of Gamma = 1.57(sup +0.06) (sup -0.03) that is obscured by a Compton-thin absorber with a column density of 8.01(sup +0.6) (sup -0.5)x l0 (exp 21) per square cm. . There is another, weaker, unabsorbed power-law component (modeled with the same slope as the primary), that is likely to be due to the primary continuum being electron-scattered into our line-of-sight by a region extended on a scale of hundreds of parsecs. We measure the Thomson depth of the scattering zone to be Tau = 0.072 +/- 0.021. An optically-thin thermal continuum emission component, which probably originates in the same extended region, is included in the model and yields a temperature and luminosity of KT = 0.656(sup +0.088) (sup -0.0.61) keV and approximately 1.2 +/- 0.4 x l0 (exp 40) erg per s respectively. We detect an Fe K emission complex which we model with broad and narrow lines and we show that the intensities of the two components are

decoupled at a confidence level \g 3 sigma. The broad Fe K alpha line has an equivalent width of 118(sup +32) (sup -61) eV and could originate in an accretion disk (with inclination angle greater than approximately 30 deg) around the putative central black hole. The narrow Fe K alpha line has an equivalent width of 1632(sup +47) (sup -26) eV and is unresolved (FWHM \h 4630 km per s) and likely originates in distant matter. The absolute flux in the narrow line implies that the column density out of the line-of-sight could be much higher than measured in the line-of-sight, and that the mean (historically-averaged) continuum luminosity responsible for forming the line could be a factor of several higher than that measured from the data. We also detect the Fe K Beta line (corresponding to the narrow Fe K alpha line) with a high signal-to-noise ratio and describe a new robust method to constrain the ionization state of Fe responsible for the Fe K alpha and Fe K Beta lines that does not require any knowledge of possible gravitational and Doppler energy shifts affecting the line energies. For the distant line-emitting matter (e. g. the putative obscuring torus) we deduce that the predominant ionization state is lower than Fe VIII (at 99% confidence), conservatively taking into account residual calibration uncertainties in the XIS energy scale and theoretical and experimental uncertainties in the Fe K fluorescent line energies. From the limits on a possible Compton-reflection continuum it is likely that the narrow Fe K alpha and Fe K Beta lines originate in a Compton-thin structure.
Author
Accretion Disks; K Lines; Seyfert Galaxies; X Ray Astronomy; Active Galactic Nuclei

20070020290 Clark-Atlanta Univ., GA, USA
Electron Collisional Excitation Rates for OI USING the B-Spline R-Matrix Approach
Zatsarinny, O.; Tayal, S. S.; The Astrophysical Journal, Supplement Series; October 2003; Volume 148, pp. 575-582; In English
Contract(s)/Grant(s): NAG5-13340; NAG5-11434; Copyright; Avail.: Other Sources; Abstract Only

The B-spline R-matrix approach has been used to calculate electron collisional excitation strengths and rates for transitions between the 3P, 1D, and 1S states of ground configuration and from these states to the states of the excited 2s(sup 2)2p(sup 3)ns (n = 3-5), 2s(sup 2)2p(sup 3)np (n = 3-4), 2s(sup 2)2p(sup 3)nd (n = 3-4), 2s(sup 2)2p(sup 3)4f, and 2s2p(sup 5) configurations. The nonorthogonal orbitals are used for an accurate description of both the target wave functions and the R-matrix basis functions. The thermally averaged collision strengths are obtained from the collision strengths by integrating over a Maxwellian velocity distribution of electron energies, and these are tabulated over a temperature range from 1000 to 60,000 K. The parametric functions of scaled energy have also been obtained to represent collision strengths over a wide energy range or thermally averaged collision strengths at any desired temperature.
Author
Electron Energy; Atomic Collisions; Excitation; Velocity Distribution; Orbitals; Splines

20070020293 Clark-Atlanta Univ., GA, USA
New Accurate Oscillator Strengths and Electron Excitation Collision Strengths for N1
Tayal, S. S.; The Astrophysical Journal, Supplement Series; March 2006; Volume 163, pp. 207-223; In English
Contract(s)/Grant(s): NAG5-13340; Copyright; Avail.: Other Sources

The nonorthogonal orbitals technique in a multiconfiguration Hartree-Fock approach is used to calculate oscillator strengths and transition probabilities of N(I) lines. The relativistic effects are allowed by means of Breit-Pauli operators. The length and velocity forms of oscillator strengths show good agreement for most transitions. The B-spline R-matrix with pseudostates approach has been used to calculate electron excitation collision strengths and rates. The nonorthogonal orbitals are used for an accurate description of both target wave functions and the R-matrix basis functions. The 24 spectroscopic bound and autoionizing states together with 15 pseudostates are included in the close-coupling expansion. The collision strengths for transitions between fine-structure levels are calculated by transforming the LS-coupled K-matrices to K-matrices in an intermediate coupling scheme. Thermally averaged collision strengths have been determined by integrating collision strength over a Maxwellian distribution of electron energies over a temperature range suitable for the modeling of astrophysical plasmas. The oscillator strengths and thermally averaged collision strengths are presented for transitions between the fine-structure levels of the 2s(sup 2)p(sup 3) (sup 4)S(sup 0), (sup 2)D(sup 0), (sup 2)P(sup 0), 2s2p(sup 4) (sup 4)P, 2s(sup 2)2p(sup 2)3s (sup 4)P, and (sup 2)P terms and from these levels to the levels of the 2s(sup 2)2p(sup 2)3p (sup 2)S(sup 0), (sup 4)D(sup 0), (sup 4)P(sup 0), (sup 4)S(sup 0), (sup 2)D(sup 0), (sup 2)P(sup 0),2s(sup 2)2p(sup 2)3s(sup 2)D, 2s(sup 2)2p(sup 2)4s(sup 4)P, (sup 2)P, 2s(sup 2)2p(sup 2)3d(sup 2)P, (sup 4)F,(sup 2)F,(sup 4)P, (sup 4)D, and (sup 2)D terms. Thermally averaged collision strengths are tabulated over a temperature range from 500 to 50,000 K.
Author
Electron Scattering; Excitation; Oscillator Strengths; Space Plasmas; Electron States; Electron Transitions; Nitrogen Atoms

20070020332 Clark-Atlanta Univ., GA, USA

Accurate Calculation of Oscillator Strengths for CI II Lines Using Non-orthogonal Wavefunctions

Tayal, S. S.; Astronomy and Astrophysics; November 2004; Volume 426, pp. 717-720; In English

Contract(s)/Grant(s): NAG5-13340; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1051/0004-6361:20041557

Non-orthogonal orbitals technique in the multiconfiguration Hartree-Fock approach is used to calculate oscillator strengths and transition probabilities for allowed and intercombination lines in Cl II. The relativistic corrections are included through the Breit-Pauli Hamiltonian. The Cl II wave functions show strong term dependence. The non-orthogonal orbitals are used to describe the term dependence of radial functions. Large sets of spectroscopic and correlation functions are chosen to describe adequately strong interactions in the 3s(sup 2)3p(sup 3)nl (sup 3)Po, (sup 1)Po and (sup 3)Do Rydberg series and to properly account for the important correlation and relaxation effects. The length and velocity forms of oscillator strength show good agreement for most transitions. The calculated radiative lifetime for the 3s3p(sup 5) (sup 3)Po state is in good agreement with experiment.

Author

Oscillator Strengths; Hartree Approximation; Transition Probabilities; Wave Functions; Hamiltonian Functions; Orbitals

20070020418 Stanford Linear Accelerator Center, CA, USA, Brookhaven National Lab., Upton, NY USA, Harvard Univ., Cambridge, MA, USA, California Univ., Santa Cruz, CA, USA

LSST Camera Overview

Gilmore, K.; Kahn, S.; Norby, M.; Burke, D.; OConnor, P.; Jan. 10, 2007; 12 pp.; In English

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

Report No.(s): DE2007-897454; SLAC-PUB-12291; No Copyright; Avail.: National Technical Information Service (NTIS)

The LSST camera is a wide-field optical (0.35-1um) imager designed to provide a 3.5 degree FOV with better than 0.2 arcsecond sampling. The detector format will be a circular mosaic providing approximately 3.2 Gigapixels per image. The camera includes a filter mechanism and, shuttering capability. It is positioned in the middle of the telescope where cross-sectional area is constrained by optical vignetting and heat dissipation must be controlled to limit thermal gradients in the optical beam. The fast, f/1.2 beam will require tight tolerances on the focal plane mechanical assembly. The focal plane array operates at a temperature of approximately -100 degrees C to achieve desired detector performance. The focal plane array is contained within an evacuated cryostat, which incorporates detector front-end electronics and thermal control. The cryostat lens serves as an entrance window and vacuum seal for the cryostat. Similarly, the camera body lens serves as an entrance window and gas seal for the camera housing, which is filled with a suitable gas to provide the operating environment for the shutter and filter change mechanisms. The filter carousel can accommodate 5 filters, each 75 cm in diameter, for rapid exchange without external intervention.

NTIS

Cameras; Surveys; Telescopes

20070020419 Stanford Linear Accelerator Center, CA, USA, Lawrence Livermore National Lab., Livermore, CA USA, Johns Hopkins Univ., Baltimore, MD, USA

Designing an Multi-petabyte Database for LSST

Becla, J.; Hanushevsky, A.; Nikolaev, S.; Abdulla, G.; Szalay, A.; Jan. 10, 2007; 8 pp.; In English

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

Report No.(s): DE2007-897453; SLAC-PUB-12292; No Copyright; Avail.: Department of Energy Information Bridge

The 3.2 giga-pixel LSST camera will produce approximately half a petabyte of archive images every month. These data need to be reduced in under a minute to produce real-time transient alerts, and then added to the cumulative catalog for further analysis. The catalog is expected to grow about three hundred terabytes per year. The data volume, the real-time transient alerting requirements of the LSST, and its spatio-temporal aspects require innovative techniques to build an efficient data access system at reasonable cost. As currently envisioned, the system will rely on a database for catalogs and metadata. Several database systems are being evaluated to understand how they perform at these data rates, data volumes, and access patterns. This paper describes the LSST requirements, the challenges they impose, the data access philosophy, results to date from evaluating available database technologies against LSST requirements, and the proposed database architecture to meet the data challenges.

NTIS

Data Base Management Systems; Data Bases; Data Storage; Surveys; Telescopes

20070020420 Stanford Linear Accelerator Center, CA, USA, Brookhaven National Lab., Upton, NY USA, Innovative Machine Solutions, Dublin, CA, USA

Focal Plane Metrology for the LSST Camera

Rasmussen, A. P.; Hale, L.; Kim, P.; Lee, E.; Perl, M.; Jan. 10, 2007; 13 pp.; In English

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

Report No.(s): DE2007-897452; SLAC-PUB-12290; No Copyright; Avail.: National Technical Information Service (NTIS)

Meeting the science goals for the Large Synoptic Survey Telescope (LSST) translates into a demanding set of imaging performance requirements for the optical system over a wide (3.5(sup o)) field of view. In turn, meeting those imaging requirements necessitates maintaining precise control of the focal plane surface (10 (micro)m P-V) over the entire field of view (640 mm diameter) at the operating temperature (T (approx.) -100 degrees C) and over the operational elevation angle range. We briefly describe the hierarchical design approach for the LSST Camera focal plane and the baseline design for assembling the flat focal plane at room temperature. Preliminary results of gravity load and thermal distortion calculations are provided, and early metrological verification of candidate materials under cold thermal conditions are presented. A detailed, generalized method for stitching together sparse metrology data originating from differential, non-contact metrological data acquisition spanning multiple (non-continuous) sensor surfaces making up the focal plane, is described and demonstrated. Finally, we describe some in situ alignment verification alternatives, some of which may be integrated into the camera's focal plane.

NTIS

Alignment; Cameras; Metrology; Surveys; Telescopes

91
LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

20070019797 NASA Marshall Space Flight Center, Huntsville, AL, USA

Observations of Lightning on Earth from the Lunar Surface

Goodman, S. J.; Buechler, D. E.; Christian, H. J., Jr.; Stahl, H. P.; [2007]; 2 pp.; In English; Lunar Science Workshop/INFONETIC, 26 Feb. - 1 Mar. 2007, Tempe, AZ, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources: A01, Hardcopy

The NASA Optical Transient Detector (OTD) launched into a 70deg inclination orbit in April 1995 aboard the MicroLab-1 satellite and the Lightning Imaging Sensor (LIS) launched into a 35deg inclination orbit in November 1997 (and still operating today) aboard the Tropical Rainfall Measuring Mission have produced the most comprehensive global observations of lightning activity on Earth. The OTD collected data for 5-yr from an altitude of 740 km while the LIS, in its 10th year of operations, is still collecting data from its current altitude of 402 km. From these altitudes the OTD observes an individual storm within its field of view for approx.3 min and the LIS for approx.90 sec as the satellites orbit the earth. Figures 1-4 show the combined LIS/OTD distribution of lightning for day and night during the Northern Hemisphere warm season from April through August (Fig. 1,2) and the cool season from October through February (Fig. 3,4) as might be observed from the lunar surface (12-h daylight and 12-h nighttime observations). The day and night plots are for the twelve hour periods centered on local noon and midnight. The total viewtime of the global lightning activity is 200 hours or less, depending on latitude (Fig. 5). Most of the observed lightning occurs over the northern hemisphere land areas as reported in previous studies. More lightning activity is seen at the higher northern latitudes during the day. The greatest lightning maxima occurs in the southeastern US, during the day. The corresponding region at night shows much less lightning activity. In contrast, there is a maxima in lightning activity at night over the high Plains area of the U.S. This region had lower lightning rates during the daytime period. During the cold season, the southern hemisphere has significantly more lightning. The maxima in Central Africa is still present, and a secondary maxima is observed in South Africa. In South America, the maxima in Argentina occurs at night in association with large-scale mesoscale convective storm complexes. This is the region on the earth having the greatest frequency of extreme storms with flash rates exceeding 1000 flashes/min. daytime maxima is seen extending from Northern Argentina to Brazil. In the US., the Gulf of Mexico and the Gulf Coast states exhibit a maximum in lightning activity both day and night.

Derived from text

Lightning; Lunar Surface; Earth Surface; Storms; TRMM Satellite; Imaging Techniques; Convection

20070019810 NASA Johnson Space Center, Houston, TX, USA

Aqueous Alteration of Basalts: Earth, Moon, and Mars

Ming, Douglas W.; [2007]; 1 pp.; In English; Goldschmidt 2007 Conference, 19-24 Aug. 2007, Cologne, Germany

Contract(s)/Grant(s): 361426.04.05; No Copyright; Avail.: Other Sources; Abstract Only

The geologic processes responsible for aqueous alteration of basaltic materials on Mars are modeled beginning with our knowledge of analog processes on Earth, i.e., characterization of elemental and mineralogical compositions of terrestrial environments where the alteration and weathering pathways related to aqueous activity are better understood. A key ingredient to successful modeling of aqueous processes on Mars is identification of phases that have formed by those processes. The purpose of this paper is to describe what is known about the elemental and mineralogical composition of aqueous alteration products of basaltic materials on Mars and their implications for specific aqueous environments based upon our knowledge of terrestrial systems. Although aqueous alteration has not occurred on the Moon, it is crucial to understand the behaviors of basaltic materials exposed to aqueous environments in support of human exploration to the Moon over the next two decades. Several methods or indices have been used to evaluate the extent of basalt alteration/weathering based upon measurements made at Mars by the Mars Exploration Rover (MER) Moessbauer and Alpha Particle X-Ray Spectrometers. The Mineralogical Alteration Index (MAI) is based upon the percentage of total Fe (Fe(sub T)) present as Fe(3+) in alteration products (Morris et al., 2006). A second method is the evaluation of compositional trends to determine the extent to which elements have been removed from the host rock and the likely formation of secondary phases (Nesbitt and Young, 1992; Ming et al., 2007). Most of the basalts that have been altered by aqueous processes at the two MER landing sites in Gusev crater and on Meridiani Planum have not undergone extensive leaching in an open hydrolytic system with the exception of an outcrop in the Columbia Hills. The extent of aqueous alteration however ranges from relatively unaltered to pervasively altered materials. Several experimental studies have focused upon the aqueous alteration of lunar materials and simulants (e.g., Keller and Huang, 1971; Eick et al., 1996). Lunar basalts are void of water and highly reduced, hence, these materials are initially very reactive when exposed to water under oxidizing conditions.

Author

Basalt; Mars Surface; Planetary Geology; Earth Surface; Mineralogy; Moon; Aqueous Solutions

20070019852 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

An Update of the Ground Testing of the Li-ion Batteries in Support of JPL's 2003 Mars Exploration Rover Mission

Smart, Marshall C.; Ratnakumar, B. V.; Ewell, R. C.; Whitcanack, L. D.; Surampudi, S.; Puglia, F.; Gitzendanner, R.; June 26, 2006; 8 pp.; In English; 4th International Energy Conversion Engineering Conference, 26-29 Jun. 2006, San Diego, CA, USA; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39912

In early 2004, JPL successfully landed two Rovers, named Spirit and Opportunity, on the surface of Mars after traveling \g 300 million miles over a 6-7 month period. In order to operate for extended duration (\g9 months), both Rovers are equipped with rechargeable Lithium-ion batteries, which have enabled operation for over 854 and 834 Sols of operation, respectively, to date. Given that the batteries were required to support the mission for 90 Sols of operation by design, it is significant that the batteries have demonstrated over a nine fold increase in life over mission objectives. In addition to supporting the surface operations in conjunction with a triple-junction deployable solar arrays, the batteries were designed to aid in the launch and the EDL pyros, and allow for anomalies during cruise. In summary, the requirements of the Lithium-ion battery include the ability to provide power at least 90 sols on the surface of Mars, operate over a wide temperature range (-20 C to +30 C), withstand long storage periods (e.g., cruise period), operate in an inverted orientation, and support high current pulses (e.g., firing pyro events). In order to determine the viability of meeting these requirements, ground testing was performed on a Rover Battery Assembly Unit (RBAU), consisting of two 8-cell 10 Ah lithium-ion batteries connected in parallel. The RBAU upon which the performance testing was performed is nearly identical to the batteries incorporated into the two Rovers currently on Mars. The testing includes, (a) performing initial characterization tests (discharge capacity at different temperatures), (b) simulating the launch conditions, (c) simulating the cruise phase conditions (including trajectory correction maneuvers), (d) simulating the entry, decent, and landing (EDL) pulse load profile (required to support the pyros) (e) simulating the Mars surface operation mission simulation conditions, as well as, (f) assessing capacity loss and impedance characteristics as a function of temperature and life. This paper provides further detail to previously reported results1 of the RBAU testing program, especially with regard to the life characteristics. To date, the lithium-ion batteries (fabricated by Lithion/Yardney,

Inc.) have been demonstrated to far exceed the requirements defined by the mission, both on Mars and on the ground, and are projected to support an extended mission (\g 4 years).
Author
Lithium Batteries; Roving Vehicles; Mars Surface; Electric Batteries; Ground Tests; Mars Exploration; Surface Properties; Simulation

20070020000 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mars Odyssey: Off-nadir Imaging
Polanskey, Carol A.; May 25, 2006; 10 pp.; In English; Mars Odyssey Project Science Group (PSG), 22-25 May 2006, Moscow, Russia; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39914

Science Objectives for off-nadir imaging: a) Daily observations of high activity and high interest targets in the Polar Regions; b) Daily imaging of regions of gas jetting through vents and the formation of dark spots and fans; c) Increases likelihood of observing these processes in an active phase; d) Stereo imaging for geographical analysis and landing site characterization; and e) Fill in existing gaps and gores.
Derived from text
Imaging Techniques; Mars (Planet); Landing Sites; Targets; Vents; Polar Regions

20070020017 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Considerations for Isochronous Data Services over the Proximity-1 Space Link
Gao, Jay L.; June 19, 2006; 12 pp.; In English; AIAA 9th International Conference on Spacecraft Operations (SpaceOps), 16-24 Jun. 2006, Rome, Italy; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39923

Future mission concepts for robotic and human explorations will involve a high level of real time control/monitoring operations such as tele-operation for spacecraft rendezvous and surface mobile platforms carrying life-support equipments. The timely dissemination of voice, command, and real-time telemetry for monitoring and coordination purposes is critical for mission success. It is envisioned that future missions will require a network infrastructure capable of supporting isochronous data services. The CCSDS Proximity-1 Space Link Protocol1 could be used to provide isochronous service over the surface-to-Earth relay as well as 'beyond-the-horizon' communications between distant Lunar or Mars surface elements. This paper will analyze the latency, jitter, and throughput performance of the Proximity-1 protocol for isochronous applications. In particular we will focus on constrained scenarios where the protocol operates in full-duplex mode, carrying isochronous traffic in one direction and error-controlled traffic in the other direction. We analyze the impact of the strict priority scheme in Proximity-1 on delay jitter and the impact of the isochronous traffic on the efficiency of the reliable data transfer in the other direction, and discuss methods for performance optimization. In general, jitter performance is driving by relative loading of isochronous traffic on the forward link compared to the acknowledgement traffic. Under light loading condition, the upper-bound of the delay jitter is the transmission duration of an acknowledgement frame on the forward link; for higher loading scenarios, the maximum jitter is scaled up by the inverse of the residual bandwidth, i.e., the spare capacity available in the forward link to carry isochronous traffic.
Author
Mission Planning; Telemetry; Space Missions; Robotics; Bandwidth; Real Time Operation; Protocol (Computers)

20070020019 California Univ., Los Angeles, CA, USA
Summary of Results from Analyses of Deposits of the Deep-Ocean Impact of the Eltanin Asteroid
Kyte, Frank T.; Kuhn, Gerhard; Gersonde, Rainer; Eos Transactions. AGU; [2005]; Volume 86, No. 52; 2 pp.; In English; AGU Fall Meeting 2005, 5 December 2005, San Francisco, CA, USA
Contract(s)/Grant(s): NAG5-12895
Report No.(s): P41E-03; Copyright; Avail.: Other Sources; Abstract Only

Deposits of the late Pliocene (2.5 Ma) Eltanin impact are unique in the known geological record. The only known example of a km-sized asteroid to impact a deep-ocean (5 km) basin, is the most meterorite-rich locality known. This was discovered as an Ir anomaly in sediments from three cores collected in 1965 by the USNS Eltanin. These cores contained mm-sized shock-melted asteroid materials and unmelted meteorite fragments. Mineral chemistry of meteorite fragments, and siderophole concentrations in melt rocks, indicate that the parent asteroid was a low-metal (4\%) mesosiderite. A geological exploration of the impact in 1995 by Polarstern expedition ANT-XIV4 was near the Freeden Seamounts (57.3S, 90.5 W), and successfully

collected three cores with impact deposits. Analyses showed that sediments as old as Eocene were eroded by the impact disturbance and redeposited in three distinct units. The lowermost is a chaotic assemblage of sediment fragments up to 50 cm in size. Above this is a laminated sand-rich unit that deposited as a turbulent flow, and this is overlain by a more fine-grained deposit of silts and clays that settled from a cloud of sediment suspended in the water column. Meteoritic ejecta particles were concentrated near the base of the uppermost unit, where coarse ejecta caught up with the disturbed sediment. Here we will present results from a new suite of cores collected on Polarstern expedition ANT-XVIIU5a. In 2001, the Polarstern returned to the impact area and explored a region of 80,000 sq-km., collecting at least 16 sediment cores with meteoritic ejecta. The known strewn field extends over a region 660 by 200 km. The meteoritic ejecta is most concentrated in cores on the Freeden seamounts, and in the basins to the north, where the amount of meteoritic material deposited on the ocean floor was as much as 3 g/sq-cm. These concentrations drop off to the north and the east to levels as low as approximately 0.1 g/sq-cm. We were unable to sample the impact south and west of the seamounts, as the deposit was buried beyond the reach of our 25 m piston corer. We estimate that ground zero was in the region just north, or northwest, of the seamounts. There is no evidence that the impactor penetrated the ocean floor or formed a crater. The composition of the melted ejecta is inconsistent with mixing between projectile and terrestrial materials other than seawater salts. X-ray radiographs of sediments reveal details not seen in earlier cores. The uppermost impact unit is well-preserved in several cores, found as much as 50 km from the seamounts to the east, north, and west of the seamounts, where at least 25 cm of this unit is preserved. At greater distances burrowing organisms have mixed the sediments so if this unit did exist, it was too thin to survive bioturbation. These finegrained sediments are clearly laminated, and show alternating layers of low- and high-density (meteoritic) sediments, consistent with ripple formation in an energetic flow regime. We have extracted 35 g of meteoritic melt rock and 3 g of meteorite fragments from sieved sediments. Additionally a 9 g, 2.2 cm meteorite was recovered during opening of one core. The fact that 9\% of the coarse ejecta is unmelted meteorites may be characteristic of deep-ocean impacts. This may have significance for delivery of organic matter to the early Earth by small impacts into primordial oceans, where actual meteorite fragments can survive in significant amounts. However, a large portion of the meteoritic debris is buried rapidly by the sediments disturbed by the impact.

Author

Deposits; Ejecta; Meteoritic Composition; Ocean Bottom; Meteorite Craters; Asteroids; Iron Meteorites

20070020020 California Univ., Los Angeles, CA, USA

Sedimentation Patterns of Meteoritic Ejecta in Eltanin Impact Deposits at Site PS58/281

Kyte, Frank T.; Gersonde, Rainer; Kuhn, Gerhard; March 13, 2006; 3 pp.; In English; 37th Lunar and Planetary Science Conference, 13-17 March 2006, Houston, TX, USA; Original contains black and white illustrations

Contract(s)/Grant(s): NAG5-12895

Report No.(s): LPI-2305; Copyright; Avail.: CASI: A01, Hardcopy

Deposits of the late Pliocene (2.5 Ma) Eltanin impact are unique in the known geological record. It is the only known km-sized asteroid impact into a deep-ocean (5 km) basin, and the central portion of the impact region is the most meterorite-rich locality known on Earth. Evidence for this deposit was first discovered as an Ir anomaly in sediments from three cores collected in 1965 by the USNS Eltanin. These cores contained mm-sized shock-melted asteroidal materials and several percent unmelted meteorite fragments. Based on mineral chemistry of unmelted meteorite fragments, and siderophole element concentrations in the impact melt, the parent asteroid is considered to be a low-metal (-4%) mesosiderite. In this poster we will illustrate details of the distribution of meteoritic ejecta in a piston core from site PS58/281 (57.4 deg S. 91.96 deg W; 4772 m depth), which was recovered from a basin on the NW edge of the seamounts. This core is exceptional in its high concentrations of meteoritic ejecta and may have been close to the actual impact site. We estimate that the impact deposited 2.8 g/square cm of meteoritic ejecta on the ocean floor at this site.

Derived from text

Asteroids; Ejecta; Iron Meteorites; Meteorite Collisions; Sediments; Hypervelocity Impact

20070020022 San Diego Univ., San Diego, CA, USA

The Cretaceous/Paleogene Transition on the East Tasman Plateau, Southwestern Pacific

Schellenberg, Stephen A.; Brinkhuis, Henk; Stickley, Catherine E.; Fuller, Michael; Kyte, Frank T.; Williams, Graham L.; The Cenozoic Southern Ocean: Techtonics, Sedimentation and Climate Change Between Australia and Antarctica; January 2004; Volume 151, pp. 93-112; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAG5-12895; Copyright; Avail.: Other Sources

Ocean Drilling Program Leg 189 recovered a potentially complete shallow marine record of the Cretaceous-Paleogene boundary (KPB) at Site 1172 on the East Tasman Plateau. Here we present high-resolution (cm-scale) data from

micropaleontology, geochemistry, sedimentology, and paleomagnetism that provide no evidence for a complete KPB, but instead suggest a boundary-spanning hiatus of at least 0.8 Ma. We interpret this hiatus to represent the sequence boundary between the uppermost Maastrichtian Tal.1 and lowermost Danian Ta1.2/ Da- 1 3rd-order sequence stratigraphic cycles. Microfloral assemblages indicate generally shallow paleodepths, restricted circulation, and eutrophic conditions through the section. Paleodepths progressively shallow through the late Maastrichtian, while more oceanic and warmer conditions dominate the early Danian. The Site 1172 KPB section is broadly comparable to other southern highlatitude sections in Antarctica and New Zealand, but appears to record a shallower and more restricted environment that permitted a eustatically-driven hiatus across the KPB mass extinction event.
Author
Pacific Ocean; Geochemistry; Paleontology; Fossils; Paleobiology; Paleomagnetism; Cretaceous-Tertiary Boundary; Iron Meteorites

20070020023 California Univ., Los Angeles, CA, USA
Meteoritic Microfossils in Eltanin Impact Deposits
Kyte, Frank T.; Gersonde, Rainer; Kuhn, Gerhard; Meteoritics and Planetary Science; September 2006; Volume 41, Suppl, pp. 5345; In English; 69th Annual Meeting of the Meteoritical Society, 6-11 August 2006, Zurich, Switzerland
Contract(s)/Grant(s): NAG5-12895; Copyright; Avail.: Other Sources

We report the unique occurrence of microfossils composed largely of meteoritic ejecta particles from the late Pliocene (2.5 Ma) Eltanin impact event. These deposits are unique, recording the only known km-sized asteroid impact into a deep-ocean (5 km) basin. First discovered as in Ir anomaly in sediment cores that were collected in 1965, the deposits contain nun-sized shock-melted asteroidal material, unmelted meteorite fragments (named the Eltanin meteorite), and trace impact spherules. Two oceanographic expeditions by the FS Polarstern in 1995 and 2001 explored approximately 80,000 sq-km. of the impact region, mapping the distribution of meteoritic ejecta, disturbance of seafloor sediments by the impact, and collected 20 new cores with impact deposits in the vicinity of the Freeden Seamounts (57.3S, 90.5W). Analyses of sediment cores show that the impact disrupted sediments on the ocean floor, redepositing them as a chaotic jumble of sediment fragments overlain by a sequence of laminated sands, silts and clays deposited from the water column. Overprinted on this is a pulse of meteoritic ejecta, likely transported ballistically, then settled through the water column. At some localities, meteoritic ejecta was as much as 0.4 to 2.8 g/cm2. This is the most meteorite-rich locality known on Earth.
Author
Asteroids; Ejecta; Hypervelocity Impact; Meteorite Collisions; Meteoritic Composition; Meteoritic Microstructures

20070020026 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Challenges of Landing on Mars
Rivellini, Tommaso; September 9, 2004; 5 pp.; In English; National Academy of Engineering Annual Meeting, 9 Sep. 2004, Long Beach, CA, USA; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40017

Humans have been fascinated with the idea of exploring Mars since the very beginning of the space age. Largely due to the belief that life may have at one time existed in some form, surface exploration has been the ultimate ambition of this exploration. Unfortunately engineers and scientists discovered early on that landing a spacecraft on the surface of Mars was to become one of the most difficult and treacherous challenges of robotic space exploration. At arrival to Mars, a spacecraft will be traveling at velocities between 4 and 7 km/s. 100% of this kinetic energy (KE) must be safely removed for a lander to deliver its payload to the surface. Fortunately Mars has an atmosphere substantial enough to allow the combination of a high drag heatshield and a parachute to remove 99% and 0.98% respectively of this kinetic energy. Unfortunately the atmosphere is not substantial enough to bring a lander to a safe touchdown. This means that an additional landing system is required to remove the remaining kinetic energy. On all previous successful missions the landing system has consisted of 2 major elements, a propulsion subsystem to remove an additional 0.002% (approx.50 - 100 m/s) of the original KE and a final dedicated touchdown system. The first generation Mars landers used legs to accomplish touchdown. The second generation of Mars lander touchdown systems used airbags to mitigate the last few meters per second of residual velocity. NASA is currently developing a third generation landing system in an effort to reduce cost, mass and risk while simultaneously increasing performance as measured by payload fraction to the surface and accessible terrain roughness.
Derived from text
Mars Landing; Mars Surface; Surface Roughness; Landing Aids; Heat Shielding; Kinetic Energy

20070020205 Massachusetts Inst. of Tech., Cambridge, MA, USA
Evidence for a Past High-Eccentricity Lunar Orbit
Garrick-Betthell, Ian; Wisdom, Jack; Zuber, Maria T.; Science; [2007]; Volume 313, No. 5787, pp. 62-655; In English; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1126/science.1128237

The large differences between the Moon's three principal moments of inertia have been mystery since Laplace considered them in 1799. Here we present calculations that show how past high eccentricity orbits can account for the moment differences, represented by the low-order lunar gravity field and libration parameters. One of our solutions is that the Moon may have once been in a 3:2 resonance of the orbit period to spin-period, similar to Mercury's present state. The possibility of past high-eccentricity orbits suggests a rich dynamical history and may influence our understanding of the early thermal evolution of the Moon.
Author
Eccentricity; Moon; Selenology; Eccentric Orbits; Lunar Evolution

20070020206 Massachusetts Inst. of Tech., Cambridge, MA, USA
Dynamics of the Lunar Spin Axis
Wisdom, Jack; The Astronomical Journal; March 2006; Volume 131, No. 1803, pp. 1864-1871; In English
Contract(s)/Grant(s): NNG05GL98G; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1086/499581

The evolution of the lunar spin axis is studied. Prior work has assumed that the inclination of the lunar orbit is constant and that the node regresses uniformly. This work takes into account the nonconstant inclination and nonuniform regression of the node as determined from averaged models of the motion of the lunar orbit. The resulting dynamics is considerably more rich, exhibiting additional resonances, period doubling and tripling, and chaos.
Author
Lunar Orbits; Lunar Evolution

20070020208 Massachusetts Inst. of Tech., Cambridge, MA, USA
Motion of the Mantle in the Translational Modes of the Earth and Mercury
Grinfeld, Pavel; Wisdom, Jack; Physics of The Earth and Planetary Interiors; July 2005; Volume 151, Issues 1-2, pp. 77-87; In English
Contract(s)/Grant(s): NNG05GL98G; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1016/j.pepi.2005.01.003

Slichter modes refer to the translational motion of the inner core with respect to the outer core and the mantle. The polar Slichter mode is the motion of the inner core along the axis of rotation. Busse presented an analysis of the polar mode which yielded an expression for its period. Busse's analysis included the assumption that the mantle was stationary. This approximation is valid for planets with small inner cores, such as the Earth whose inner core is about 1/60 of the total planet mass. On the other hand, many believe that Mercury's core may be enormous. If so, the motion of the mantle should be expected to produce a significant effect. We present a formal framework for including the motion of the mantle in the analysis of the translational motion of the inner core. We analyze the effect of the motion of the mantle on the Slichter modes for a non-rotating planet with an inner core of arbitrary size. We omit the effects of viscosity in the outer core, magnetic effects, and solid tides. Our approach is perturbative and is based on a linearization of Euler's equations for the motion of the fluid and Newton's second law for the motion of the inner core. We find an analytical expression for the period of the Slichter mode. Our result agrees with Busse's in the limiting case of small inner core. We present the unexpected result that even for Mercury the motion of the mantle does not significantly change the period of oscillation.
Author
Mercury (Planet); Planetary Cores; Translational Motion; Planetary Mantles; Perturbation Theory; Fluid Dynamics

20070020279 Michigan Univ., Ann Arbor, MI, USA
Gas Dynamics and Kinetics in the Cometary Coma: Theory and Observations
Combi, Michael R.; Harris, Walter M.; Smyth, William H.; COMET II; May 2005, pp. 523; In English
Contract(s)/Grant(s): NAG5-13239; Copyright; Avail.: Other Sources

Our ability to describe the physical state of the expanding coma affects fundamental areas of cometary study both directly and indirectly. In order to convert measured abundances of gas species in the coma to gas production rates, models for the

distribution and kinematics of gas species in the coma are required. Conversely, many different types of observations, together with laboratory data and theory, are still required to determine coma model attributes and parameters. Accurate relative and absolute gas production rates and their variations with time and from comet to comet are crucial to our basic understanding of the composition and structure of cometary nuclei and their place in the solar system. We review the gas dynamics and kinetics of cometary comae from both theoretical and observational perspectives, which are important for understanding the wide variety of physical conditions that are encountered.
Author
Comets; Gas Dynamics; Kinetics; Cometary Atmospheres; Comet Heads

20070020280 Johns Hopkins Univ., USA
Spectroscopic Investigations of Fragment Species in the Coma
Feldman, Paul D.; Cochran, Anita L.; Combi, Michael R.; Comets II; [2004], pp. 425; In English
Contract(s)/Grant(s): NAG5-13239; Copyright; Avail.: Other Sources

The content of the gaseous coma of a comet is dominated by fragment species produced by photolysis of the parent molecules issuing directly from the icy nucleus of the comet. Spectroscopy of these species provides complementary information on the physical state of the coma to that obtained from observations of the parent species. Extraction of physical parameters requires detailed molecular and atomic data together with reliable high-resolution spectra and absolute fluxes of the primary source of excitation, the Sun. The large database of observations, dating back more than a century, provides a means to assess the chemical and evolutionary diversity of comets.
Author
Comet Nuclei; Comets; Fragments; Spectroscopy; Cometary Atmospheres; Composition (Property); Chemical Analysis

20070020281 Johns Hopkins Univ., Laurel, MD, USA
Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System
Lisse, C. M.; Christian, D. J.; Deneri, K.; Wolk, S. J.; Bodewits, D.; Hoekstra, R.; Combi, M. R.; Makinen, T.; Dryer, M.; Fry, C. D.; Weaver, H.; The Astrophysical Journal; December 20, 2005; Volume 635, pp. 1329-1347; In English
Contract(s)/Grant(s): NAG5-13239; Copyright; Avail.: Other Sources

We report the results of 15 hr of Chandra observations of comet 2P/Encke 2003 on November 24. X-ray emission from comet Encke was resolved on scales of 500-40,000 km, with unusual morphology due to the presence of a low-density, collisionally thin (to charge exchange) coma. A light curve with peak-to-peak amplitude of 20% consistent with a nucleus rotational period of 11.1 hr was found, further evidence for a collisionally thin coma. We confirm emission lines due to oxygen and neon in the 800-1000 eV range but find very unusual oxygen and carbon line ratios in the 200-700 eV range, evidence for low-density, high effective temperature solar wind composition. We compare the X-ray spectral observation results to contemporaneous measurements of the coma and solar wind made by other means and find good evidence for the dominance of a postshock bubble of expanding solar wind plasma, moving at 600 km/s with charge state composition between that of the ‘fast’ and ‘slow’ solar winds.
Author
Encke Comet; Plasma Interactions; Solar Wind; Cometary Atmospheres; Comet Nuclei; X Rays

20070020320 Clark-Atlanta Univ., GA, USA
Accurate Cross Sections for Excitation of Resonance Transitions in Atomic Oxygen
Tayal, S. S.; Journal of Geophysical Research; August 03, 2004; ISSN 0148-0227; Volume 109, pp. A08301; In English
Contract(s)/Grant(s): NAG5-13340; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1029/2004JA010389

Electron collision excitation cross sections for the resonance 2p(sup)4 (sup 3)P-2p(sup 3)3s (sup 3)S(sup 0), 2p(sup 4) (sup 3)P-2p(sup 3)3d (sup 3)D(sup 0), 2p4 (sup 3)P-2p(sup 3)3s (sup 3)D(sup 0), 2p(sup 4) (sup 3)P-2p(sup 3)3s (sup 3)P(sup 0) and 2p(sup 4) (sup 3)P-2s2p(sup 5) (sup 3)P(sup 0) transitions have been calculated by using the R matrix with a pseudostates approach for incident electron energies from near threshold to 100 eV. The excitation of these transition sgives rise to strong atomic oxygen emission features at 1304, 1027, 989, 878, and 792 Angstrom in the spectra of several planetary atmospheres. We included 22 spectroscopic bound and autoionizing states and 30 pseudostates in the close-coupling expansion. The target wave functions are chosen to properly account for the important correlation and relaxation effects. The effect of coupling to the continuum is included through the use of pseudostates. The contribution of the ionization continuum

is significant for resonance transitions. Measured absolute direct excitation cross sections of 0 I are reported by experimental groups from the Jet Propulsion Laboratory and Johns Hopkins University. Good agreement is noted for the 2p(sup)4 (sup 3)P-2p(sup 3)3s (sup 3)S(sup 0) transition (lambda 1304 Ang) with measured cross sections from both groups that agree well with each other. There is disagreement between experiments for other transitions. Our results support the measured cross sections from the Johns Hopkins University for the 2p(sup 4) (sup 3)P-2p(sup 3)3d (sup 3)D(sup 0) and 2p4 (sup 3)P-2p(sup 3)3s (sup 3)D(sup 0) transitions, while for the 2p4 (sup 3)P-2p(sup 3)3s (sup 3)D(sup 0) transition the agreement is switched to the measured cross sections from the Jet Propulsion Laboratory.
Author
Electron Energy; Excitation; Oxygen Atoms; Planetary Atmospheres; Electron Transitions

20070020321 Agnes Scott Coll., Decatur, GA, USA
On The Effect of Electron Collisions in the Excitation of Cometary HCN
Lovell, Amy J.; Kallivayalil, Nitya; Schloerb, F. Peter; Combi, Michael R.; Hansen, Kenneth C.; Gombosi, T. I.; The Astrophysical Journal; September 20, 2004; Volume 613, pp. 615-621; In English
Contract(s)/Grant(s): NAG5-13239; NAG5-10677; NAG5-11041; Copyright; Avail.: Other Sources; Abstract Only

The electron-HCN collision rate for the excitation of rotational transitions of the HCN molecule is evaluated in comets C/1995 01 (Hale-Bopp) and C/1996 B2 (Hyakutake). Based on theoretical models of the cometary atmosphere, we show that collisions with electrons can provide a significant excitation mechanism for rotational transitions in the HCN molecule. Computed values of the cross section sigma(sub e-HCN) can be as high as 1.3 x cm2, more than 2 orders of magnitude greater than the commonly assumed HCN-H2O cross section. For the ground rotational transitions of HCN, the electron-HCN collision rate is found to exceed the HCN-H2O collision rate at distances greater than 3000 km from the cometary nucleus of Hale-Bopp and 1000 km from that of Hyakutake. Collisional excitation processes dominate over radiative excitation processes up to a distance of 160,000 km from the cometary nucleus of Hale-Bopp and 50,000 km from that of Hyakutake. Excitation models that neglect electron collisions can underestimate the HCN gas production rates by as much as a factor of 2.
Author
Collision Rates; Comet Nuclei; Comets; Electron Scattering; Hydrocyanic Acid

20070020448 Grainflow Dynamics, Inc., Livermore, CA, USA
Adhesion of Lunar Dust
Walton, Otis R.; April 2007; 48 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NNC06VC87P; WBS 092837.04.02.03
Report No.(s): NASA/CR-2007-214685; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070020448

This paper reviews the physical characteristics of lunar dust and the effects of various fundamental forces acting on dust particles on surfaces in a lunar environment. There are transport forces and adhesion forces after contact. Mechanical forces (i.e., from rover wheels, astronaut boots and rocket engine blast) and static electric effects (from UV photo-ionization and/or tribo-electric charging) are likely to be the major contributors to the transport of dust particles. If fine regolith particles are deposited on a surface, then surface energy-related (e.g., van der Walls) adhesion forces and static-electric-image forces are likely to be the strongest contributors to adhesion. Some measurement techniques are offered to quantify the strength of adhesion forces. And finally some dust removal techniques are discussed.
Author
Adhesion; Lunar Dust; Lunar Environment; Surface Energy; Explosions; Lunar Soil

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20070019865 NASA, Washington, DC, USA

Neutral Atmospheric Influences of the Solar Proton Events in October-November 2003

Jackman, Charles H.; DeLand, Matthew T.; Labow, Gordon J.; Fleming, Eric L.; Weisenstein, Debra K.; Ko, Malcolm K. W.; Sinnhuber, Miriam; Russell, James M.; Journal of Geophysical Rsearch; July 14, 2005; Volume 110, pp. 1-10; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNH04CC39C; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1029/2004JA010888

The large solar storms in October-November 2003 caused solar proton events (SPEs) at the Earth and impacted the middle atmospheric polar cap regions. Although occurring near the end of the maximum of solar cycle 23, the fourth largest period of SPES measured in the past 40 years happened 28-31 October 2003. The highly energetic protons associated with the SPEs produced ionizations, excitations, dissociations, and dissociative ionizations of the background constituents, which led to the production of odd hydrogen (HO(sub x)) and odd nitrogen (NO(sub y)). NO(sub x) (NO + NO2) was observed by the UARS HALOE instrument to increase over 20 ppbv throughout the Southern Hemisphere polar lower mesosphere. The NOAA 16 SBUV/2 instrument measured a short-term ozone depletion of 40% in the Southern Hemisphere polar lower mesosphere, probably a result of the HO(sub x) increases. SBUV/2 observations showed ozone depletions of 5-8% in the southern polar upper stratosphere lasting days beyond the events, most likely a result of the NO(sub y) enhancements. Longer-term Northern Hemisphere polar total ozone decreases of \g0.5% were predicted to last for over 8 months past the events with the Goddard Space Flight Center two-dimensional model. Although the production of NO(sub y) constituents is the same in both hemispheres, the NO(sub y) constituents have a much larger impact in the northern than the southern polar latitudes because of the seasonal differences between the two hemispheres. These observations and model computations illustrate the substantial impact of solar protons on the polar neutral middle atmosphere.

Author

Mesosphere; Neutral Atmospheres; Polar Regions; Solar Storms; Solar Protons; Nitrogen Oxides; Solar Terrestrial Interactions

Subject Term Index

ABERRATION
The Sensitivity of Shaped Pupil Coronagraphs to Optical Aberrations – 143

ACCELERATED LIFE TESTS
Development of a Standard Accelerated Corrosion Test for Acceptance of Post-Tensioning Grouts in Florida – 29

ACCELERATORS
Development of Rutherford-type Cables for High Field Accelerator Magnets at Fermilab – 148

ILC Beam Delivery WG Summary: Optics, Collimation and Background – 110

ACCELEROMETERS
Dual Microwave Cavity Accelerometer – 54

ACCRETION DISKS
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 163

ACETIC ACID
Flavone Acetic Acid Analogs and Methods of Use Thereof – 31

ACHONDRITES
Processes in Early Planetesimals: Evidence from Ureilite Meteorites – 72

ACOUSTIC IMPEDANCE
Acoustic Immunosensor for Detecting Neurotransmitter GABA – 141

ACOUSTICS
Acoustic Longitudinal Field NIF Optic Feature Detection Map Using Time-Reversal and MUSIC – 146

Dynamic Acoustic Thermometer – 51

Sonic Helium Detectors in the Fermilab Tevatron – 138

ACTIVATED CARBON
Production Scale-Up of Activated Carbons for Ultracapacitors. (Final Report, September 30, 2004-September 30, 2006) – 50

ACTIVE GALACTIC NUCLEI
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 163

ACTIVITY (BIOLOGY)
Glycodendrimers having Biological Activity – 38

ACTUATORS
CDF II Detector and Trigger for B Physics – 115

Thin, Flexible Actuator Array to Produce Complex Shapes and Force Distributions – 131

Variable Structure Diagnostics Approach Achieving Optimized Low-Frequency Data Sampling for EMA Motoring Systems – 7

ADDITIVES
Oxygenates Fact Book: A Compilation of Information on the Benefits of Oxygenates in Gasoline – 69

ADHESION
Adhesion of Lunar Dust – 172

ADHESIVES
Adhesive Anchors for Retrofit/Repair of Bridge Rails: Summary Report – 22

ADJUSTING
Multi-Dimensioned Easily Adjustable Single Sheet Container Formula with Indicia – 84

AERIAL PHOTOGRAPHY
Advanced Image Processing of Aerial Imagery – 60

AERODYNAMICS
Gliding Experiments of the Wright Brothers: The Wrights and Flight Research 1899-1908 – 6

AEROSOLS
Aerosol Attenuation Model for Scandinavian Environment; User Manual – 70

Toxicological Evaluation of Realistic Emissions of Source Aerosols (Teresa): Application to Power Plant-Derived PM2.5 – 69

AEROSPACE ENGINEERING
Automated On-board Terrain Analysis for Precision Landings – 15

AEROSPACE ENVIRONMENTS
Radiation-Hardened Electronics for the Space Environment – 15

STS 116 Return Samples: Assessment of Air Quality aboard the Shuttle (STS-116) and International Space Station (12A.1) – 82

AEROSPACE MEDICINE
A Brief Historical Review of Vestibular and Sensorimotor Research Associated with Space Flight – 81

Assuring Crew Health Protection – 81

AEROSPACE SCIENCES
Organization's Orderly Interest Exploration: Inception, Development and Insights of AIAA's Topics Database – 99

AEROSPACE SYSTEMS
Development of New Modeling and Analysis Tools for Solar Sails – 16

AFTERGLOWS
Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae – 162

AGING (MATERIALS)
Properties of Fiberboard Overpack Material in the 9975 Shipping Package Following Thermal Aging – 23

Protection of Alodine Coatings from Thermal Aging by Removable Polymer Coatings – 39

AIR POLLUTION
Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM(sub 2.5), and Regional Haze – 69

Oxygenates Fact Book: A Compilation of Information on the Benefits of Oxygenates in Gasoline – 69

AIR QUALITY
Deriving Benefit Measures with Higher Precision: A Study of Economic Values of Air Quality – 71

Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM(sub 2.5), and Regional Haze – 69

Note on Trasande et al., 'Public Health and Economic Consequences of Methylmercury Toxicity on the Developing Brain' – 70

STS 116 Return Samples: Assessment of Air Quality aboard the Shuttle (STS-116) and International Space Station (12A.1) – 82

AIR TRAFFIC CONTROL
Development of a Prototype Automation Simulation Scenario Generator for Air Traffic Management Software Simulations – 3

AIR TRAFFIC
Study of Normal Operational Landing Performance on Subsonic, Civil, Narrow-Body Jet Aircraft During Instrument Landing System Approaches – 3

AIR TRANSPORTATION
Development of a Prototype Automation Simulation Scenario Generator for Air Traffic Management Software Simulations – 3

Panel Resource Management (PRM) Implementation and Effects within Safety Review Panel Settings and Dynamics – 4

Reisevaner pa Fly 2005. (Norwegian Air Travel Survey, 2005.) – 3

AIRBORNE EQUIPMENT
SOFIA: Stratospheric Observatory For Infrared Astronomy – 161

AIRCRAFT CONTROL
An Assessment of Pilot Control Interfaces for Unmanned Aircraft – 7

AIRCRAFT DESIGN
Gliding Experiments of the Wright Brothers: The Wrights and Flight Research 1899-1908 – 6

AIRCRAFT LANDING
Study of Normal Operational Landing Performance on Subsonic, Civil, Narrow-Body Jet Aircraft During Instrument Landing System Approaches – 3

AIRCRAFT PERFORMANCE
Study of Normal Operational Landing Performance on Subsonic, Civil, Narrow-Body Jet Aircraft During Instrument Landing System Approaches – 3

AIRCRAFT SAFETY
Voluntary Aviation Safety Information-Sharing Process: Preliminary Audit of Distributed FOQA and ASAP Archives Against Industry Statement of Requirements – 4

AIRFOILS
Foil Structure for Regenerators – 63

AIRLINE OPERATIONS
Voluntary Aviation Safety Information-Sharing Process: Preliminary Audit of Distributed FOQA and ASAP Archives Against Industry Statement of Requirements – 4

AIRPORT SECURITY
Enhanced Images for Checked and Carry-on Baggage and Cargo Screening – 59

AIRPORTS
Anti-Icing Pavement Coating Study at Chicago O'Hare International Airport – 2

End-Around Taxiway Screen Evaluation – 6

Study of Normal Operational Landing Performance on Subsonic, Civil, Narrow-Body Jet Aircraft During Instrument Landing System Approaches – 2

AIRSPACE
The NASA Dryden Flight Research Center Unmanned Aircraft System Service Capabilities – 1

ALASKA
Proceedings of a Workshop on Hydrological Modeling of Freshwater Discharge from Alaska's Arctic Coast – 78

ALDEHYDES
Methods and Compositions for Modulating Mitochondrial Aldehyde Dehydrogenase-2 – 19

ALGORITHMS
Adaptive Mesh Refinement Algorithms for Parallel Unstructured Finite Element Codes – 96

Broadband Performance of TPF's High-contrast Imaging Testbed: Modeling and Simulations – 142

Clustering with Missing Values: No Imputation Required – 100

Contact Interface Verification for DYNA3D. Scenario 1: Basic Contact – 92

Contact Interface Verification for DYNA3D. Scenario 2: Multi-Surface Contact – 18

DSP Implementation of the Multiscale Retinex Image Enhancement Algorithm – 59

Feedback Control System and Method for Maintaining Constant Resistance Operation of Electrically Heated Elements – 48

Impact of Multiscale Retinex Computation on Performance of Segmentation Algorithms – 58

Inclusive Jet Production using the k(sub T) Algorithm at CDF – 121

Measurement of the Inclusive Jet Cross Section Using the Midpoint Algorithm in Run II at the Collider Detector at FERMILAB (CDF) – 124

Measurement of the Mass of the Top Quark in Dilepton Final States with the DO-Detector – 115

Reduced Reference Video Calibration Algorithms – 90

Study of B(sub s) Mixing at the CDFII Experiment with a Newly Developed Opposite Side beta-Flavour Tagging Algorithm Using Kaons – 117

ALIGNMENT
Apparatus for Controlled Alignment of Catalytically Grown Nanostructures – 49

Electron Beam Alignment Strategy in the LCLS Undulators – 120

Focal Plane Metrology for the LSST Camera – 165

Target Selection and Imaging Requirements for JWST Fine Phasing – 143

ALLOYS
Development of Rutherford-type Cables for High Field Accelerator Magnets at Fermilab – 148

Long-Term Corrosion Behavior of Alloy 22 in 5 M CaCl2 at 120 C – 20

ALTIMETRY
Societal Benefits of Ocean Altimetry Data – 80

ALUMINUM ALLOYS
Bias Selectable Dual Band AlGaN Ultraviolet Detectors – 53

Energy Saving Model for the Heat Treatment of Castings – 35

Mechanistic Selection and Growth of Twinned Bicrysalline Primary Si in near Eutectic Al-Si Alloys – 36

Protection of Alodine Coatings from Thermal Aging by Removable Polymer Coatings – 39

ALUMINUM NITRIDES
Powder Metallurgy Crucible for Alluminum Nitride Crystal Growth – 35

AMINES
Testing of an Amine-Based Pressure-Swing System for Carbon Dioxide and Humidity Control – 84

AMPLIFICATION
Single Molecule Screening of Disease DNA without Amplification – 33

ANALOGS
Flavone Acetic Acid Analogs and Methods of Use Thereof – 31

ANALYZERS
Language Generation and Verification in the NRL Protocol Analyzer – 98

ANCHORS (FASTENERS)
Adhesive Anchors for Retrofit/Repair of Bridge Rails: Summary Report – 22

Repair/Retrofit Anchorage Designs for Bridge Rails – 22

ANNEALING
Growth and Properties of Lattice Matched GaAsSbN Epilayer on GaAs for Solar Cell Applications – 132

Influence of Growth Parameters and Annealing on Properties of MBE Grown GaAsSbN SQWs – 149

ANOMALIES
Magnetization Anomaly of Nb3Al Strands and Instability of Nb3Al Rutherford Cables – 148

Parameters for Intrusion Analysis – 93

ANTENNA ARRAYS
Co-axial Joint Technology Applied to Antenna Backup Structures – 11

ANTENNA COMPONENTS
Co-axial Joint Technology Applied to Antenna Backup Structures – 11

ANTENNA DESIGN
Reduced-Volume Antennas with Integrated High-Impedance Electromagnetic Surfaces – 43

Using EIGER for Antenna Design and Analysis – 97

ANTENNA FEEDS
Compact, Lightweight Dual- Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 41

Compact, Lightweight Dual-Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 67

ANTENNA GAIN
Use of the 37-38 GHz and 40-40.5 GHz Ka-bands for Deep Space Communications – 11

ANTENNA RADIATION PATTERNS
Use of the 37-38 GHz and 40-40.5 GHz Ka-bands for Deep Space Communications – 11

ANTIINFECTIVES AND ANTIBACTERIALS
Assessment of Silver Based Disinfection Technology for CEV and Future US Spacecraft – 85

ANTIMATTER
Looking for Exotica at the B Factories – 108

ANTIMONY
Influence of Growth Parameters and Annealing on Properties of MBE Grown GaAsSbN SQWs – 149

ANTINEUTRINOS
Getting the Most for NOVA and T2K – 161

ANTIPROTONS
Beam Intensity Upgrade at FERMILAB – 112

Search for 3rd Generation Vector Leptoquarks in the Di-tau Di-jet Channel in Proton Antiproton Collisions at square root(s)=1.96 – 123

ANTISEPTICS
Assessment of Silver Based Disinfection Technology for CEV and Future US Spacecraft – 85

APERTURES
Recent Results from the Swift Burst Alert Telescope – 157

Study of 2-in-1 Large-Aperture Nb3Sn IR Quadrupoles for the LHC Luminosity Upgrade – 103

APPLICATIONS PROGRAMS (COMPUTERS)
Space-based Networking Technology Developments in the Interplanetary Network Directorate Information Technology Program – 152

AQUEOUS SOLUTIONS
Aqueous Alteration of Basalts: Earth, Moon, and Mars – 166

ARCTIC REGIONS
Proceedings of a Workshop on Hydrological Modeling of Freshwater Discharge from Alaska's Arctic Coast – 78

ARES 1 LAUNCH VEHICLE
From ESAS to Ares: A Chronology – 9

Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

ARES 5 CARGO LAUNCH VEHICLE
Ares V an Enabling Capability for Future Space Astrophysics Missions – 9

Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

ARID LANDS
Impact of Rainfall on the Retrieval of Soil Moisture Using AMSR-E Data – 79

ARTIFICIAL INTELLIGENCE
Intelligent Vision Systems Independent Research and Development (IR&D) 2006 – 99

ASPECT RATIO
Impact of Aspect Ratio on Two-Column Bent Seismic Performance – 65

ASSIMILATION
Effects of High-frequency Wind Sampling on Simulated Mixed Layer Depth and Upper Ocean Temperature – 73

ASTEROIDS
Meteoritic Microfossils in Eltanin Impact Deposits – 169

Sedimentation Patterns of Meteoritic Ejecta in Eltanin Impact Deposits at Site PS58/281 – 168

Summary of Results from Analyses of Deposits of the Deep-Ocean Impact of the Eltanin Asteroid – 167

ASTROMETRY
Search for Terrestrial Planets with ESA Planet Quest – 155

SIMsim: An End-to-end Simulator for the ESA Mission – 157

ASTRONOMICAL INTERFEROMETRY
Measuring Extended Structure in Stars Using the Keck Interferometer Nuller – 158

ASTRONOMY
ESA PlanetQuest: Status and Recent Progress – 156

ASTROPHYSICS
A Possible Magnetar Nature for IGR J16358-4726 – 157

Ares V an Enabling Capability for Future Space Astrophysics Missions – 9

Developments in Planet Detection using Transit Timing Variations – 161

ESA PlanetQuest: Status and Recent Progress – 155

ASYMMETRY
Looking for Exotica at the B Factories – 108

Time-Integrated Charge Asymmetries at D0 – 125

Unique Description for Single Transverse Spin Asymmetries in DIS and Hadronic Collisions – 105

ATMOSPHERIC ATTENUATION
Aerosol Attenuation Model for Scandinavian Environment; User Manual – 70

ATMOSPHERIC BOUNDARY LAYER
Improved Hurricane Boundary Layer Observations with the Imaging Wind and Rain Airborne Profiler – 77

ATMOSPHERIC ENTRY
Examination of B. subtilis var. niger Spore Killing by Dry Heat Methods – 155

ATMOSPHERIC MODELS
Aerosol Attenuation Model for Scandinavian Environment; User Manual – 70

ATMOSPHERIC PRESSURE
On-Line Coating of Glass with Tin Oxide by Atmospheric Pressure Chemical Vapor Deposition – 38

ATMOSPHERIC TEMPERATURE
International Space Station Environmental Control and Life Support System: Verification for the Pressurized Mating Adapters – 83

Status of MTP Data Analysis for TCSP – 78

ATMOSPHERIC TURBULENCE
Using Historic Models of C(sub n)(sup 2) to Predict r(sub 0) and Regimes Affected by Atmospheric Turbulence for Horizontal, Slant and Topological Paths – 78

ATOMIC CLOCKS
Method and System for Operating an Atomic Clock with Alternating Polarization Light – 145

ATOMIC COLLISIONS
Collisions of Electrons with Atomic Oxygen: Current Status – 142

Electron Collisional Excitation Rates for OI USING the B-Spline R-Matrix Approach – 163

ATOMIC ENERGY LEVELS
Curved Track Segment Finding Using Tiny Triplet Finder (TTF) – 121

ATOMIC EXCITATIONS
Electron Impact Excitation of Forbidden and Allowed Transitions in O(II) – 131

ATOMS
Atomic, Crystal, Elastic, Thermal, Nuclear, and Other Properties of Beryllium – 149

Collisions of Electrons with Atomic Oxygen: Current Status – 141

AUDIO EQUIPMENT
NASA Bluetooth Wireless Communications – 12

AUGMENTATION
Engine Valve Actuation for Combustion Enhancement – 63

Enhancement of Resilient Modulus Data for the Design of Pavement Structures in Florida – 151

The Automatic Assessment and Reduction of Noise Using Edge Pattern Analysis in Nonlinear Image Enhancement – 59

AUTOMATA THEORY
PVS Strategies for Proving Abstraction Properties of Automata – 101

AUTOMATIC FLIGHT CONTROL
An Assessment of Pilot Control Interfaces for Unmanned Aircraft – 7

AUTOMATION
Extended Abstract: Organizing Automaton Specifications to Achieve Faithful Representation – 97

AUTOMOBILE ENGINES
Reformulated Diesel Fuel – 62

AUTONOMY
Autonomous Detection of Dust Devils and Clouds on Mars – 155

Intelligent Vision Systems Independent Research and Development (IR&D) 2006 – 99

Secure, Autonomous, Intelligent Controller for Integrating Distributed Sensor Webs – 5

AVIONICS
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

Organization's Orderly Interest Exploration: Inception, Development and Insights of AIAA's Topics Database – 98

AVOIDANCE
Comparison of the Exclusion Volume and Probability Threshold Methods of Debris Avoidance for the STS Orbiter – 10

AZIMUTH
Wakefield Calculation for Superconducting TM(sub 110) Cavity Without Azimuthal Symmetry – 112

BANDWIDTH
Autonomous Detection of Dust Devils and Clouds on Mars – 155

Considerations for Isochronous Data Services over the Proximity-1 Space Link – 167

Reduced Reference Video Calibration Algorithms – 90

Use of the 37-38 GHz and 40-40.5 GHz Ka-bands for Deep Space Communications – 11

BASALT
Anomalous Iridium Enrichment at the Triassic-Jurassic Boundary, Blomidon Formation, Fundy Basin, Canada – 75

Aqueous Alteration of Basalts: Earth, Moon, and Mars – 166

BEAM INJECTION
Beam Diagnostics, Collimation, Injection/Extraction, Targetry. Accidents and Commissioning: Working Group C&G Summary Report – 124

BEAM STEERING
Benchmarking, Crosschecking DFS in the ILC Main Linac – 137

BEAMFORMING
The Glacier and Land Ice Surface Topography Interferometer (GLISTIN): A Novel Ka-band Digitally Beamformed Interferometer – 67

BEAMS (RADIATION)
Analog Signal Pre-Processing for the Fermilab Main Injectore BPM Upgrade – 138

BEDS (PROCESS ENGINEERING)
Characteristics of Post-Sorbent and High Temperature Catalytic Oxidizer Beds After Long-Term On-Orbit Use – 83

BERYLLIUM
Atomic, Crystal, Elastic, Thermal, Nuclear, and Other Properties of Beryllium – 149

Joining of Beryllium – 36

BIAS
Bias Selectable Dual Band AlGaN Ultraviolet Detectors – 53

BIOAVAILABILITY
Report on Bioavailability of Chemical Wastes with Respect to the Potential for Soil Bioremediation – 32

BIOGEOCHEMISTRY
Study of Interactions Between Microbes and Minerals by Scanning Transmission X-Ray Microscopy (STXM) – 34

BIOMETRICS
Biomimetic Organic/Inorganic Composite Processes for Their Production and Methods of Use, PAT-APPL-11-433-725 – 24

Biomimetic Organic/Inorganic Composites, Processes for Their Production, and Methods of Use, PAT-APPL-11- – 21

BIOMIMETICS
Biomimetic Organic/Inorganic Composite Processes for Their Production and Methods of Use, PAT-APPL-11-433-725 – 24

Biomimetic Organic/Inorganic Composites, Processes for Their Production, and Methods of Use, PAT-APPL-11- – 21

BIPOLARITY
Minimizing Degradation of SiC Bipolar Semiconductor Devices – 54

BIRTH
Detailed Linked Birth/Infant Death Period Public Use File for 2003 (Raw data on CD-ROM) – 100

BOARDS (PAPER)
Properties of Fiberboard Overpack Material in the 9975 Shipping Package Following Thermal Aging – 23

BOILERS
Combustion Emissions from Hazardous Waste Incinerators, Boilers and Industrial Furnaces, and Municipal Solid Waste Incinerators: Results from Five STAR Grants and Research Needs – 71

BONDING
Joining of Beryllium – 37

New Developments in Charge Transfer Multiplet Calculations: Projection Operations, Mixed-Spin States and pi-Bonding – 120

BORIDES
Growth of In-Situ Thin Films by Reactive Evaporation – 149

BORON
Structure, Ionic Conductivity and Mobile Carrier Density in Fast Ionic Conducting Chalcogenide Glasses – 137

BOSONS
High Q(sup 2) QCD Physics at the Tevatron – 117

Measurement of the W Boson and Top-Quark Masses at CDF – 150

W and Z Production at the Tevatron – 112

W Boson Measurements at the Tevatron – 117

BOUNDARY CONDITIONS
Using EIGER for Antenna Design and Analysis – 97

BOXES (CONTAINERS)
Multi-Dimensioned Easily Adjustable Single Sheet Container Formula with Indicia – 84

BRAGG GRATINGS
Strain Measurement Using FBG on COPV in Stress Rupture Test – 25

BRAIN
Note on Trasande et al., 'Public Health and Economic Consequences of Methylmercury Toxicity on the Developing Brain' – 70

BREATHING APPARATUS
NASA Bluetooth Wireless Communications – 12

BRECCIA
Processes in Early Planetesimals: Evidence from Ureilite Meteorites – 72

BRIDGES (STRUCTURES)
Impact of Aspect Ratio on Two-Column Bent Seismic Performance – 65

BRIDGES
Repair/Retrofit Anchorage Designs for Bridge Rails – 22

BRIGHTNESS TEMPERATURE
Microwave Remote Sensing Modeling of Ocean Surface Salinity and Winds Using an Empirical Sea Surface Spectrum – 74

The Aquarius Scatterometer: An Active System for Measuring Surface Roughness for Sea-Surface Brightness Temperature Correction – 74

BRIGHTNESS
Impact of Multiscale Retinex Computation on Performance of Segmentation Algorithms – 58

Photoinjectors R&D For Future Light Sources & Linear Colliders – 105

BROADBAND
Broadband Performance of TPF's High-contrast Imaging Testbed: Modeling and Simulations – 142

BSCCO SUPERCONDUCTORS
Cost Effective Open Geometry HTS MRI System amended to BSCCO 2212 Wire for High Field Magnets – 64

BUDGETING
Decision Support for Bridge Programming and Budgeting – 90

BURNERS
Evaluation of the Reproducibility of the FAA Oil Burner Fire Test for Aircraft Seat Cushions – 6

C++ (PROGRAMMING LANGUAGE)
Support for Whole-Program Analysis and the Verification of the One-Definition Rule in C++ – 92

CALCIUM CHLORIDES
Long-Term Corrosion Behavior of Alloy 22 in 5 M CaCl2 at 120 C – 20

CALIBRATING
Deriving Benefit Measures with Higher Precision: A Study of Economic Values of Air Quality – 71

Reduced Reference Video Calibration Algorithms – 90

CAMERAS
Focal Plane Metrology for the LSST Camera – 165

LSST Camera Overview – 164

Real-time Enhancement, Registration, and Fusion for an Enhanced Vision System – 60

CAMOUFLAGE
Camouflage Creams with New Properties – 23

CANCER
Flavone Acetic Acid Analogs and Methods of Use Thereof – 31

CANONICAL FORMS
Simplectic Correctors for Canonical Heliocentric N-Body Maps – 160

CAPACITORS
Production Scale-Up of Activated Carbons for Ultracapacitors. (Final Report, September 30, 2004-September 30, 2006) – 50

CARBON 13
Processes in Early Planetesimals: Evidence from Ureilite Meteorites – 72

CARBON DIOXIDE
CO2 Capture by Absorption with Potassium Carbonate Fourth Quarterly Report 2006. Quarterly Progress Report. Reporting Period: October 1, 2006 through December 31, 2006 – 72

Testing of an Amine-Based Pressure-Swing System for Carbon Dioxide and Humidity Control – 84

CARBON ISOTOPES
Processes in Early Planetesimals: Evidence from Ureilite Meteorites – 72

CARBON MONOXIDE POISONING
Evaluation of Carbon Monoxide Concentration With and Without Catalytic Emission Controls from Gasoline Propulsion Engines – 63

CARBON MONOXIDE
Evaluation of Carbon Monoxide Concentration With and Without Catalytic Emission Controls from Gasoline Propulsion Engines – 63

CARBONATES
CO2 Capture by Absorption with Potassium Carbonate Fourth Quarterly Report 2006. Quarterly Progress Report. Reporting Period: October 1, 2006 through December 31, 2006 – 72

CARBON
Efficiency and Lifetime of Carbon Foils – 32

Kinetic Modeling of Slow Energy Release in Non-Ideal Carbon Rich Explosives – 17

Methods of Making Monolayers – 24

Production Scale-Up of Activated Carbons for Ultracapacitors. (Final Report, September 30, 2004-September 30, 2006) – 50

CARRIER SENSE MULTIPLE ACCESS
Methods for Providing Prioritized Communications Using a Carrier Sense Multiple Access Protocol – 42

CAST ALLOYS
Phase Transformation in Cast Superaustenitic Stainless Steels – 36

CASTINGS
Energy Saving Model for the Heat Treatment of Castings – 35

CATALYTIC ACTIVITY
Apparatus for Controlled Alignment of Catalytically Grown Nanostructures – 49

Characteristics of Post-Sorbent and High Temperature Catalytic Oxidizer Beds After Long-Term On-Orbit Use – 83

CATHODES
In-Situ Cleaning of Metal Photo-Cathodes in rf Guns – 121

Progress on a Cryogenically Cooled RF Gun Polarized Electron Source – 102

CAVITIES
Designing Focusing Solenoids for Superconducting RF Accelerators – 114

Dual Microwave Cavity Accelerometer – 54

MUCOOL RF Program – 126

Wakefield Calculation for Superconducting TM(sub 110) Cavity Without Azimuthal Symmetry – 112

CAVITY RESONATORS
Phase Matched Parametric Light Generation in Monolithically Integrated Intersubband Optical Devices – 144

Wakefield Calculation for Superconducting TM(sub 110) Cavity Without Azimuthal Symmetry – 112

CD-ROM
Detailed Linked Birth/Infant Death Period Public Use File for 2003 (Raw data on CD-ROM) – 100

CELLS (BIOLOGY)
Technique for Measuring Cell-Membrane Properties in Cultured Cells Grown on Biomaterials in an Ussing Chamber – 24

CENTER OF MASS
Supersymmetry Searches at the Tevatron – 119

CERAMICS
Thermal Properties of PZT95/5(1.8Nb) and PSZT Ceramics – 38

CERTIFICATION
Certification Process for Commercial Batteries for Payloads – 16

CHALCOGENIDES
Circuit for Accessing a Chalcogenide Memory Array – 47

Structure, Ionic Conductivity and Mobile Carrier Density in Fast Ionic Conducting Chalcogenide Glasses – 137

CHANGE DETECTION
Detecting Changes in Terrain Using Unmanned Aerial Vehicles – 61

CHANNELS (DATA TRANSMISSION)
Applications of Time-Reversal Processing for Planetary Surface Communications – 44

CHARACTERIZATION
Biogenic UO-2- Characterization and Surface Reactivity – 31

Characterization of Damaged Materials – 17

CHARGE TRANSFER
New Developments in Charge Transfer Multiplet Calculations: Projection Operations, Mixed-Spin States and pi-Bonding – 120

CHARGED PARTICLES
Search for the Pentquark Partners: Theta++, SigmaO and NO – 120

Use of the 37-38 GHz and 40-40.5 GHz Ka-bands for Deep Space Communications – 11

CHARM (PARTICLE PHYSICS)
Looking for Exotica at the B Factories – 108

Measurements of sin2Beta and cos2Beta from b -\g cc(bar)s Decays at BaBar – 108

Searches for D0 - Anti-D0 Mixing, Rare Charm and Tau Decays – 109

CHASSIS
Chassis Dynamometer Testing of Aqueous Ethanol in a Transit Van – 153

CHECKOUT
Execution of the Spitzer In-orbit Checkout and Science Verification Plan – 158

CHELATION
Nanoporous Chelating Fibers – 26

Stabilization of Self-Assembled Monolayers – 26

CHEMICAL ANALYSIS
Mass Spectrometric Immunoassay – 30

Spectroscopic Investigations of Fragment Species in the Coma – 171

CHEMICAL COMPOSITION
Crystal Water on Mars: Insights from the Mars Exploration Rovers – 156

CHEMICAL ELEMENTS
Program Pu FUtures 2006 – 19

CHEMICAL PROPERTIES
NASA Hydrogen Peroxide Propellant Hazards Technical Manual – 40

CHEMICAL REACTIONS
Novel Approach to Experimental Studies of Mineral Dissolution Kinetics. Annual Technical Progress Report. Period September 1, 2005 through August 31, 2006 – 29

CHEMICAL STERILIZATION
Assessment of Silver Based Disinfection Technology for CEV and Future US Spacecraft – 85

CHIPS (ELECTRONICS)
Single Chip Radio with Integrated Antenna – 46

CHIPS
Single Chip Radio with Integrated Antenna – 46

CHONDRITES
Anomalous Iridium Enrichment at the Triassic-Jurassic Boundary, Blomidon Formation, Fundy Basin, Canada – 75

CIRCUIT BOARDS
Fast Faraday Cup with High Band Width – 107

CIRCUITS
Circuit for Accessing a Chalcogenide Memory Array – 47

CITIES
Policy Document on Earth Observation for Urban Planning and Management: State of the Art and Recommendations for Application of Earth Observation in Urban Planning – 67

CIVIL AVIATION
Voluntary Aviation Safety Information-Sharing Process: Preliminary Audit of Distributed FOQA and ASAP Archives Against Industry Statement of Requirements – 4

CLEANING
In-Situ Cleaning of Metal Photo-Cathodes in rf Guns – 121

CLIMATE CHANGE
Energy Star (Trade Name) and Other Climate Protection Partnerships 2005 Annual Report – 80

If Geoengineering Is the First Best Step Towards Global Climate Change Control, How Could It Best Be Implemented – 79

Summary of NHEERL Ecological Research on Global Climate Change – 79

CLIMATE
Energy Star (Trade Name) and Other Climate Protection Partnerships 2005 Annual Report – 80

Societal Benefits of Ocean Altimetry Data – 80

CLIMATOLOGY
Global Climate Control: Is There a Better Strategy Than Reducing Greenhouse Gas Emissions – 71

If Geoengineering Is the First Best Step Towards Global Climate Change Control, How Could It Best Be Implemented – 79

Impact of Rainfall on the Retrieval of Soil Moisture Using AMSR-E Data – 79

Summary of NHEERL Ecological Research on Global Climate Change – 79

CLOUDS
Autonomous Detection of Dust Devils and Clouds on Mars – 155

CLUSTER ANALYSIS
Clustering with Missing Values: No Imputation Required – 100

COALESCING
Hydrodynamic Effects on Coalescence – 56

COAL
Note on Trasande et al., 'Public Health and Economic Consequences of Methylmercury Toxicity on the Developing Brain' – 70

COASTS
Proceedings of a Workshop on Hydrological Modeling of Freshwater Discharge from Alaska's Arctic Coast – 78

COATINGS
Coatings, Coated Articles and Methods of Manufacture Thereof, PAT-APPL-11-418-626 – 21

Coatings, Coated Articles and Methods of Manufacture Thereof, PAT-APPL-11-418-871 – 21

COATING
Anti-Icing Pavement Coating Study at Chicago O'Hare International Airport – 2

On-Line Coating of Glass with Tin Oxide by Atmospheric Pressure Chemical Vapor Deposition – 37

CODE DIVISION MULTIPLE ACCESS
Combined Frequency-Time Domain Power Adaptation for CDMA Communication System – 42

CODES
Efficient MATLAB Computations with Sparse and Factored Tensors – 87

COGNITION
Investigating Surety Methodologies for Cognitive Systems – 82

COHERENT RADIATION
Coherent Instabilities at the FNAL Booster – 110

COILS
Quench Monitoring and Control System and Method of Operating Same – 147

COLLIMATION
Beam Diagnostics, Collimation, Injection/Extraction, Targetry. Accidents and Commissioning: Working Group C&G Summary Report – 124

Channeling Collimation Studies at the Fermilab Tevatron – 111

High-Intensity Beam Collimation and Targetry – 124

ILC Beam Delivery WG Summary: Optics, Collimation and Background – 110

COLLIMATORS
Channeling Collimation Studies at the Fermilab Tevatron – 111

COLLISION AVOIDANCE
ISS Debris Avoidance Maneuver Threshold Analysis – 14

Orbital Debris Studies at NASA – 156

COLLISION RATES
On The Effect of Electron Collisions in the Excitation of Cometary HCN – 172

COLLISIONS
DO Hot Topics – 113

Handling Collision Debris In Quad-and Dipole-First LHC IR Options – 127

Jets at CDF – 113

Unique Description for Single Transverse Spin Asymmetries in DIS and Hadronic Collisions – 105

COLOR
Impact of Multiscale Retinex Computation on Performance of Segmentation Algorithms – 58

COLUMNS (SUPPORTS)
Impact of Aspect Ratio on Two-Column Bent Seismic Performance – 65

Static and Dynamic Performance of RC Bridge Bents with Architectural-Flared Columns – 64

COMBUSTION
Engine Valve Actuation for Combustion Enhancement – 63

Note on Trasande et al., 'Public Health and Economic Consequences of Methylmercury Toxicity on the Developing Brain' – 70

COMET HEADS
Gas Dynamics and Kinetics in the Cometary Coma: Theory and Observations – 171

COMET NUCLEI
Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System – 171

On The Effect of Electron Collisions in the Excitation of Cometary HCN – 172

Spectroscopic Investigations of Fragment Species in the Coma – 171

COMETARY ATMOSPHERES
Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System – 171

Gas Dynamics and Kinetics in the Cometary Coma: Theory and Observations – 170

Spectroscopic Investigations of Fragment Species in the Coma – 171

COMETS
Gas Dynamics and Kinetics in the Cometary Coma: Theory and Observations – 171

On The Effect of Electron Collisions in the Excitation of Cometary HCN – 172

Spectroscopic Investigations of Fragment Species in the Coma – 171

COMMERCIAL OFF-THE-SHELF PRODUCTS

Certification Process for Commercial Batteries for Payloads – 16

COMMUNICATING

Data Monitoring and Recovery – 8

Packet-Based and Pseudo-Packet Based Cryptographic Communications System and Method – 91

COMMUNICATION NETWORKS

Applications of Time-Reversal Processing for Planetary Surface Communications – 44

Secure, Autonomous, Intelligent Controller for Integrating Distributed Sensor Webs – 5

Security Problems in Mobile ad hoc Networks – 44

Systems and Methods for Automatically Placing Nodes in an Ad Hoc Network – 45

COMMUNICATION SATELLITES

Combined Frequency-Time Domain Power Adaptation for CDMA Communication System – 42

Institute for Telecommunication Sciences Technical Progress Report, 2000 – 42

Institute for Telecommunication Sciences Technical Progress Report, 2001 – 43

Institute for Telecommunication Sciences Technical Progress Report, 2003 – 41

Institute for Telecommunication Sciences Technical Progress Report, 2004 – 41

Institute for Telecommunication Sciences Technical Progress Report, 2006 – 41

COMMUNICATION

Translator Database – 95

COMPONENTS

On the Use of 3dB Qualification Margin for Structural Parts on Expendable Launch Vehicles – 10

Test Results of Total Ionizing Dose Conducted at the Jet Propulsion Laboratory – 56

COMPOSITE MATERIALS

Nanoporous Chelating Fibers – 26

Stabilization of Self-Assembled Monolayers – 26

Static and Dynamic Performance of RC Bridge Bents with Architectural-Flared Columns – 64

The Effect of Delamination on Damage Path and Failure Load Prediction for Notched Composite Laminates – 27

COMPOSITE STRUCTURES

A Framework for Performing Multiscale Stochastic Progressive Failure Analysis of Composite Structures – 26

Investigation of MMOD Impact on Shuttle Payload Bay Door Radiator – 13

Solid State Electrochemical Composite – 29

Water Soluble Tooling Materials for Composite Structures – 6

COMPOSITE WRAPPING

Interrelationship of Nondestructive Evaluation Methodologies Applied to Testing of Composite Overwrapped Pressure Vessels – 27

Strain Measurement Using FBG on COPV in Stress Rupture Test – 25

COMPOSITION (PROPERTY)

Spectroscopic Investigations of Fragment Species in the Coma – 171

COMPRESSED GAS

Crew Exploration Vehicle Environmental Control and Life Support Emergency Gas Consumable Sizing – 82

COMPRESSORS

Critical Speed Measurements in the Tevatron Cold Compressors – 122

Surge Recovery Techniques for the Tevatron Cold Compressors – 139

COMPUTATION

A Dynamical Systems Approach to the Design of the Science Orbit Around Europa – 88

COMPUTER INFORMATION SECURITY

Extended Abstract: Organizing Automaton Specifications to Achieve Faithful Representation – 97

Final Report for the Network Authentication Investigation and Pilot – 87

Method and Device for Generating Approximate Message Authentication Codes – 90

Risks in Using USB Flash Drives and u3 – 94

COMPUTER NETWORKS

Final Report for the Network Authentication Investigation and Pilot – 87

Intelligent Email Services – 153

Scalable and Dynamic Quality of Service Control – 45

COMPUTER PROGRAMMING

From Prime to Extended Mission: Evolution of the MER Tactical Uplink Process – 99

COMPUTER PROGRAMS

Composite Nanomechanics: A Mechanistic Properties Prediction – 27

ProUCL Version 4.0, Technical Guide – 93

ProUCL Version 4.0, User Guide – 93

Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan. Part 1: ASC Software Quality Engineering Practices, Version 2.0 – 94

The Effects of Fault Counting Methods on Fault Model Quality – 97

COMPUTER SYSTEMS PROGRAMS

A Formal Language for Cryptographic Protocol Requirements – 98

Organization's Orderly Interest Exploration: Inception, Development and Insights of AIAA's Topics Database – 98

COMPUTERIZED SIMULATION

Design Hurricane Storm Surge Pilot Study – 78

Development of a Prototype Automation Simulation Scenario Generator for Air Traffic Management Software Simulations – 3

Multigrid Methods for Mesh Relaxation – 91

Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan. Part 1: ASC Software Quality Engineering Practices, Version 2.0 – 94

CONCRETES

Static and Dynamic Performance of RC Bridge Bents with Architectural-Flared Columns – 65

CONCURRENT ENGINEERING

System and Method for Multi-Perspective Collaborative Modeling – 44

CONFERENCES

Proceedings of a Workshop on Hydrological Modeling of Freshwater Discharge from Alaska's Arctic Coast – 78

Proceedings of the Fifth National Seismic Conference on Bridges and Highways: Innovations in Earthquake Engineering for Highway Structures Held September 18-20, 2006 – 65

CONFIDENCE LIMITS

Search for D0-anti-D0 Mixing with the BaBar Experiment – 137

CONNECTORS

Co-axial Joint Technology Applied to Antenna Backup Structures – 11

CONSERVATION

Search for the Rare Decay KL-\gpiO piO gamma – 129

CONSTRAINTS

Clustering with Missing Values: No Imputation Required – 100

Three Dimensional Constraint Effects on the Estimated (Delta)CTOD during the Numerical Simulation of Different Fatigue Threshold Testing Techniques – 28

CONSUMABLES (SPACECRAFT)

Crew Exploration Vehicle Environmental Control and Life Support Emergency Gas Consumable Sizing – 82

ISS Asset Tracking Using SAW RFID Technology – 55

CONTAINMENT
Coupling of Realistic Real Estimates with Genomics for Assessing Contaminant Attenuation and Long-Term Plume Containment – 114

CONTAMINANTS
Characteristics of Post-Sorbent and High Temperature Catalytic Oxidizer Beds After Long-Term On-Orbit Use – 83

Coupling of Realistic Real Estimates with Genomics for Assessing Contaminant Attenuation and Long-Term Plume Containment – 114

CONTINUOUS RADIATION
Operation of Terahertz Quantum-cascade Lasers at 164 K in Pulsed Mode and at 117 K in Continuous-wave Mode – 142

CONTRAST
Broadband Performance of TPF's High-contrast Imaging Testbed: Modeling and Simulations – 142

CONTROL EQUIPMENT
Evaluation of Carbon Monoxide Concentration With and Without Catalytic Emission Controls from Gasoline Propulsion Engines – 63

CONTROL SYSTEMS DESIGN
Feedback Control System and Method for Maintaining Constant Resistance Operation of Electrically Heated Elements – 49

Thermal Design and Flight Experience of the Mars Exploration Rover Spacecraft Computer-Controlled, Propulsion Line Heaters – 61

CONTROLLERS
Secure, Autonomous, Intelligent Controller for Integrating Distributed Sensor Webs – 5

Siso Model Predictive Controller – 91

CONVECTION
Observations of Lightning on Earth from the Lunar Surface – 165

COOLING
MUCOOL RF Program – 126

Status of High Energy Electron Cooling in FNAL's Recycler Ring – 119

COORDINATES
Simplectic Correctors for Canonical Heliocentric N-Body Maps – 160

COORDINATION
Program Pu FUtures 2006 – 19

CORES
Water Soluble Tooling Materials for Composite Structures – 6

CORONAGRAPHS
Broadband Performance of TPF's High-contrast Imaging Testbed: Modeling and Simulations – 142

The Sensitivity of Shaped Pupil Coronagraphs to Optical Aberrations – 143

CORRECTION
Simplectic Correctors for Canonical Heliocentric N-Body Maps – 160

CORROSION TESTS
Development of a Standard Accelerated Corrosion Test for Acceptance of Post-Tensioning Grouts in Florida – 29

CORROSION
Comparative Corrosion Behavior of Two Palladium Containing Titanium Alloys – 20

Eddy Current System for Material Inspection and Flaw Visualization – 54

Long-Term Corrosion Behavior of Alloy 22 in 5 M CaCl2 at 120 C – 20

COSMIC DUST
SN 1987A after 18 Years: Mid-Infrared GEMINI and SPITZER Observations of the Remnant – 159

COST EFFECTIVENESS
Cost Effective Open Geometry HTS MRI System amended to BSCCO 2212 Wire for High Field Magnets – 64

COSTS
Sampling-Based Computational Strategy for the Representation of Epistemic Uncertainty in Model Predictions with evidence Theory – 95

COUNTING
Counting Rules, Holographic Wave Functions, Meromorphization and Quark-Hadron Duality – 138

Improved Action for Heavy Quarks – 129

The Effects of Fault Counting Methods on Fault Model Quality – 97

COUPLINGS
Top Pair Production III: Testing the Standard Model in Top Quark Decays – 130

CP VIOLATION
DO Hot Topics – 113

CRACK OPENING DISPLACEMENT
Three Dimensional Constraint Effects on the Estimated (Delta)CTOD during the Numerical Simulation of Different Fatigue Threshold Testing Techniques – 28

CRACKS
Eddy Current System for Material Inspection and Flaw Visualization – 55

CRATERS
Primary Mineralogical and Chemical Characteristics of the Major K/T and Late Eocene Impact Deposits – 75

CRETACEOUS-TERTIARY BOUNDARY
The Cretaceous/Paleogene Transition on the East Tasman Plateau, Southwestern Pacific – 169

CREW EXPLORATION VEHICLE
Crew Exploration Vehicle Environmental Control and Life Support Emergency Gas Consumable Sizing – 82

Developing the Parachute System for NASA's Orion: An Overview at Inception – 14

Overview of Umbilical Extravehicular Activity (EVA) Interfaces in Life Support Systems on Spacecraft Vehicles and Applications for the Crew Exploration Vehicle (CEV) – 84

Space Human Factors Engineering Gap Analysis Project Final Report – 86

CRITICAL VELOCITY
Critical Speed Measurements in the Tevatron Cold Compressors – 122

CROSSINGS
Human Factors Guidelines for Intelligent Transportation Systems at the Highway-Rail Intersection: Technical Report – 86

CRUCIBLES
Powder Metallurgy Crucible for Alluminum Nitride Crystal Growth – 35

CRYOGENICS
Critical Speed Measurements in the Tevatron Cold Compressors – 122

Cryogenics for the Supercondcuting Module Test Facility – 136

Design, Fabrication, and Test of an SRF Cryomodule Prototype at Fermilab – 125

Execution of the Spitzer In-orbit Checkout and Science Verification Plan – 158

CRYOSTATS
Design of 325MHz Single and Triple Spoke Resonators at FNAL – 104

CRYPTOGRAPHY
A Formal Language for Cryptographic Protocol Requirements – 98

Packet-Based and Pseudo-Packet Based Cryptographic Communications System and Method – 91

CRYSTAL GROWTH
Powder Metallurgy Crucible for Alluminum Nitride Crystal Growth – 35

CRYSTALS
Atomic, Crystal, Elastic, Thermal, Nuclear, and Other Properties of Beryllium – 149

Fundamental Channeling Questions at Ultra Relativistic Energies – 103

CUSHIONS
Evaluation of the Reproducibility of the FAA Oil Burner Fire Test for Aircraft Seat Cushions – 6

Laboratory-Scale and Full-Scale Fire Testing of Lightweight Aircraft Seat Cushion Materials – 5

DAMAGE ASSESSMENT
The Effect of Delamination on Damage Path and Failure Load Prediction for Notched Composite Laminates – 27

DAMAGE
Beam-Induced Damage to the Tevatron Components and What has been Done About it – 136

Characterization of Damaged Materials – 17

Nitride-Based Transistors with a Protective Layer and a Low-Damage Recess and Methods of Fabrication Thereof – 148

Test Results of Total Ionizing Dose Conducted at the Jet Propulsion Laboratory – 56

DAMPING

Photoinjector Production of a Flat Beam with Transverse Emittance Ratio of 100 – 111

DARK MATTER

Phenomenology of Universal Extra Dimensions – 161

DATA ACQUISITION

CMS DAQ Event Builder Based on Gigabit Ethernet – 133

Data Visualization as a Tool for Improved Decision Making within Transit Agencies – 152

DATA BASE MANAGEMENT SYSTEMS

Designing an Multi-petabyte Database for LSST – 164

Efficacy of Utility Database Management – 89

User Definable Hierarchy for Database Management – 152

DATA BASES

Designing an Multi-petabyte Database for LSST – 164

Development of a Materials and Engineering Database for Shales of Eastern Kansas – 90

Organization's Orderly Interest Exploration: Inception, Development and Insights of AIAA's Topics Database – 98

Space Human Factors Engineering Gap Analysis Project Final Report – 86

Translator Database – 95

User Definable Hierarchy for Database Management – 152

Voluntary Aviation Safety Information-Sharing Process: Preliminary Audit of Distributed FOQA and ASAP Archives Against Industry Statement of Requirements – 4

DATA COMPRESSION

Method and Device for Online Dynamic Semantic Video Compression and Video Indexing – 151

DATA MANAGEMENT

Design and Implementation of Ceph: A Scalable Distributed File System – 88

DATA PRODUCTS

The Chandra X-ray Observatory: An Astronomical Facility Available to the World – 159

DATA REDUCTION

Running the Sloan Digital Sky Survey Data Archive – 160

DATA SAMPLING

Variable Structure Diagnostics Approach Achieving Optimized Low-Frequency Data Sampling for EMA Motoring Systems – 8

DATA STORAGE

Design and Implementation of Ceph: A Scalable Distributed File System – 88

Designing an Multi-petabyte Database for LSST – 164

Risks in Using USB Flash Drives and u3 – 94

DATA STRUCTURES

Data Monitoring and Recovery – 8

DATA TRANSMISSION

Scalable and Dynamic Quality of Service Control – 45

DEATH

Detailed Linked Birth/Infant Death Period Public Use File for 2003 (Raw data on CD-ROM) – 100

DEBRIS

Handling Collision Debris In Quad-and Dipole-First LHC IR Options – 127

DECAY

Rare B Decays at CDF – 135

Search for the Rare Decay KL-\gpiO piO gamma – 129

DECISION MAKING

Data Visualization as a Tool for Improved Decision Making within Transit Agencies – 152

From ESAS to Ares: A Chronology – 9

Investigating Surety Methodologies for Cognitive Systems – 81

DECISION SUPPORT SYSTEMS

Decision Support for Bridge Programming and Budgeting – 90

DEEP SPACE NETWORK

Spitzer Space Telescope Sequencing Operations Software, Strategies, and Lessons Learned – 160

DEEP SPACE

Deep Space Ka-band Link Management and the MRO Demonstration: Long-term Weather Statistics Versus Forecasting – 77

From Prime to Extended Mission: Evolution of the MER Tactical Uplink Process – 99

Use of the 37-38 GHz and 40-40.5 GHz Ka-bands for Deep Space Communications – 11

DEFLAGRATION

Measurement and ALE3D Simulation of Violence in a Deflagration Experiment with LX-10 and Aermet-100 Alloy – 18

DEFOCUSING

Target Selection and Imaging Requirements for JWST Fine Phasing – 143

DEFORMABLE MIRRORS

Characterization of a Micromachined Membrane Deformable Mirror – 145

DEFORMATION

Structure for Identifying, Locating and Quantifying Physical Phenomena – 65

DEGRADATION

Minimizing Degradation of SiC Bipolar Semiconductor Devices – 54

Reliability of Cascaded THz Frequency Chains with Planar GaAs Circuits – 46

DEICERS

Anti-Icing Pavement Coating Study at Chicago O'Hare International Airport – 2

DELAMINATING

The Effect of Delamination on Damage Path and Failure Load Prediction for Notched Composite Laminates – 27

DENDRIMERS

Glycodendrimers having Biological Activity – 38

DEOXYRIBONUCLEIC ACID

Feasibility of Single Molecule DNA Sequencing Using Surface-Enhanced Raman Scattering – 140

Single Molecule Screening of Disease DNA without Amplification – 33

DEPOLARIZATION

Polarimetric Analysis of Scatterometer Data for Ocean Surface Wind Measurement – 73

DEPOSITS

Primary Mineralogical and Chemical Characteristics of the Major K/T and Late Eocene Impact Deposits – 75

Summary of Results from Analyses of Deposits of the Deep-Ocean Impact of the Eltanin Asteroid – 167

DEPRESSANTS

Anti-Icing Pavement Coating Study at Chicago O'Hare International Airport – 2

DESIGN ANALYSIS

Using EIGER for Antenna Design and Analysis – 97

DETECTION

Acoustic Immunosensor for Detecting Neurotransmitter GABA – 141

Compact, Lightweight Dual-Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 67

Detecting and Quantifying Reductive Dechlorination During Monitored Natural attenuation at the Savannah River CBRP Site – 32

Enhanced Images for Checked and Carry-on Baggage and Cargo Screening – 59

Lightning Charge Retrievals: Dimensional Reduction, LDAR Constraints, and a First Comparison with LIS Satellite Data – 76

Method and Device and for Ultra Sonic Vibration Detection During High-Performance Machining – 46

Parameters for Intrusion Analysis – 93

Target Identification System and Method – 50

Target Selection and Imaging Requirements for JWST Fine Phasing – 143

DETECTORS

CDF II Detector and Trigger for B Physics – 115

CMS DAQ Event Builder Based on Gigabit Ethernet – 133

FPGA Curved Track Fitter with Very Low Resource Usage – 128

Search for Chargino-Neutralino Production at the Collider Detector at Fermilab – 122

Searches for GMSB, AMSB and Split SUSY with the D0 Detector – 125

DETONATION

High-Octane and Mid-Octane Detonation Performance of Leaded and Unleaded Fuels in Naturally Aspirated, Piston, Spark Ignition Aircraft Engines – 2

Non-molecular Phases of HF and H2O Under Detonation-like Conditions – 108

DIAGNOSIS

Beam Diagnostics, Collimation, Injection/Extraction, Targetry. Accidents and Commissioning: Working Group C&G Summary Report – 124

Summary I: Accelerator Ion Sources, Fundamentals and Diagnostics – 110

Summary of Beam Quality Diagnostics and Control Working Group – 116

Variable Structure Diagnostics Approach Achieving Optimized Low-Frequency Data Sampling for EMA Motoring Systems – 7

Volatile Organic Analyzer (VOA) in 2006: Repair, Revalidation, and Restart of Elektron Even – 15

DIELECTRICS

Siloxane-Polymer Dielectric Compositions and Related Organic Field-Effect Transistors – 52

DIESEL ENGINES

Reformulated Diesel Fuel – 62

DIESEL FUELS

Reformulated Diesel Fuel – 62

DIFFRACTION

Broadband Performance of TPF's High-contrast Imaging Testbed: Modeling and Simulations – 142

Diffraction at the Tevetron: CDF Results – 122

The Sensitivity of Shaped Pupil Coronagraphs to Optical Aberrations – 143

DIGITAL DATA

Running the Sloan Digital Sky Survey Data Archive – 160

The International Space Station Supports International Polar Year (IPY) – 58

DIGITAL SYSTEMS

DSP Implementation of the Multiscale Retinex Image Enhancement Algorithm – 59

Real-time Enhancement, Registration, and Fusion for an Enhanced Vision System – 60

DIMENSIONS

Multi-Dimensioned Easily Adjustable Single Sheet Container Formula with Indicia – 84

DIOXIDES

Biogenic UO-2- Characterization and Surface Reactivity – 31

DIPOLES

Handling Collision Debris In Quad-and Dipole-First LHC IR Options – 127

DIRECT NUMERICAL SIMULATION

Three Dimensional Constraint Effects on the Estimated (Delta)CTOD during the Numerical Simulation of Different Fatigue Threshold Testing Techniques – 28

DISEASES

Single Molecule Screening of Disease DNA without Amplification – 33

DISPLAY DEVICES

End-Around Taxiway Screen Evaluation – 6

RSD, Retinal Scanning Display Pilot Study and Evaluation – 49

DISSOLVING

Novel Approach to Experimental Studies of Mineral Dissolution Kinetics. Annual Technical Progress Report. Period September 1, 2005 through August 31, 2006 – 29

DISTANCE

Getting the Most for NOVA and T2K – 161

DISTILLATION

Propellant Analysis and Distillation Unit Design – 17

DISTRIBUTED PROCESSING

Secure, Autonomous, Intelligent Controller for Integrating Distributed Sensor Webs – 5

DOSAGE

Test Results of Total Ionizing Dose Conducted at the Jet Propulsion Laboratory – 56

DRY HEAT

Examination of B. subtilis var. niger Spore Killing by Dry Heat Methods – 155

DUCTS

Low Profile Tension Style Flexible Joint – 7

DURABILITY

Durability of Silicate Glasses: An Historical Approach – 39

DUST

Autonomous Detection of Dust Devils and Clouds on Mars – 155

DYES

Cyanine Dyes as Labeling Reagents for Detection of Biological and Other Materials by Luminescence Methods – 23

DYNAMIC CONTROL

Scalable and Dynamic Quality of Service Control – 45

DYNAMIC LOADS

Static and Dynamic Performance of RC Bridge Bents with Architectural-Flared Columns – 65

DYNAMIC RESPONSE

Mid-frequency Band Dynamics of Large Space Structures – 13

DYNAMIC STRUCTURAL ANALYSIS

Finite Element Calculations Illustrating a Method of Model Reduction for the Dynamics of Structures with Localized Nonlinearities – 94

Mid-frequency Band Dynamics of Large Space Structures – 13

DYNAMIC TESTS

Evaluation of the Dynamic Complex Modulus Test and Indirect Diametral Test for Implementing the AASHTO 2002 Design Guide for Pavement Structures in Florida – 3

DYNAMICAL SYSTEMS

A Dynamical Systems Approach to the Design of the Science Orbit Around Europa – 88

DYNAMOMETERS

Chassis Dynamometer Testing of Aqueous Ethanol in a Transit Van – 153

EARTH ENVIRONMENT

Policy Document on Earth Observation for Urban Planning and Management: State of the Art and Recommendations for Application of Earth Observation in Urban Planning – 67

EARTH ORBITS

Real-time Sub-cm Differential Orbit Determination of two Low-Earth Orbiters with GPS Bias Fixing – 12

EARTH SCIENCES

Lightning Charge Retrievals: Dimensional Reduction, LDAR Constraints, and a First Comparison with LIS Satellite Data – 76

EARTH SURFACE

Aqueous Alteration of Basalts: Earth, Moon, and Mars – 166

Observations of Lightning on Earth from the Lunar Surface – 165

EARTHQUAKES

Proceedings of the Fifth National Seismic Conference on Bridges and Highways: Innovations in Earthquake Engineering for Highway Structures Held September 18-20, 2006 – 65

ECCENTRIC ORBITS

Evidence for a Past High-Eccentricity Lunar Orbit – 170

ECCENTRICITY
A Dynamical Systems Approach to the Design of the Science Orbit Around Europa – 88

Evidence for a Past High-Eccentricity Lunar Orbit – 170

ECONOMIC ANALYSIS
Deriving Benefit Measures with Higher Precision: A Study of Economic Values of Air Quality – 71

ECONOMICS
Deriving Benefit Measures with Higher Precision: A Study of Economic Values of Air Quality – 71

Note on Trasande et al., 'Public Health and Economic Consequences of Methylmercury Toxicity on the Developing Brain' – 70

EDDY CURRENTS
Eddy Current System for Material Inspection and Flaw Visualization – 55

EDGE DETECTION
Automated On-board Terrain Analysis for Precision Landings – 15

EDUCATION
Panel Resource Management (PRM) Implementation and Effects within Safety Review Panel Settings and Dynamics – 4

EFFICIENCY
Advanced Vehicle Technologies for Efficient Powertrain Performance – 154

Efficient MATLAB Computations with Sparse and Factored Tensors – 87

EJECTA
Meteoritic Microfossils in Eltanin Impact Deposits – 169

Primary Mineralogical and Chemical Characteristics of the Major K/T and Late Eocene Impact Deposits – 75

Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae – 162

Sedimentation Patterns of Meteoritic Ejecta in Eltanin Impact Deposits at Site PS58/281 – 168

Summary of Results from Analyses of Deposits of the Deep-Ocean Impact of the Eltanin Asteroid – 167

ELASTIC SCATTERING
Low-Energy Elastic Electron Scattering by Atomic Oxygen – 141

ELASTOMERS
Microfabricated Elastomeric Valve and Pump Systems – 40

ELECTRIC BATTERIES
An Update of the Ground Testing of the Li-ion Batteries in Support of JPL's 2003 Mars Exploration Rover Mission – 167

Certification Process for Commercial Batteries for Payloads – 16

Method for Forming Magnetically Modified Electrodes and Articles Produced Thereby – 68

ELECTRIC EQUIPMENT TESTS
Test Results of Total Ionizing Dose Conducted at the Jet Propulsion Laboratory – 56

ELECTRIC FIELDS
Dayside Global Ionospheric Response to the Major Interplanetary Events of October 29-30, 2003 ''Halloween Storms'' – 73

ELECTRIC MOTORS
Electric Machine for Hybrid Motor Vehicle – 62

Variable Structure Diagnostics Approach Achieving Optimized Low-Frequency Data Sampling for EMA Motoring Systems – 7

ELECTRIC POWER SUPPLIES
Variable Structure Diagnostics Approach Achieving Optimized Low-Frequency Data Sampling for EMA Motoring Systems – 8

ELECTRIC POWER
Feedback Control System and Method for Maintaining Constant Resistance Operation of Electrically Heated Elements – 49

ELECTRICAL RESISTANCE
Feedback Control System and Method for Maintaining Constant Resistance Operation of Electrically Heated Elements – 49

ELECTRICITY
Policy Innovation Impacts on Scrubber Electricity Usage – 70

ELECTROCHEMICAL CAPACITORS
Production Scale-Up of Activated Carbons for Ultracapacitors. (Final Report, September 30, 2004-September 30, 2006) – 50

ELECTROCHEMISTRY
Solid State Electrochemical Composite – 30

ELECTRODES
Method for Forming Magnetically Modified Electrodes and Articles Produced Thereby – 68

Systems and Methods for Immobilization – 54

ELECTROKINETICS
Microelectronic Arrays for Cell-Based Functional Genomics/ High Throughput Phenotyping by Electrokinetic Assembly – 30

ELECTROLUMINESCENCE
Intersubband Mid-Infrared Electroluminescent Semiconductor Devices – 126

ELECTROLYTES
Integrated Photoelectrochemical Cell and System Having a Liquid Electrolyte – 68

ELECTROMAGNETIC INTERACTIONS
Using EIGER for Antenna Design and Analysis – 97

ELECTROMAGNETIC RADIATION
High Frequency Magnetic Thin Film Filter – 31

ELECTROMAGNETISM
Reduced-Volume Antennas with Integrated High-Impedance Electromagnetic Surfaces – 43

ELECTRON AFFINITY
Differential Mobility Spectrometry: Preliminary Findings on Determination of Fundamental Constants – 149

ELECTRON BEAMS
Electron Beam Alignment Strategy in the LCLS Undulators – 121

Electron Beam Generation in Tevatron Electron Lenses – 132

Electron Impact Excitation of Forbidden and Allowed Transitions in O(II) – 131

Electron Production and Collective Field Generation in Intense Particle Beams – 140

Energy Measurements of Trapped Electrons from a Plasma Wakefield Accelerator – 121

Photoinjector Production of a Flat Beam with Transverse Emittance Ratio of 100 – 111

Photoinjectors R&D For Future Light Sources & Linear Colliders – 105

ELECTRON CAPTURE
Differential Mobility Spectrometry: Preliminary Findings on Determination of Fundamental Constants – 149

ELECTRON DENSITY (CONCENTRATION)
Dayside Global Ionospheric Response to the Major Interplanetary Events of October 29-30, 2003 ''Halloween Storms'' – 73

ELECTRON ENERGY
Accurate Cross Sections for Excitation of Resonance Transitions in Atomic Oxygen – 172

Electron Collisional Excitation Rates for OI USING the B-Spline R-Matrix Approach – 163

ELECTRON GUNS
Progress on a Cryogenically Cooled RF Gun Polarized Electron Source – 102

ELECTRON IMPACT
Electron Impact Excitation of Forbidden and Allowed Transitions in O(II) – 131

ELECTRON OPTICS
Electron Beam Generation in Tevatron Electron Lenses – 133

ELECTRON SCATTERING
Collisions of Electrons with Atomic Oxygen: Current Status – 142

Effect of EMIC Wave Normal Angle Distribution on Relativistic Electron Scattering Based on the Newly Developed Self-consistent RC/EMIC Waves Model by Khazanov et al. [2006] – 150

Improved Action for Heavy Quarks – 129

Low-Energy Elastic Electron Scattering by Atomic Oxygen – 141

New Accurate Oscillator Strengths and Electron Excitation Collision Strengths for N1 – 163

On The Effect of Electron Collisions in the Excitation of Cometary HCN – 172

ELECTRON SOURCES

Progress on a Cryogenically Cooled RF Gun Polarized Electron Source – 102

ELECTRON STATES

New Accurate Oscillator Strengths and Electron Excitation Collision Strengths for N1 – 163

ELECTRON TRANSITIONS

Accurate Cross Sections for Excitation of Resonance Transitions in Atomic Oxygen – 172

New Accurate Oscillator Strengths and Electron Excitation Collision Strengths for N1 – 163

ELECTRONIC EQUIPMENT

Methods of Fabricating Devices by Transfer of Organic Material – 49

ELECTRONIC MAIL

Intelligent Email Services – 153

ELECTRONICS

Radiation-Hardened Electronics for the Space Environment – 15

ELECTRONS

Collisions of Electrons with Atomic Oxygen: Current Status – 142

Electron Production and Collective Field Generation in Intense Particle Beams – 140

Energy Measurements of Trapped Electrons from a Plasma Wakefield Accelerator – 121

Using the Fermilab Proton Source for a Muon to Electron Conversion Experiment – 128

ELECTROPHORESIS

Apparatus for Transport and Analysis of Particles Using Dielectrophoresis – 22

Methods and Devices for High-Throughput Dielectrophoretic Concentration – 125

ELECTROSTATICS

Reliability of Cascaded THz Frequency Chains with Planar GaAs Circuits – 46

ELECTROWEAK INTERACTIONS (FIELD THEORY)

Search for the Single Top Quarks Produced in s-Channel via Electroweak Interactions at s=1.96 at the Tevatron – 123

ELEMENTARY PARTICLES

B Masses and Lifetimes at the Tevatron – 117

B(sup 0)(Sub s) Mixing at CDF – 134

Update on the Next-to-Leading order Monte Carol MCFM – 135

EMBEDDING

Shape Memory System With Integrated Actuation Using Embedded Particles – 35

EMISSION

Combustion Emissions from Hazardous Waste Incinerators, Boilers and Industrial Furnaces, and Municipal Solid Waste Incinerators: Results from Five STAR Grants and Research Needs – 71

EMITTANCE

Photoinjector Production of a Flat Beam with Transverse Emittance Ratio of 100 – 111

EMULSIONS

Mixing Utility Liquid Viscometric Apparatus – 57

ENCELADUS

Cassini Observes the Active South Pole of Enceladus – 160

ENCKE COMET

Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System – 171

ENCLOSURE

Thermal Modeling Tool for a Spherical Capsule in a Sputtering Chamber – 140

ENERGY CONSERVATION

Energy Saving Model for the Heat Treatment of Castings – 35

Energy Star (Trade Name) and Other Climate Protection Partnerships 2005 Annual Report – 80

ENERGY CONVERSION

An Overview of Space Power Systems for NASA Missions – 14

ENERGY LEVELS

New Developments in Charge Transfer Multiplet Calculations: Projection Operations, Mixed-Spin States and pi-Bonding – 120

ENERGY STORAGE

Production Scale-Up of Activated Carbons for Ultracapacitors. (Final Report, September 30, 2004-September 30, 2006) – 50

ENERGY TRANSFER

Particle and Energy Transport in the SOL and DIII-D and NSTX – 106

ENGINE PARTS

Turbocharging a Crank-Case Scavenged and Direct-Injected Two-Stroke Engine for Snowmobile Applications – 154

ENHANCED VISION

Real-time Enhancement, Registration, and Fusion for an Enhanced Vision System – 60

ENVIRONMENT EFFECTS

Radiation-Hardened Electronics for the Space Environment – 15

Summary of NHEERL Ecological Research on Global Climate Change – 79

ENVIRONMENT PROTECTION

Note on Trasande et al., 'Public Health and Economic Consequences of Methylmercury Toxicity on the Developing Brain' – 70

ENVIRONMENTAL CLEANUP

ProUCL Version 4.0, User Guide – 93

ENVIRONMENTAL CONTROL

Crew Exploration Vehicle Environmental Control and Life Support Emergency Gas Consumable Sizing – 82

International Space Station Environmental Control and Life Support System: Verification for the Pressurized Mating Adapters – 83

International Space Station (ISS) Environmental Control and Life Support (ECLS) System Overview of Events: February 2006 - 2007 – 82

ENVIRONMENTAL QUALITY

Technical Assistance Project for the Minnesota Pollution Control Agency – 68

ENVIRONMENTS

ProUCL Version 4.0, Technical Guide – 93

ENZYMES

Understanding the Mechanism of Human P450 CYP1A2 Using Coupled Qunatum-Classical Simulations in a Dynamical Environment – 34

ERRORS

SIMsim: An End-to-end Simulator for the ESA Mission – 158

Volatile Organic Analyzer (VOA) in 2006: Repair, Revalidation, and Restart of Elektron Even – 15

ESTIMATES

Coupling of Realistic Real Estimates with Genomics for Assessing Contaminant Attenuation and Long-Term Plume Containment – 114

ESTIMATING

SIMsim: An End-to-end Simulator for the ESA Mission – 158

ETHERNET

CMS DAQ Event Builder Based on Gigabit Ethernet – 133

ETHYL ALCOHOL

Chassis Dynamometer Testing of Aqueous Ethanol in a Transit Van – 153

EUROPA

A Dynamical Systems Approach to the Design of the Science Orbit Around Europa – 88

EUTECTIC ALLOYS

Mechanistic Selection and Growth of Twinned Bicrysalline Primary Si in near Eutectic Al-Si Alloys – 36

EUTECTICS

Mechanistic Selection and Growth of Twinned Bicrysalline Primary Si in near Eutectic Al-Si Alloys – 36

EVALUATION
Evaluating the Performance Impact of Xen on MPI and Process Execution for HPC Systems – 88

EVAPORATION
Growth of In-Situ Thin Films by Reactive Evaporation – 149

Results from the CDX-U Lithium Wall and NSTX Lithium Pallet Injection and Evaporation Experiments – 106

EXCITATION
Accurate Cross Sections for Excitation of Resonance Transitions in Atomic Oxygen – 172

Electron Collisional Excitation Rates for OI USING the B-Spline R-Matrix Approach – 163

New Accurate Oscillator Strengths and Electron Excitation Collision Strengths for N1 – 163

EXHAUST EMISSION
Evaluation of Carbon Monoxide Concentration With and Without Catalytic Emission Controls from Gasoline Propulsion Engines – 63

Global Climate Control: Is There a Better Strategy Than Reducing Greenhouse Gas Emissions – 71

Toxicological Evaluation of Realistic Emissions of Source Aerosols (Teresa): Application to Power Plant-Derived PM2.5 – 69

EXHAUST GASES
Global Climate Control: Is There a Better Strategy Than Reducing Greenhouse Gas Emissions – 71

EXPLOSIONS
Adhesion of Lunar Dust – 172

Measurement and ALE3D Simulation of Violence in a Deflagration Experiment with LX-10 and Aermet-100 Alloy – 18

EXPLOSIVES
Kinetic Modeling of Slow Energy Release in Non-Ideal Carbon Rich Explosives – 17

EXTRACTION
Beam Diagnostics, Collimation, Injection/Extraction, Targetry. Accidents and Commissioning: Working Group C&G Summary Report – 124

Noise, Edge Extraction and Visibility of Features – 61

EXTRAVEHICULAR ACTIVITY
EVA Hazards due to TPS Inspection and Repair – 8

EVA Task Timing and Timeline Planning – 156

Overview of Umbilical Extravehicular Activity (EVA) Interfaces in Life Support Systems on Spacecraft Vehicles and Applications for the Crew Exploration Vehicle (CEV) – 84

EXTREMELY HIGH FREQUENCIES
Deep Space Ka-band Link Management and the MRO Demonstration: Long-term Weather Statistics Versus Forecasting – 77

Use of the 37-38 GHz and 40-40.5 GHz Ka-bands for Deep Space Communications – 11

EXTRUDING
Extruded Scintillator for the Calorimetry Applications – 130

FABRICATION
Compact, Lightweight Dual- Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 41

Design, Fabrication, and Test of an SRF Cryomodule Prototype at Fermilab – 125

Ion Exchange Waveguides and Methods Fabrication – 146

Methods of Fabricating Devices by Transfer of Organic Material – 49

Nitride-Based Transistors with a Protective Layer and a Low-Damage Recess and Methods of Fabrication Thereof – 148

Process for Removing an Organic Layer During Fabrication of an Organic Electronic Device and the Organic Electronic Device Formed By the Process – 55

Propellant Analysis and Distillation Unit Design – 16

Reduced-Volume Antennas with Integrated High-Impedance Electromagnetic Surfaces – 43

Strain Measurement Using FBG on COPV in Stress Rupture Test – 25

Test Results of Total Ionizing Dose Conducted at the Jet Propulsion Laboratory – 56

Water Soluble Tooling Materials for Composite Structures – 6

FAILURE ANALYSIS
A Framework for Performing Multiscale Stochastic Progressive Failure Analysis of Composite Structures – 26

The Effect of Delamination on Damage Path and Failure Load Prediction for Notched Composite Laminates – 27

FARADAY EFFECT
Fast Faraday Cup with High Band Width – 107

FATIGUE (MATERIALS)
On the Use of 3dB Qualification Margin for Structural Parts on Expendable Launch Vehicles – 10

Three Dimensional Constraint Effects on the Estimated (Delta)CTOD during the Numerical Simulation of Different Fatigue Threshold Testing Techniques – 28

FEASIBILITY
Feasibility Study of Nb3Al Rutherford Cable for High Field Accelerator Magnet Application – 127

Pulsed Power 3 GHz Feasibility Study in FOI 36.7 m3 Mode Stirred Reverberation Chamber – 46

FEEDBACK CONTROL
Feedback Control System and Method for Maintaining Constant Resistance Operation of Electrically Heated Elements – 49

FIBERS
Fiber Waveguides and Methods of Making the Same – 52

FIELD EFFECT TRANSISTORS
Siloxane-Polymer Dielectric Compositions and Related Organic Field-Effect Transistors – 52

FIELD OF VIEW
Recent Results from the Swift Burst Alert Telescope – 157

FIELD-PROGRAMMABLE GATE ARRAYS
FPGA Curved Track Fitter with Very Low Resource Usage – 129

FILAMENT WINDING
Interrelationship of Nondestructive Evaluation Methodologies Applied to Testing of Composite Overwrapped Pressure Vessels – 27

FINITE ELEMENT METHOD
Adaptive Mesh Refinement Algorithms for Parallel Unstructured Finite Element Codes – 96

Contact Interface Verification for DYNA3D. Scenario 1: Basic Contact – 92

Contact Interface Verification for DYNA3D. Scenario 2: Multi-Surface Contact – 18

Development of New Modeling and Analysis Tools for Solar Sails – 16

Finite Element Calculations Illustrating a Method of Model Reduction for the Dynamics of Structures with Localized Nonlinearities – 94

Using EIGER for Antenna Design and Analysis – 97

FIRE PREVENTION
Laboratory-Scale and Full-Scale Fire Testing of Lightweight Aircraft Seat Cushion Materials – 5

FIRES
Evaluation of the Reproducibility of the FAA Oil Burner Fire Test for Aircraft Seat Cushions – 6

Laboratory-Scale and Full-Scale Fire Testing of Lightweight Aircraft Seat Cushion Materials – 5

FISHERIES
Societal Benefits of Ocean Altimetry Data – 80

FLAMMABILITY
Oxygen Concentration Flammability Threshold Tests for the Constellation Program – 10

FLASH LAMPS
Numerical Simulation of a Flashlamp Pumped Nd:YAG Laser (Numerisk Simulering av en Blixlampspumpad Nd:YAG Laser) – 146

FLAT PANEL DISPLAYS
System and Method for Dual Stacked Panel Display – 51

FLAVOR (PARTICLE PHYSICS)
B-Tagging at CDF and DO Lesson for LHC – 102

FLIGHT CONTROL
Dragless Flight Control System for Flying Objects – 1

FLIGHT INSTRUMENTS
ESA PlanetQuest: Status and Recent Progress – 156

FLIGHT SAFETY
Panel Resource Management (PRM) Implementation and Effects within Safety Review Panel Settings and Dynamics – 4

Voluntary Aviation Safety Information-Sharing Process: Preliminary Audit of Distributed FOQA and ASAP Archives Against Industry Statement of Requirements – 4

FLIGHT TESTS
Developing the Parachute System for NASA's Orion: An Overview at Inception – 14

Gliding Experiments of the Wright Brothers: The Wrights and Flight Research 1899-1908 – 6

Mid-frequency Band Dynamics of Large Space Structures – 13

The NASA Dryden Flight Research Center Unmanned Aircraft System Service Capabilities – 1

FLIGHT TIME
EVA Task Timing and Timeline Planning – 157

FLUID DYNAMICS
Motion of the Mantle in the Translational Modes of the Earth and Mercury – 170

FLUID FLOW
Final Report for the ASC Gas-Powder Two-Phase Flow Modeling Project AD2006-09 – 57

FOAMS
Mixing Utility Liquid Viscometric Apparatus – 57

FOCAL PLANE DEVICES
Megapixel Multi-band QWIP Focal Plane Arrays – 58

FOCUSING
The Sensitivity of Shaped Pupil Coronagraphs to Optical Aberrations – 143

FOILS (MATERIALS)
Efficiency and Lifetime of Carbon Foils – 32

FORBIDDEN TRANSITIONS
Electron Impact Excitation of Forbidden and Allowed Transitions in O(II) – 131

FORCE DISTRIBUTION
Thin, Flexible Actuator Array to Produce Complex Shapes and Force Distributions – 131

FORECASTING
Societal Benefits of Ocean Altimetry Data – 80

FORM FACTORS
Modern Description of Semileptonic Meson Form Factors – 113

FORMING TECHNIQUES
Laser Based Micro Forming and Assembly – 147

FOSSILS
The Cretaceous/Paleogene Transition on the East Tasman Plateau, Southwestern Pacific – 169

FRACTURE MECHANICS
The Effects of Fault Counting Methods on Fault Model Quality – 97

FRACTURES (MATERIALS)
Novel Approach to Experimental Studies of Mineral Dissolution Kinetics. Annual Technical Progress Report. Period September 1, 2005 through August 31, 2006 – 29

FRAGMENTATION
B-Tagging at CDF and DO Lesson for LHC – 102

Orbital Debris Studies at NASA – 156

FRAGMENTS
Spectroscopic Investigations of Fragment Species in the Coma – 171

FREE ELECTRON LASERS
Electron Beam Alignment Strategy in the LCLS Undulators – 121

FREQUENCIES
Combined Frequency-Time Domain Power Adaptation for CDMA Communication System – 42

Measurement of B(sub s) Oscillations at CDF – 118

FREQUENCY DISTRIBUTION
Deep Space Ka-band Link Management and the MRO Demonstration: Long-term Weather Statistics Versus Forecasting – 77

FREQUENCY MULTIPLIERS
Reliability of Cascaded THz Frequency Chains with Planar GaAs Circuits – 46

FRESH WATER
Proceedings of a Workshop on Hydrological Modeling of Freshwater Discharge from Alaska's Arctic Coast – 78

FRICTION FACTOR
Examination of B. subtilis var. niger Spore Killing by Dry Heat Methods – 155

FUEL CELLS
Recycling of Used Perfluorosulfonic Acid Membranes – 83

FUELS
High-Octane and Mid-Octane Detonation Performance of Leaded and Unleaded Fuels in Naturally Aspirated, Piston, Spark Ignition Aircraft Engines – 2

FURNACES
Combustion Emissions from Hazardous Waste Incinerators, Boilers and Industrial Furnaces, and Municipal Solid Waste Incinerators: Results from Five STAR Grants and Research Needs – 71

GALLIUM ALLOYS
Bias Selectable Dual Band AlGaN Ultraviolet Detectors – 53

GALLIUM ARSENIDES
Growth and Properties of Lattice Matched GaAsSbN Epilayer on GaAs for Solar Cell Applications – 132

Influence of Growth Parameters and Annealing on Properties of MBE Grown GaAsSbN SQWs – 149

GALLIUM NITRIDES
Hafnium Nitride Buffer Layers for Growth of GaN on Silicon – 48

Influence of Growth Parameters and Annealing on Properties of MBE Grown GaAsSbN SQWs – 149

GAMMA RAY BURSTS
Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae – 162

Recent Results from the Swift Burst Alert Telescope – 157

GAMMA RAY SOURCES (ASTRONOMY)
A Possible Magnetar Nature for IGR J16358-4726 – 157

GAS DYNAMICS
Gas Dynamics and Kinetics in the Cometary Coma: Theory and Observations – 171

GAS FLOW
Final Report for the ASC Gas-Powder Two-Phase Flow Modeling Project AD2006-09 – 57

GAS INJECTION
DIII-D Studies of Massive Gas Injection Fast Shutdowns for Disruption Mitigation – 107

GASOLINE
Evaluation of Carbon Monoxide Concentration With and Without Catalytic Emission Controls from Gasoline Propulsion Engines – 63

Oxygenates Fact Book: A Compilation of Information on the Benefits of Oxygenates in Gasoline – 69

GENERAL OVERVIEWS
International Space Station (ISS) Environmental Control and Life Support (ECLS) System Overview of Events: February 2006 - 2007 – 83

GENOME
Microelectronic Arrays for Cell-Based Functional Genomics/ High Throughput Phenotyping by Electrokinetic Assembly – 30

GEOCHEMISTRY
Linking Home Plate and Algonquin Class Rocks through Microtextural Analysis: Evidence for Hydrovolcanism in the Inner Basin of Columbia Hills, Gusev Crater – 66

The Cretaceous/Paleogene Transition on the East Tasman Plateau, Southwestern Pacific – 168

GEOMAGNETISM
Dayside Global Ionospheric Response to the Major Interplanetary Events of October 29-30, 2003 ''Halloween Storms'' – 73

GEOPHYSICS
The Aquarius Scatterometer: An Active System for Measuring Surface Roughness for Sea-Surface Brightness Temperature Correction – 74

Windsat Validation Using Seawinds, Windrad and POLSCAT Measurements – 76

GEOSYNCHRONOUS ORBITS
Optical Studies of Space Debris at GEO: Survey and Follow-up with Two Telescopes – 11

Real-time Sub-cm Differential Orbit Determination of two Low-Earth Orbiters with GPS Bias Fixing – 12

GLACIERS
The Glacier and Land Ice Surface Topography Interferometer (GLISTIN): A Novel Ka-band Digitally Beamformed Interferometer – 67

GLASS
Durability of Silicate Glasses: An Historical Approach – 39

On-Line Coating of Glass with Tin Oxide by Atmospheric Pressure Chemical Vapor Deposition – 37

Structure, Ionic Conductivity and Mobile Carrier Density in Fast Ionic Conducting Chalcogenide Glasses – 137

GLIDERS
Gliding Experiments of the Wright Brothers: The Wrights and Flight Research 1899-1908 – 6

GLOBAL POSITIONING SYSTEM
Real-time Sub-cm Differential Orbit Determination of two Low-Earth Orbiters with GPS Bias Fixing – 12

GRASSLANDS
Detecting and Quantifying Reductive Dechlorination During Monitored Natural attenuation at the Savannah River CBRP Site – 32

Measurement and Prediction of Radiolytic Hydrogen Production in Defense Waste Processing Slurries at Savannah River Site – 71

GRAVITY WAVES
Status of MTP Data Analysis for TCSP – 79

GREENHOUSE EFFECT
Global Climate Control: Is There a Better Strategy Than Reducing Greenhouse Gas Emissions – 71

GRID GENERATION (MATHEMATICS)
Adaptive Mesh Refinement Algorithms for Parallel Unstructured Finite Element Codes – 96

GRID REFINEMENT (MATHEMATICS)
Adaptive Mesh Refinement Algorithms for Parallel Unstructured Finite Element Codes – 96

GROUND TESTS
An Update of the Ground Testing of the Li-ion Batteries in Support of JPL's 2003 Mars Exploration Rover Mission – 167

GROUND WIND
Microwave Remote Sensing Modeling of Ocean Surface Salinity and Winds Using an Empirical Sea Surface Spectrum – 74

Polarimetric Analysis of Scatterometer Data for Ocean Surface Wind Measurement – 73

GROUT
Development of a Standard Accelerated Corrosion Test for Acceptance of Post-Tensioning Grouts in Florida – 29

HABITATS
NASA Bluetooth Wireless Communications – 12

HADRONS
B(sup 0)(Sub s) Mixing at CDF – 134

Counting Rules, Holographic Wave Functions, Meromorphization and Quark-Hadron Duality – 138

Future Science at the Relativistic Heavy Ion Collider – 103

Jets at CDF – 113

Measurement of the Branching Fraction Ratio B--\g D K/B--\gD pi with the CDF II Detector – 123

Searches for D0 - Anti-D0 Mixing, Rare Charm and Tau Decays – 109

Studying the Underlying Event at CDF – 150

Tevatron-for-LHC Report: Preparations for Discoveries – 123

Unique Description for Single Transverse Spin Asymmetries in DIS and Hadronic Collisions – 105

HAFNIUM COMPOUNDS
Hafnium Nitride Buffer Layers for Growth of GaN on Silicon – 48

HAMILTONIAN FUNCTIONS
Accurate Calculation of Oscillator Strengths for CI II Lines Using Non-orthogonal Wavefunctions – 164

HANDBOOKS
Photovoltaic Incentive Design Handbook – 68

HARTREE APPROXIMATION
Accurate Calculation of Oscillator Strengths for CI II Lines Using Non-orthogonal Wavefunctions – 164

HAZARDOUS MATERIALS
NASA Hydrogen Peroxide Propellant Hazards Technical Manual – 40

HAZARDOUS WASTES
Combustion Emissions from Hazardous Waste Incinerators, Boilers and Industrial Furnaces, and Municipal Solid Waste Incinerators: Results from Five STAR Grants and Research Needs – 71

HAZARDS
EVA Hazards due to TPS Inspection and Repair – 8

HAZE
Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM(sub 2.5), and Regional Haze – 69

HEAD-UP DISPLAYS
Maintenance Procedure Display: Head Mounted Display (HMD) Evaluations – 82

HEALTH
Assuring Crew Health Protection – 81

Detailed Linked Birth/Infant Death Period Public Use File for 2003 (Raw data on CD-ROM) – 100

Note on Trasande et al., 'Public Health and Economic Consequences of Methylmercury Toxicity on the Developing Brain' – 70

Summary of NHEERL Ecological Research on Global Climate Change – 79

HEAT EXCHANGERS
Eddy Current System for Material Inspection and Flaw Visualization – 55

HEAT MEASUREMENT
Extruded Scintillator for the Calorimetry Applications – 130

HEAT RESISTANT ALLOYS
Oxidation Kinetics of a NiPtTi High Temperature Shape Memory Alloy – 35

HEAT SHIELDING
The Challenges of Landing on Mars – 169

HEAT TREATMENT
Energy Saving Model for the Heat Treatment of Castings – 35

Protection of Alodine Coatings from Thermal Aging by Removable Polymer Coatings – 39

HEATING EQUIPMENT
Thermal Design and Flight Experience of the Mars Exploration Rover Spacecraft Computer-Controlled, Propulsion Line Heaters – 62

HEATING
Cassini Observes the Active South Pole of Enceladus – 160

Method and Apparatus for Reworking a Microwave Module – 53

Relative Humidity Sensor Enclosed with Formed Heating Element – 52

HEAVY IONS
Future Science at the Relativistic Heavy Ion Collider – 104

Heavy Quarks at RHIC from Parton Transport Theory – 102

HELIUM
Sonic Helium Detectors in the Fermilab Tevatron – 139

Superconducting Solenoid Magnet Test Results – 114

HETEROJUNCTIONS
High Efficiency Organic Photovoltaic Cells Employing Hybridized Mixed Planar Heterojunctions – 51

HIERARCHIES
Getting the Most for NOVA and T2K – 161

User Definable Hierarchy for Database Management – 152

HIGGS BOSONS
Search for Low Mass Higgs at the Tevatron – 135

Standard Model Higgs Searches and Perspectives at the Tevatron – 129

SUSY Higgs Searches at D0, Tevatron – 134

HIGH ENERGY ELECTRONS
Status of High Energy Electron Cooling in FNAL's Recycler Ring – 119

HIGH ENERGY INTERACTIONS
Future of Spin Physics at BNL – 105

Search for D0-anti-D0 Mixing with the BaBar Experiment – 137

Search for New Phenomena in the CDF Top Quark Sample – 150

Studying the Underlying Event at CDF – 150

HIGH FIELD MAGNETS
Cost Effective Open Geometry HTS MRI System amended to BSCCO 2212 Wire for High Field Magnets – 64

Development of Rutherford-type Cables for High Field Accelerator Magnets at Fermilab – 148

Feasibility Study of Nb3Al Rutherford Cable for High Field Accelerator Magnet Application – 127

HIGH FREQUENCIES
Broadband Performance of TPF's High-contrast Imaging Testbed: Modeling and Simulations – 142

High Frequency Magnetic Thin Film Filter – 31

Noise, Edge Extraction and Visibility of Features – 61

HIGH PRESSURE
Graded-density Reservoirs for Accessing High Pressure Low Temperature Material States – 18

HIGH RESOLUTION
Search for the Pentquark Partners: Theta++, SigmaO and NO – 120

Simple Approach for Obtaining High Resolution, High Sensitivity 1H NMR Metabolite Spectra of Biofluids with Limited Mass Supply – 20

HIGH TEMPERATURE
Characteristics of Post-Sorbent and High Temperature Catalytic Oxidizer Beds After Long-Term On-Orbit Use – 83

Characterization of Damaged Materials – 17

Examination of B. subtilis var. niger Spore Killing by Dry Heat Methods – 155

Reliability of Cascaded THz Frequency Chains with Planar GaAs Circuits – 46

HIGHWAYS
Decision Support for Bridge Programming and Budgeting – 90

Enhancement of Resilient Modulus Data for the Design of Pavement Structures in Florida – 151

Evaluation of the Dynamic Complex Modulus Test and Indirect Diametral Test for Implementing the AASHTO 2002 Design Guide for Pavement Structures in Florida – 3

Human Factors Guidelines for Intelligent Transportation Systems at the Highway-Rail Intersection: Technical Report – 85

Proceedings of the Fifth National Seismic Conference on Bridges and Highways: Innovations in Earthquake Engineering for Highway Structures Held September 18-20, 2006 – 65

Seismic Retrofitting Manual for Highway Structures. Part 1: Bridges (December 2006) – 74

Seismic Retrofitting Manual for Highway Structures. Part 2: Retaining Structures, Slopes, Tunnels,Culverts and Roadways (December 2006) – 66

HISTORIES
A Brief Historical Review of Vestibular and Sensorimotor Research Associated with Space Flight – 81

Durability of Silicate Glasses: An Historical Approach – 39

Gliding Experiments of the Wright Brothers: The Wrights and Flight Research 1899-1908 – 6

HOLOGRAPHY
Counting Rules, Holographic Wave Functions, Meromorphization and Quark-Hadron Duality – 138

HONEYCOMB STRUCTURES
Investigation of MMOD Impact on Shuttle Payload Bay Door Radiator – 13

HUMAN FACTORS ENGINEERING
Ergonomic Guidelines for Manual Material Handling – 86

Human Factors Guidelines for Intelligent Transportation Systems at the Highway-Rail Intersection: Technical Report – 85

Human-Factors Perspective On Simulator Fidelity Assessment – 84

Space Human Factors Engineering Gap Analysis Project Final Report – 86

HUMIDITY
International Space Station Environmental Control and Life Support System: Verification for the Pressurized Mating Adapters – 83

Relative Humidity Sensor Enclosed with Formed Heating Element – 52

Testing of an Amine-Based Pressure-Swing System for Carbon Dioxide and Humidity Control – 84

HURRICANES
Design Hurricane Storm Surge Pilot Study – 78

Improved Hurricane Boundary Layer Observations with the Imaging Wind and Rain Airborne Profiler – 76

Societal Benefits of Ocean Altimetry Data – 80

Status of MTP Data Analysis for TCSP – 78

HYDRATION
Crystal Water on Mars: Insights from the Mars Exploration Rovers – 156

HYDROCYANIC ACID
On The Effect of Electron Collisions in the Excitation of Cometary HCN – 172

HYDRODYNAMICS
Hydrodynamic Effects on Coalescence – 56

HYDROGEN IONS
Negative Hydrogen Ion Source Research and Beam Parameters for Accelerators – 115

HYDROGEN PEROXIDE
NASA Hydrogen Peroxide Propellant Hazards Technical Manual – 40

HYDROGEN PRODUCTION
Low Current Plasmatron Fuel Converter Having Enlarged Volume Discharges – 62

Measurement and Prediction of Radiolytic Hydrogen Production in Defense Waste Processing Slurries at Savannah River Site – 71

HYDROGEN

Integrated Photoelectrochemical Cell and System Having a Liquid Electrolyte – 68

Update for the MuCool Test Area – 139

HYDROLOGY MODELS

Proceedings of a Workshop on Hydrological Modeling of Freshwater Discharge from Alaska's Arctic Coast – 78

HYDROLOGY

Design Hurricane Storm Surge Pilot Study – 78

Proceedings of a Workshop on Hydrological Modeling of Freshwater Discharge from Alaska's Arctic Coast – 78

HYDROSTATICS

Hydro Static Water Level Systems at Fermilab – 57

HYPERGOLIC ROCKET PROPELLANTS

Propellant Analysis and Distillation Unit Design – 17

HYPERVELOCITY IMPACT

Meteoritic Microfossils in Eltanin Impact Deposits – 169

Sedimentation Patterns of Meteoritic Ejecta in Eltanin Impact Deposits at Site PS58/281 – 168

HYSTERESIS

Co-axial Joint Technology Applied to Antenna Backup Structures – 11

ICE PREVENTION

Anti-Icing Pavement Coating Study at Chicago O'Hare International Airport – 2

IDENTIFYING

Cutting Edge RFID Technologies for NASA Applications – 154

Data Monitoring and Recovery – 8

Structure for Identifying, Locating and Quantifying Physical Phenomena – 65

System and Method for Identifying, Reporting, and Evaluating Presence of Substance – 95

IGNITION

Acoustic Longitudinal Field NIF Optic Feature Detection Map Using Time-Reversal and MUSIC – 146

Hard X-ray Imaging for Measuring Laser Absortion Spatial Profiles on the National Ignition Facility – 145

IMAGE CONTRAST

Image Formation in High Contrast Optical Systems: The Role of Polarization – 143

IMAGE ENHANCEMENT

Automated On-board Terrain Analysis for Precision Landings – 15

DSP Implementation of the Multiscale Retinex Image Enhancement Algorithm – 59

Enhanced Images for Checked and Carry-on Baggage and Cargo Screening – 59

Image Enhancement, Image Quality, and Noise – 60

Impact of Multiscale Retinex Computation on Performance of Segmentation Algorithms – 58

Real-time Enhancement, Registration, and Fusion for an Enhanced Vision System – 60

The Automatic Assessment and Reduction of Noise Using Edge Pattern Analysis in Nonlinear Image Enhancement – 59

IMAGE PROCESSING

Advanced Image Processing of Aerial Imagery – 60

Enhanced Images for Checked and Carry-on Baggage and Cargo Screening – 59

The Automatic Assessment and Reduction of Noise Using Edge Pattern Analysis in Nonlinear Image Enhancement – 59

Visualization and Processing of Multidimensional Data Using Prefiltering and Sorting Criteria – 96

IMAGE RESOLUTION

Advanced Image Processing of Aerial Imagery – 60

Image Enhancement, Image Quality, and Noise – 60

Image Formation in High Contrast Optical Systems: The Role of Polarization – 143

IMAGERY

Advanced Image Processing of Aerial Imagery – 60

The International Space Station Supports International Polar Year (IPY) – 58

IMAGING TECHNIQUES

Advanced Image Processing of Aerial Imagery – 60

Automated On-board Terrain Analysis for Precision Landings – 15

Broadband Performance of TPF's High-contrast Imaging Testbed: Modeling and Simulations – 142

Hard X-ray Imaging for Measuring Laser Absortion Spatial Profiles on the National Ignition Facility – 145

Image Formation in High Contrast Optical Systems: The Role of Polarization – 143

Mars Odyssey: Off-nadir Imaging – 167

Measuring Extended Structure in Stars Using the Keck Interferometer Nuller – 158

Observations of Lightning on Earth from the Lunar Surface – 165

Recent Results from the Swift Burst Alert Telescope – 157

Target Selection and Imaging Requirements for JWST Fine Phasing – 143

The Sensitivity of Shaped Pupil Coronagraphs to Optical Aberrations – 143

IMMOBILIZATION

Systems and Methods for Immobilization – 54

IMMUNOASSAY

Mass Spectrometric Immunoassay – 30

IMPACT TESTS

Investigation of MMOD Impact on Shuttle Payload Bay Door Radiator – 13

IMPEDANCE

Reduced-Volume Antennas with Integrated High-Impedance Electromagnetic Surfaces – 43

INCENTIVES

Photovoltaic Incentive Design Handbook – 68

INCINERATORS

Combustion Emissions from Hazardous Waste Incinerators, Boilers and Industrial Furnaces, and Municipal Solid Waste Incinerators: Results from Five STAR Grants and Research Needs – 71

INDUSTRIES

Institute for Telecommunication Sciences Technical Progress Report, 2001 – 43

Policy Innovation Impacts on Scrubber Electricity Usage – 70

INELASTIC SCATTERING

Unique Description for Single Transverse Spin Asymmetries in DIS and Hadronic Collisions – 105

INEQUALITIES

Qualitative Process Theory – 28

IN-FLIGHT MONITORING

Characteristics of Post-Sorbent and High Temperature Catalytic Oxidizer Beds After Long-Term On-Orbit Use – 83

INFORMATION DISSEMINATION

Voluntary Aviation Safety Information-Sharing Process: Preliminary Audit of Distributed FOQA and ASAP Archives Against Industry Statement of Requirements – 4

INFORMATION MANAGEMENT

Decision Support for Bridge Programming and Budgeting – 90

INFORMATION RETRIEVAL

Voluntary Aviation Safety Information-Sharing Process: Preliminary Audit of Distributed FOQA and ASAP Archives Against Industry Statement of Requirements – 4

INFORMATION SYSTEMS

Space-based Networking Technology Developments in the Interplanetary Network Directorate Information Technology Program – 152

INFRARED ASTRONOMY
SOFIA: Stratospheric Observatory For Infrared Astronomy – 161

INFRARED RADIATION
Megapixel Multi-band QWIP Focal Plane Arrays – 58

INJECTION MOLDING
Advanced Pattern Material for Investment Casting Applications – 37

INJECTION
Results from the CDX-U Lithium Wall and NSTX Lithium Pallet Injection and Evaporation Experiments – 106

INJECTORS
Beam Intensity Upgrade at FERMILAB – 112

Induction Barrier RF and Applications in Main Injector – 110

INSPECTION
Eddy Current System for Material Inspection and Flaw Visualization – 55

EVA Hazards due to TPS Inspection and Repair – 8

INSTRUMENT LANDING SYSTEMS
Study of Normal Operational Landing Performance on Subsonic, Civil, Narrow-Body Jet Aircraft During Instrument Landing System Approaches – 3

INTEGRAL EQUATIONS
Using EIGER for Antenna Design and Analysis – 97

INTEGRATORS
Simplectic Correctors for Canonical Heliocentric N-Body Maps – 160

INTERFEROMETERS
SIMsim: An End-to-end Simulator for the ESA Mission – 158

The Glacier and Land Ice Surface Topography Interferometer (GLISTIN): A Novel Ka-band Digitally Beamformed Interferometer – 66

INTERFEROMETRY
ESA PlanetQuest: Status and Recent Progress – 156

Noninvasive Characterization of a Flowing Multiphase Fluid Using Ultrasonic Interferometry – 56

INTERNAL COMBUSTION ENGINES
Electric Machine for Hybrid Motor Vehicle – 62

Engine Valve Actuation for Combustion Enhancement – 63

High-Octane and Mid-Octane Detonation Performance of Leaded and Unleaded Fuels in Naturally Aspirated, Piston, Spark Ignition Aircraft Engines – 2

INTERNATIONAL COOPERATION
The International Space Station Supports International Polar Year (IPY) – 58

INTERNATIONAL SPACE STATION
Characteristics of Post-Sorbent and High Temperature Catalytic Oxidizer Beds After Long-Term On-Orbit Use – 83

Comparison of the Exclusion Volume and Probability Threshold Methods of Debris Avoidance for the STS Orbiter – 10

EVA Task Timing and Timeline Planning – 156

EXPRESS Pallet Payload Interface Requirements – 12

International Space Station Environmental Control and Life Support System: Verification for the Pressurized Mating Adapters – 83

International Space Station (ISS) Environmental Control and Life Support (ECLS) System Overview of Events: February 2006 - 2007 – 82

ISS Asset Tracking Using SAW RFID Technology – 55

ISS Debris Avoidance Maneuver Threshold Analysis – 14

Maintenance Procedure Display: Head Mounted Display (HMD) Evaluations – 82

NASA Bluetooth Wireless Communications – 12

STS 116 Return Samples: Assessment of Air Quality aboard the Shuttle (STS-116) and International Space Station (12A.1) – 82

Volatile Organic Analyzer (VOA) in 2006: Repair, Revalidation, and Restart of Elektron Even – 15

INTERPLANETARY SPACE
Dayside Global Ionospheric Response to the Major Interplanetary Events of October 29-30, 2003 ''Halloween Storms'' – 73

INTERPROCESSOR COMMUNICATION
System and Method for Multi-Perspective Collaborative Modeling – 44

INTERSECTIONS
Human Factors Guidelines for Intelligent Transportation Systems at the Highway-Rail Intersection: Technical Report – 86

INTERSTELLAR MATTER
SN 1987A after 18 Years: Mid-Infrared GEMINI and SPITZER Observations of the Remnant – 159

INTRUSION
Parameters for Intrusion Analysis – 93

INVENTIONS
Translation Tool – 153

INVENTORY MANAGEMENT
ISS Asset Tracking Using SAW RFID Technology – 55

INVESTMENT CASTING
Advanced Pattern Material for Investment Casting Applications – 37

ION CURRENTS
Structure, Ionic Conductivity and Mobile Carrier Density in Fast Ionic Conducting Chalcogenide Glasses – 137

ION CYCLOTRON RADIATION
Effect of EMIC Wave Normal Angle Distribution on Relativistic Electron Scattering Based on the Newly Developed Self-consistent RC/EMIC Waves Model by Khazanov et al. [2006] – 150

ION EXCHANGING
Ion Exchange Waveguides and Methods Fabrication – 146

ION SOURCES
Ion Source Choices An H Source for the High Intensity Neutrino Source – 119

Negative Hydrogen Ion Source Research and Beam Parameters for Accelerators – 115

Summary I: Accelerator Ion Sources, Fundamentals and Diagnostics – 110

IONIZATION
MUCOOL RF Program – 126

Test Results of Total Ionizing Dose Conducted at the Jet Propulsion Laboratory – 56

IONIZED GASES
Electron Impact Excitation of Forbidden and Allowed Transitions in O(II) – 131

IRIDIUM
Anomalous Iridium Enrichment at the Triassic-Jurassic Boundary, Blomidon Formation, Fundy Basin, Canada – 75

IRON METEORITES
Sedimentation Patterns of Meteoritic Ejecta in Eltanin Impact Deposits at Site PS58/281 – 168

Summary of Results from Analyses of Deposits of the Deep-Ocean Impact of the Eltanin Asteroid – 167

The Cretaceous/Paleogene Transition on the East Tasman Plateau, Southwestern Pacific – 168

JAMES WEBB SPACE TELESCOPE
Target Selection and Imaging Requirements for JWST Fine Phasing – 143

JET AIRCRAFT
Study of Normal Operational Landing Performance on Subsonic, Civil, Narrow-Body Jet Aircraft During Instrument Landing System Approaches – 3

JOINTS (JUNCTIONS)
Wire Bond Vibration of Forward Pixel Tracking Detector of CMS – 131

K LINES
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 163

KANSAS
Development of a Materials and Engineering Database for Shales of Eastern Kansas – 90

KAONS
Study of B(sub s) Mixing at the CDFII Experiment with a Newly Developed Opposite Side beta-Flavour Tagging Algorithm Using Kaons – 117

KINEMATICS
Contact Interface Verification for DYNA3D. Scenario 1: Basic Contact – 92

Contact Interface Verification for DYNA3D. Scenario 2: Multi-Surface Contact – 18

KINETIC ENERGY
Kinetic Modeling of Slow Energy Release in Non-Ideal Carbon Rich Explosives – 17

The Challenges of Landing on Mars – 169

KINETICS
Gas Dynamics and Kinetics in the Cometary Coma: Theory and Observations – 171

Novel Approach to Experimental Studies of Mineral Dissolution Kinetics. Annual Technical Progress Report. Period September 1, 2005 through August 31, 2006 – 29

Oxidation Kinetics of a NiPtTi High Temperature Shape Memory Alloy – 34

LABORATORIES
Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan. Part 1: ASC Software Quality Engineering Practices, Version 2.0 – 94

LAMINATES
The Effect of Delamination on Damage Path and Failure Load Prediction for Notched Composite Laminates – 27

LAND ICE
The Glacier and Land Ice Surface Topography Interferometer (GLISTIN): A Novel Ka-band Digitally Beamformed Interferometer – 67

LANDING AIDS
Developing the Parachute System for NASA's Orion: An Overview at Inception – 14

The Challenges of Landing on Mars – 169

LANDING SITES
Automated On-board Terrain Analysis for Precision Landings – 15

Mars Odyssey: Off-nadir Imaging – 167

LANGUAGE PROGRAMMING
A Formal Language for Cryptographic Protocol Requirements – 98

LANGUAGES
Language Generation and Verification in the NRL Protocol Analyzer – 98

LARGE SPACE STRUCTURES
Compact, Lightweight Dual-Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 67

Mid-frequency Band Dynamics of Large Space Structures – 13

LASER ALTIMETERS
The Glacier and Land Ice Surface Topography Interferometer (GLISTIN): A Novel Ka-band Digitally Beamformed Interferometer – 67

LASER HEATING
Examination of B. subtilis var. niger Spore Killing by Dry Heat Methods – 155

LASERS
Hard X-ray Imaging for Measuring Laser Absortion Spatial Profiles on the National Ignition Facility – 145

Laser Based Micro Forming and Assembly – 146

Numerical Simulation of a Flashlamp Pumped Nd:YAG Laser (Numerisk Simulering av en Blixlampspumpad Nd:YAG Laser) – 146

LAUNCH VEHICLE CONFIGURATIONS
Ares V an Enabling Capability for Future Space Astrophysics Missions – 9

LAUNCH VEHICLES
From ESAS to Ares: A Chronology – 9

On the Use of 3dB Qualification Margin for Structural Parts on Expendable Launch Vehicles – 9

LAYERS
Stabilization of Self-Assembled Monolayers – 26

LAYOUTS
SOFIA: Stratospheric Observatory For Infrared Astronomy – 161

LENSES
Electron Beam Generation in Tevatron Electron Lenses – 133

Results from the UCLA/FNPL Underdense Plasma Lens Experiment – 107

LEPTONS
Rare B decays in Collider Experiments – 109

Tau identification at D0 – 126

LIFE (DURABILITY)
Efficiency and Lifetime of Carbon Foils – 32

LIFE SUPPORT SYSTEMS
An Overview of Space Power Systems for NASA Missions – 14

Crew Exploration Vehicle Environmental Control and Life Support Emergency Gas Consumable Sizing – 82

International Space Station Environmental Control and Life Support System: Verification for the Pressurized Mating Adapters – 83

International Space Station (ISS) Environmental Control and Life Support (ECLS) System Overview of Events: February 2006 - 2007 – 82

Overview of Umbilical Extravehicular Activity (EVA) Interfaces in Life Support Systems on Spacecraft Vehicles and Applications for the Crew Exploration Vehicle (CEV) – 84

LIGHT EMITTING DIODES
Polymer and Small Molecule Based Hybrid Light Source – 53

LIGHT MODULATORS
Optical System for Generating Three-Dimensional Images – 144

LIGHT SOURCES
Photoinjectors R&D For Future Light Sources & Linear Colliders – 105

Polymer and Small Molecule Based Hybrid Light Source – 53

LIGHTNING
Lightning Charge Retrievals: Dimensional Reduction, LDAR Constraints, and a First Comparison with LIS Satellite Data – 76

Observations of Lightning on Earth from the Lunar Surface – 165

LINEAR ACCELERATORS
Benchmarking, Crosschecking DFS in the ILC Main Linac – 137

Ion Source Choices An H Source for the High Intensity Neutrino Source – 119

Start-to-end Beam Optics Development and Multi-Particle Tracking for the ILC Undulator-based Positron Source – 108

LINEAR SYSTEMS
Mid-frequency Band Dynamics of Large Space Structures – 13

LINEARITY
Linear Lattic Modeling of the Recycler Ring at FERMILAB – 109

LINES
Thermal Design and Flight Experience of the Mars Exploration Rover Spacecraft Computer-Controlled, Propulsion Line Heaters – 62

LININGS
Interrelationship of Nondestructive Evaluation Methodologies Applied to Testing of Composite Overwrapped Pressure Vessels – 27

LIQUID METALS
Orbital Debris Studies at NASA – 156

LIQUIDS
Coupling of Realistic Real Estimates with Genomics for Assessing Contaminant Attenuation and Long-Term Plume Containment – 114

LITHIUM BATTERIES
An Update of the Ground Testing of the Li-ion Batteries in Support of JPL's 2003 Mars Exploration Rover Mission – 167

LITHIUM
Results from the CDX-U Lithium Wall and NSTX Lithium Pallet Injection and Evaporation Experiments – 106

LITHOGRAPHY
Methods Utilizing Scanning Probe Microscope Tips and Products Thereof or Produced Thereby – 40

LOADS (FORCES)
Co-axial Joint Technology Applied to Antenna Backup Structures – 11

The Effect of Delamination on Damage Path and Failure Load Prediction for Notched Composite Laminates – 27

LOCKING

Spray Shadowing for Stress Relief and Mechanical Locking in Thick Protective Coatings – 39

LOGISTICS MANAGEMENT

ISS Asset Tracking Using SAW RFID Technology – 55

LOW ALTITUDE

A Dynamical Systems Approach to the Design of the Science Orbit Around Europa – 88

LOW CURRENTS

Low Current Plasmatron Fuel Converter Having Enlarged Volume Discharges – 62

LOW EARTH ORBITS

NASA Bluetooth Wireless Communications – 12

Oxygen Concentration Flammability Threshold Tests for the Constellation Program – 10

LOW FREQUENCIES

Mid-frequency Band Dynamics of Large Space Structures – 13

Variable Structure Diagnostics Approach Achieving Optimized Low-Frequency Data Sampling for EMA Motoring Systems – 7

LOW TEMPERATURE

Graded-density Reservoirs for Accessing High Pressure Low Temperature Material States – 18

Radiation-Hardened Electronics for the Space Environment – 15

LUMINESCENCE

Cyanine Dyes as Labeling Reagents for Detection of Biological and Other Materials by Luminescence Methods – 23

LUMINOSITY

Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae – 162

Radiation Damage to Scintillator in the D0 Luminosity Monitor – 128

Search for New Phenomena in the CDF Top Quark Sample – 150

Study of 2-in-1 Large-Aperture Nb3Sn IR Quadrupoles for the LHC Luminosity Upgrade – 103

LUNAR DUST

Adhesion of Lunar Dust – 172

LUNAR ENVIRONMENT

Adhesion of Lunar Dust – 172

LUNAR EVOLUTION

Dynamics of the Lunar Spin Axis – 170

Evidence for a Past High-Eccentricity Lunar Orbit – 170

LUNAR EXPLORATION

Space Human Factors Engineering Gap Analysis Project Final Report – 87

LUNAR ORBITS

Dynamics of the Lunar Spin Axis – 170

LUNAR SOIL

Adhesion of Lunar Dust – 172

LUNAR SPACECRAFT

Oxygen Concentration Flammability Threshold Tests for the Constellation Program – 10

LUNAR SURFACE

Observations of Lightning on Earth from the Lunar Surface – 165

MACHINING

Method and Device and for Ultra Sonic Vibration Detection During High-Performance Machining – 47

MAGNESIUM

Growth of In-Situ Thin Films by Reactive Evaporation – 149

MAGNETARS

A Possible Magnetar Nature for IGR J16358-4726 – 157

MAGNETIC FIELDS

Superconducting Solenoid Magnet Test Results – 114

MAGNETIC FILMS

High Frequency Magnetic Thin Film Filter – 31

MAGNETIC MATERIALS

Shape Memory System With Integrated Actuation Using Embedded Particles – 35

MAGNETIC STORAGE

Magnetic Switching with Expanded Hard-Axis Magnetization Volume at Magnetoresistive Bit Ends – 53

MAGNETIC STORMS

Dayside Global Ionospheric Response to the Major Interplanetary Events of October 29-30, 2003 ''Halloween Storms'' – 73

MAGNETIC SWITCHING

Magnetic Switching with Expanded Hard-Axis Magnetization Volume at Magnetoresistive Bit Ends – 53

MAGNETIZATION

Magnetic Switching with Expanded Hard-Axis Magnetization Volume at Magnetoresistive Bit Ends – 53

Magnetization Anomaly of Nb3Al Strands and Instability of Nb3Al Rutherford Cables – 148

MAGNETOPAUSE

Dayside Global Ionospheric Response to the Major Interplanetary Events of October 29-30, 2003 ''Halloween Storms'' – 73

MAGNETORESISTIVITY

Magnetic Switching with Expanded Hard-Axis Magnetization Volume at Magnetoresistive Bit Ends – 53

MAGNETOSTRICTION

Magnetostrictive Wavelet Method for Measuring Pulse Propagation Time – 132

MAGNETRONS

Pulsed Power 3 GHz Feasibility Study in FOI 36.7 m3 Mode Stirred Reverberation Chamber – 46

MAGNETS

Cost Effective Open Geometry HTS MRI System amended to BSCCO 2212 Wire for High Field Magnets – 64

Feasibility Study of Nb3Al Rutherford Cable for High Field Accelerator Magnet Application – 127

Handling Collision Debris In Quad-and Dipole-First LHC IR Options – 127

MAINTENANCE

Maintenance Procedure Display: Head Mounted Display (HMD) Evaluations – 82

MALFUNCTIONS

Intelligent Email Services – 153

MANAGEMENT INFORMATION SYSTEMS

Decision Support for Bridge Programming and Budgeting – 90

MANAGEMENT SYSTEMS

Decision Support for Bridge Programming and Budgeting – 90

MANIFOLDS (MATHEMATICS)

A Dynamical Systems Approach to the Design of the Science Orbit Around Europa – 88

MANNED SPACECRAFT

Overview of Umbilical Extravehicular Activity (EVA) Interfaces in Life Support Systems on Spacecraft Vehicles and Applications for the Crew Exploration Vehicle (CEV) – 85

MANUALS

Seismic Retrofitting Manual for Highway Structures. Part 1: Bridges (December 2006) – 74

Seismic Retrofitting Manual for Highway Structures. Part 2: Retaining Structures, Slopes, Tunnels,Culverts and Roadways (December 2006) – 66

MANUFACTURING

Coatings, Coated Articles and Methods of Manufacture Thereof, PAT-APPL-11-418-626 – 21

Coatings, Coated Articles and Methods of Manufacture Thereof, PAT-APPL-11-418-871 – 21

Method of Preparing Nanocrystals – 24

MANY BODY PROBLEM

Simplectic Correctors for Canonical Heliocentric N-Body Maps – 160

MAPPING

Roadway Data Representation and Application Development: Developing a New Straight Line Diagram Application for the Florida Department of Transportation – 89

MAPS

Simplectic Correctors for Canonical Heliocentric N-Body Maps – 160

MARKING
B-Tagging at CDF and DO Lesson for LHC – 102

Study of B(sub s) Mixing at the CDFII Experiment with a Newly Developed Opposite Side beta-Flavour Tagging Algorithm Using Kaons – 117

MARS ATMOSPHERE
Autonomous Detection of Dust Devils and Clouds on Mars – 155

MARS CRATERS
Linking Home Plate and Algonquin Class Rocks through Microtextural Analysis: Evidence for Hydrovolcanism in the Inner Basin of Columbia Hills, Gusev Crater – 66

MARS EXPLORATION
An Update of the Ground Testing of the Li-ion Batteries in Support of JPL's 2003 Mars Exploration Rover Mission – 167

Autonomous Detection of Dust Devils and Clouds on Mars – 154

Crystal Water on Mars: Insights from the Mars Exploration Rovers – 156

From Prime to Extended Mission: Evolution of the MER Tactical Uplink Process – 99

Space Human Factors Engineering Gap Analysis Project Final Report – 86

Thermal Design and Flight Experience of the Mars Exploration Rover Spacecraft Computer-Controlled, Propulsion Line Heaters – 61

MARS LANDING SITES
Linking Home Plate and Algonquin Class Rocks through Microtextural Analysis: Evidence for Hydrovolcanism in the Inner Basin of Columbia Hills, Gusev Crater – 66

MARS LANDING
The Challenges of Landing on Mars – 169

MARS (PLANET)
Mars Odyssey: Off-nadir Imaging – 167

MARS ROVING VEHICLES
Thermal Design and Flight Experience of the Mars Exploration Rover Spacecraft Computer-Controlled, Propulsion Line Heaters – 62

MARS SURFACE
An Update of the Ground Testing of the Li-ion Batteries in Support of JPL's 2003 Mars Exploration Rover Mission – 167

Aqueous Alteration of Basalts: Earth, Moon, and Mars – 166

Crystal Water on Mars: Insights from the Mars Exploration Rovers – 156

The Challenges of Landing on Mars – 169

MASKS
Method for Photolithography Using Multiple Illuminations and a Single Fine Feature Mask – 48

MASS SPECTRA
Search for Excited and Exotic Muons at CDF – 116

MASS SPECTROSCOPY
Mass Spectrometric Immunoassay – 30

MASS
Search for Low Mass Higgs at the Tevatron – 135

MATERIALS HANDLING
Ergonomic Guidelines for Manual Material Handling – 86

MATERIALS SELECTION
Interrelationship of Nondestructive Evaluation Methodologies Applied to Testing of Composite Overwrapped Pressure Vessels – 27

NASA Hydrogen Peroxide Propellant Hazards Technical Manual – 40

MATHEMATICAL MODELS
A Framework for Performing Multiscale Stochastic Progressive Failure Analysis of Composite Structures – 26

Closing Talk: QCD Moriond 2006 – 111

Final Report for the ASC Gas-Powder Two-Phase Flow Modeling Project AD2006-09 – 57

Lightning Charge Retrievals: Dimensional Reduction, LDAR Constraints, and a First Comparison with LIS Satellite Data – 76

Linear Lattic Modeling of the Recycler Ring at FERMILAB – 109

Studying the Underlying Event at CDF – 150

The Effects of Fault Counting Methods on Fault Model Quality – 97

MATRICES (MATHEMATICS)
Parallel H-1-Based Auxiliary Space AMG Solver for H(curl) Problems – 89

MATRIX METHODS
Measurement of the Top Quark Mass with a Matrix Element Method – 128

MATTER (PHYSICS)
Looking for Exotica at the B Factories – 108

MAXWELL EQUATION
Parallel H-1-Based Auxiliary Space AMG Solver for H(curl) Problems – 89

MEASURING INSTRUMENTS
Search for Excited and Exotic Muons at CDF – 116

MECHANICAL ENGINEERING
Design of 325MHz Single and Triple Spoke Resonators at FNAL – 104

MECHANICAL PROPERTIES
A Framework for Performing Multiscale Stochastic Progressive Failure Analysis of Composite Structures – 26

Composite Nanomechanics: A Mechanistic Properties Prediction – 27

Design of 325MHz Single and Triple Spoke Resonators at FNAL – 104

MELTING POINTS
Anti-Icing Pavement Coating Study at Chicago O'Hare International Airport – 2

MEMBRANES
Characterization of a Micromachined Membrane Deformable Mirror – 145

Recycling of Used Perfluorosulfonic Acid Membranes – 83

Technique for Measuring Cell-Membrane Properties in Cultured Cells Grown on Biomaterials in an Ussing Chamber – 24

MEMORY (COMPUTERS)
Circuit for Accessing a Chalcogenide Memory Array – 47

Shape Memory System With Integrated Actuation Using Embedded Particles – 35

MERCURY (PLANET)
Motion of the Mantle in the Translational Modes of the Earth and Mercury – 170

MESONS
Bs Mixing at the Tevatron – 132

Latest Results on Orbitally Excited Strange Bottom Mesons with the CDF II Detector – 134

Modern Description of Semileptonic Meson Form Factors – 113

New Results on the B(sup -)(sub c) Meson at the Tevatron – 118

Rare Decays of Heavy Flavor at the Tevatron – 115

MESOSPHERE
Neutral Atmospheric Influences of the Solar Proton Events in October-November 2003 – 173

MESSAGES
Evaluating the Performance Impact of Xen on MPI and Process Execution for HPC Systems – 88

METABOLITES
Simple Approach for Obtaining High Resolution, High Sensitivity 1H NMR Metabolite Spectra of Biofluids with Limited Mass Supply – 20

METAL MATRIX COMPOSITES
A Framework for Performing Multiscale Stochastic Progressive Failure Analysis of Composite Structures – 26

METAL NITRIDES
Hafnium Nitride Buffer Layers for Growth of GaN on Silicon – 48

METAMORPHISM (GEOLOGY)
Primary Mineralogical and Chemical Characteristics of the Major K/T and Late Eocene Impact Deposits – 75

METEORITE COLLISIONS
Meteoritic Microfossils in Eltanin Impact Deposits – 169

Sedimentation Patterns of Meteoritic Ejecta in Eltanin Impact Deposits at Site PS58/281 – 168

METEORITE CRATERS
Summary of Results from Analyses of Deposits of the Deep-Ocean Impact of the Eltanin Asteroid – 168

METEORITES
Processes in Early Planetesimals: Evidence from Ureilite Meteorites – 72

METEORITIC COMPOSITION
Meteoritic Microfossils in Eltanin Impact Deposits – 169

Summary of Results from Analyses of Deposits of the Deep-Ocean Impact of the Eltanin Asteroid – 167

METEORITIC MICROSTRUCTURES
Meteoritic Microfossils in Eltanin Impact Deposits – 169

METEOROLOGICAL INSTRUMENTS
Relative Humidity Sensor Enclosed with Formed Heating Element – 52

METHODOLOGY
Apparatus and Method for Routing a Transmission Line through a Downhole Tool – 48

METROLOGY
ESA PlanetQuest: Status and Recent Progress – 156

Focal Plane Metrology for the LSST Camera – 165

MICROELECTRONICS
Microelectronic Arrays for Cell-Based Functional Genomics/ High Throughput Phenotyping by Electrokinetic Assembly – 30

Test Results of Total Ionizing Dose Conducted at the Jet Propulsion Laboratory – 56

MICROMACHINING
Characterization of a Micromachined Membrane Deformable Mirror – 145

Microfabricated Elastomeric Valve and Pump Systems – 40

MICROMECHANICS
A Framework for Performing Multiscale Stochastic Progressive Failure Analysis of Composite Structures – 26

Composite Nanomechanics: A Mechanistic Properties Prediction – 27

MICROORGANISMS
Examination of B. subtilis var. niger Spore Killing by Dry Heat Methods – 155

Study of Interactions Between Microbes and Minerals by Scanning Transmission X-Ray Microscopy (STXM) – 34

MICROSCOPY
Methods Utilizing Scanning Probe Microscope Tips and Products Thereof or Produced Thereby – 40

Study of Interactions Between Microbes and Minerals by Scanning Transmission X-Ray Microscopy (STXM) – 34

MICROSTRIP ANTENNAS
Compact, Lightweight Dual- Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 41

Compact, Lightweight Dual-Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 67

MICROSTRIP DEVICES
High Frequency Magnetic Thin Film Filter – 31

MICROWAVE RADIOMETERS
Improved Hurricane Boundary Layer Observations with the Imaging Wind and Rain Airborne Profiler – 77

Microwave Remote Sensing Modeling of Ocean Surface Salinity and Winds Using an Empirical Sea Surface Spectrum – 74

MICROWAVE SCATTERING
Microwave Remote Sensing Modeling of Ocean Surface Salinity and Winds Using an Empirical Sea Surface Spectrum – 74

MICROWAVES
Dual Microwave Cavity Accelerometer – 54

Method and Apparatus for Reworking a Microwave Module – 53

MINERALOGY
Aqueous Alteration of Basalts: Earth, Moon, and Mars – 166

Crystal Water on Mars: Insights from the Mars Exploration Rovers – 156

Primary Mineralogical and Chemical Characteristics of the Major K/T and Late Eocene Impact Deposits – 75

Processes in Early Planetesimals: Evidence from Ureilite Meteorites – 72

MINERALS
Linking Home Plate and Algonquin Class Rocks through Microtextural Analysis: Evidence for Hydrovolcanism in the Inner Basin of Columbia Hills, Gusev Crater – 66

Novel Approach to Experimental Studies of Mineral Dissolution Kinetics. Annual Technical Progress Report. Period September 1, 2005 through August 31, 2006 – 29

Study of Interactions Between Microbes and Minerals by Scanning Transmission X-Ray Microscopy (STXM) – 34

MISALIGNMENT
The Sensitivity of Shaped Pupil Coronagraphs to Optical Aberrations – 143

MISSILE CONTROL
Dual Microwave Cavity Accelerometer – 54

MISSILES
Dragless Flight Control System for Flying Objects – 1

MISSION PLANNING
Considerations for Isochronous Data Services over the Proximity-1 Space Link – 167

MITOCHONDRIA
Methods and Compositions for Modulating Mitochondrial Aldehyde Dehydrogenase-2 – 19

MOBILE COMMUNICATION SYSTEMS
Combined Frequency-Time Domain Power Adaptation for CDMA Communication System – 42

Security Problems in Mobile ad hoc Networks – 44

MODELS
System and Method for Multi-Perspective Collaborative Modeling – 44

MODULATION
Methods and Compositions for Modulating Mitochondrial Aldehyde Dehydrogenase-2 – 19

MODULES
Electrical Production Testing of the DO Silicon Microstrip Tracker Detector Modules – 118

Enhancement of Resilient Modulus Data for the Design of Pavement Structures in Florida – 151

Evaluation of the Dynamic Complex Modulus Test and Indirect Diametral Test for Implementing the AASHTO 2002 Design Guide for Pavement Structures in Florida – 3

MOISTURE CONTENT
Crystal Water on Mars: Insights from the Mars Exploration Rovers – 156

MOISTURE
Testing of an Amine-Based Pressure-Swing System for Carbon Dioxide and Humidity Control – 84

MOLECULAR BEAM EPITAXY
Growth and Properties of Lattice Matched GaAsSbN Epilayer on GaAs for Solar Cell Applications – 132

Influence of Growth Parameters and Annealing on Properties of MBE Grown GaAsSbN SQWs – 149

MOLECULAR BIOLOGY
Understanding the Mechanism of Human P450 CYP1A2 Using Coupled Qunatum-Classical Simulations in a Dynamical Environment – 34

MOLECULES
Feasibility of Single Molecule DNA Sequencing Using Surface-Enhanced Raman Scattering – 140

Immunostimulatory Nucleic Acid Molecules – 30

Polymer and Small Molecule Based Hybrid Light Source – 53

Single Molecule Screening of Disease DNA without Amplification – 33

MONTE CARLO METHOD
Public Release of a One Dimensional Version of the Photon Clean Method (PCM1D) – 114
Sampling-Based Computational Strategy for the Representation of Epistemic Uncertainty in Model Predictions with evidence Theory – 94
Target Selection and Imaging Requirements for JWST Fine Phasing – 143
Update on the Next-to-Leading order Monte Carol MCFM – 135

MOON
Aqueous Alteration of Basalts: Earth, Moon, and Mars – 166
Evidence for a Past High-Eccentricity Lunar Orbit – 170

MORTALITY
Detailed Linked Birth/Infant Death Period Public Use File for 2003 (Raw data on CD-ROM) – 100

MOTOR VEHICLES
Electric Machine for Hybrid Motor Vehicle – 62

MULTIGRID METHODS
Multigrid Methods for Mesh Relaxation – 92

MULTILAYER INSULATION
Coatings, Coated Articles and Methods of Manufacture Thereof, PAT-APPL-11-418-626 – 21
Coatings, Coated Articles and Methods of Manufacture Thereof, PAT-APPL-11-418-871 – 21

MULTIPATH TRANSMISSION
Applications of Time-Reversal Processing for Planetary Surface Communications – 44

MULTISENSOR FUSION
Clustering with Missing Values: No Imputation Required – 100

MUONS
MUCOOL RF Program – 126
Search for Excited and Exotic Muons at CDF – 116
Time-Integrated Charge Asymmetries at D0 – 125
Update for the MuCool Test Area – 139
Using the Fermilab Proton Source for a Muon to Electron Conversion Experiment – 128

MUSIC
Acoustic Longitudinal Field NIF Optic Feature Detection Map Using Time-Reversal and MUSIC – 146

N ELECTRONS
Low-Energy Elastic Electron Scattering by Atomic Oxygen – 141

NANOCOMPOSITES
Composite Nanomechanics: A Mechanistic Properties Prediction – 27

NANOCRYSTALS
Method of Preparing Nanocrystals – 24
Nanocrystals with Linear and Branched Topology – 106

NANOFABRICATION
Methods Utilizing Scanning Probe Microscope Tips and Products Thereof or Produced Thereby – 40

NANOSTRUCTURES (DEVICES)
Apparatus for Controlled Alignment of Catalytically Grown Nanostructures – 49

NANOTECHNOLOGY
Methods Utilizing Scanning Probe Microscope Tips and Products Thereof or Produced Thereby – 40

NASA PROGRAMS
An Overview of Space Power Systems for NASA Missions – 14
Cutting Edge RFID Technologies for NASA Applications – 154
Space Human Factors Engineering Gap Analysis Project Final Report – 86

NASA SPACE PROGRAMS
A Brief Historical Review of Vestibular and Sensorimotor Research Associated with Space Flight – 81

NEAR EARTH OBJECTS
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9
Optical Studies of Space Debris at GEO: Survey and Follow-up with Two Telescopes – 10

NEGATIVE IONS
Negative Hydrogen Ion Source Research and Beam Parameters for Accelerators – 115

NEODYMIUM LASERS
Numerical Simulation of a Flashlamp Pumped Nd:YAG Laser (Numerisk Simulering av en Blixlampspumpad Nd:YAG Laser) – 146

NEURAL NETS
Intelligent Vision Systems Independent Research and Development (IR&D) 2006 – 99

NEUROLOGY
A Brief Historical Review of Vestibular and Sensorimotor Research Associated with Space Flight – 81

NEUROTRANSMITTERS
Acoustic Immunosensor for Detecting Neurotransmitter GABA – 141

NEUTRAL ATMOSPHERES
Neutral Atmospheric Influences of the Solar Proton Events in October-November 2003 – 173

NEUTRAL CURRENTS
DO Hot Topics – 113
Searches for D0 - Anti-D0 Mixing, Rare Charm and Tau Decays – 109

NEUTRINO BEAMS
MINERVA: A Dedicated Neutrino Scattering Experiment at NuMI – 119

NEUTRINOS
Ion Source Choices An H Source for the High Intensity Neutrino Source – 119
MINERVA: A Dedicated Neutrino Scattering Experiment at NuMI – 119
Update for the MuCool Test Area – 139

NEUTRON STARS
A Possible Magnetar Nature for IGR J16358-4726 – 157

NICKEL ALLOYS
Oxidation Kinetics of a NiPtTi High Temperature Shape Memory Alloy – 35

NITRIDES
Nitride-Based Transistors with a Protective Layer and a Low-Damage Recess and Methods of Fabrication Thereof – 148
Powder Metallurgy Crucible for Alluminum Nitride Crystal Growth – 35

NITROGEN ATOMS
New Accurate Oscillator Strengths and Electron Excitation Collision Strengths for N1 – 163

NITROGEN COMPOUNDS
Bias Selectable Dual Band AlGaN Ultraviolet Detectors – 53

NITROGEN OXIDES
Neutral Atmospheric Influences of the Solar Proton Events in October-November 2003 – 173

NITROGEN PLASMA
Growth and Properties of Lattice Matched GaAsSbN Epilayer on GaAs for Solar Cell Applications – 132

NOISE REDUCTION
Noise, Edge Extraction and Visibility of Features – 61
The Automatic Assessment and Reduction of Noise Using Edge Pattern Analysis in Nonlinear Image Enhancement – 59

NONDESTRUCTIVE TESTS
Eddy Current System for Material Inspection and Flaw Visualization – 55
Interrelationship of Nondestructive Evaluation Methodologies Applied to Testing of Composite Overwrapped Pressure Vessels – 26

NONLINEARITY
Finite Element Calculations Illustrating a Method of Model Reduction for the Dynamics of Structures with Localized Nonlinearities – 94

NORWAY
Reisevaner pa Fly 2005. (Norwegian Air Travel Survey, 2005.) – 4

NOTCHES
The Effect of Delamination on Damage Path and Failure Load Prediction for Notched Composite Laminates – 27

NUCLEAR MAGNETIC RESONANCE
Simple Approach for Obtaining High Resolution, High Sensitivity 1H NMR Metabolite Spectra of Biofluids with Limited Mass Supply – 20

NUCLEAR PHYSICS
Curved Track Segment Finding Using Tiny Triplet Finder (TTF) – 121

NUCLEAR REACTORS
Investigating Surety Methodologies for Cognitive Systems – 82

NUCLEAR WEAPONS
Investigating Surety Methodologies for Cognitive Systems – 82

NUCLEIC ACIDS
Immunostimulatory Nucleic Acid Molecules – 30

NUCLEONS
Nucleon Structure and Generalized Parton Distributions – 109

NUMERICAL ANALYSIS
ISS Debris Avoidance Maneuver Threshold Analysis – 14

OBJECT-ORIENTED PROGRAMMING
Using EIGER for Antenna Design and Analysis – 97

OBSERVATION
Policy Document on Earth Observation for Urban Planning and Management: State of the Art and Recommendations for Application of Earth Observation in Urban Planning – 67

OCEAN BOTTOM
Summary of Results from Analyses of Deposits of the Deep-Ocean Impact of the Eltanin Asteroid – 168

OCEAN MODELS
Effects of High-frequency Wind Sampling on Simulated Mixed Layer Depth and Upper Ocean Temperature – 73

OCEAN SURFACE
Compact, Lightweight Dual- Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 41

Compact, Lightweight Dual-Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 67

Microwave Remote Sensing Modeling of Ocean Surface Salinity and Winds Using an Empirical Sea Surface Spectrum – 74

Polarimetric Analysis of Scatterometer Data for Ocean Surface Wind Measurement – 73

Societal Benefits of Ocean Altimetry Data – 80

OCEAN TEMPERATURE
Effects of High-frequency Wind Sampling on Simulated Mixed Layer Depth and Upper Ocean Temperature – 73

OCEANOGRAPHY
Windsat Validation Using Seawinds, Windrad and POLSCAT Measurements – 76

OCTANE NUMBER
High-Octane and Mid-Octane Detonation Performance of Leaded and Unleaded Fuels in Naturally Aspirated, Piston, Spark Ignition Aircraft Engines – 2

OILS
Evaluation of the Reproducibility of the FAA Oil Burner Fire Test for Aircraft Seat Cushions – 6

OMNIDIRECTIONAL ANTENNAS
Reduced-Volume Antennas with Integrated High-Impedance Electromagnetic Surfaces – 43

ONBOARD EQUIPMENT
Overview of Umbilical Extravehicular Activity (EVA) Interfaces in Life Support Systems on Spacecraft Vehicles and Applications for the Crew Exploration Vehicle (CEV) – 85

ON-LINE SYSTEMS
On-Line Coating of Glass with Tin Oxide by Atmospheric Pressure Chemical Vapor Deposition – 38

OPERATIONS RESEARCH
Societal Benefits of Ocean Altimetry Data – 80

OPTICAL COMMUNICATION
Execution of the Spitzer In-orbit Checkout and Science Verification Plan – 158

OPTICAL CONTROL
Mid-frequency Band Dynamics of Large Space Structures – 13

OPTICAL DENSITY
Broadband Performance of TPF's High-contrast Imaging Testbed: Modeling and Simulations – 142

OPTICAL EQUIPMENT
Aerosol Attenuation Model for Scandinavian Environment; User Manual – 70

Phase Matched Parametric Light Generation in Monolithically Integrated Intersubband Optical Devices – 144

Start-to-end Beam Optics Development and Multi-Particle Tracking for the ILC Undulator-based Positron Source – 108

OPTICAL PROPERTIES
Growth and Properties of Lattice Matched GaAsSbN Epilayer on GaAs for Solar Cell Applications – 132

OPTICAL WAVEGUIDES
Ion Exchange Waveguides and Methods Fabrication – 146

OPTICS
ILC Beam Delivery WG Summary: Optics, Collimation and Background – 110

OPTIMIZATION
Fusing Quantitative Requirements Analysis with Model-based Systems Engineering – 101

ORBIT DETERMINATION
Real-time Sub-cm Differential Orbit Determination of two Low-Earth Orbiters with GPS Bias Fixing – 12

ORBITALS
Accurate Calculation of Oscillator Strengths for CI II Lines Using Non-orthogonal Wavefunctions – 164

Electron Collisional Excitation Rates for OI USING the B-Spline R-Matrix Approach – 163

ORGANIC CHEMISTRY
Novel Aryne Chemistry in Organic Synthesis – 34

ORGANIC COMPOUNDS
Novel Aryne Chemistry in Organic Synthesis – 34

Oxidations of Organic and Inorganic Substrates by Superoxo-, Hydroperoxo-, and Oxo-Compounds of the Transition Metals – 32

ORGANIC MATERIALS
High Efficiency Organic Photovoltaic Cells Employing Hybridized Mixed Planar Heterojunctions – 51

Methods of Fabricating Devices by Transfer of Organic Material – 49

ORGANIZATIONS
Institute for Telecommunication Sciences Technical Progress Report, 2001 – 43

OSCILLATIONS
Measurement of B(sub s) Oscillations at CDF – 118

OSCILLATOR STRENGTHS
Accurate Calculation of Oscillator Strengths for CI II Lines Using Non-orthogonal Wavefunctions – 164

New Accurate Oscillator Strengths and Electron Excitation Collision Strengths for N1 – 163

OUTGASSING
Measurement and Prediction of Water Outgassing from TR55 Silicone by the Isoconversional Technique – 18

OXIDATION-REDUCTION REACTIONS
Anomalous Iridium Enrichment at the Triassic-Jurassic Boundary, Blomidon Formation, Fundy Basin, Canada – 75

OXIDATION
Oxidation Kinetics of a NiPtTi High Temperature Shape Memory Alloy – 35

OXIDIZERS
Characteristics of Post-Sorbent and High Temperature Catalytic Oxidizer Beds After Long-Term On-Orbit Use – 83

Oxidations of Organic and Inorganic Substrates by Superoxo-, Hydroperoxo-, and Oxo-Compounds of the Transition Metals – 32

OXYGEN 17
Processes in Early Planetesimals: Evidence from Ureilite Meteorites – 72

OXYGEN ATOMS
Accurate Cross Sections for Excitation of Resonance Transitions in Atomic Oxygen – 172
Collisions of Electrons with Atomic Oxygen: Current Status – 141
Low-Energy Elastic Electron Scattering by Atomic Oxygen – 141

OXYGEN ISOTOPES
Processes in Early Planetesimals: Evidence from Ureilite Meteorites – 72

OXYGEN SUPPLY EQUIPMENT
Technical Note: Some Issues Related to the Selection of Polymers for Aerospace Oxygen Systems – 38

OXYGEN
Electron Impact Excitation of Forbidden and Allowed Transitions in O(II) – 131
Integrated Photoelectrochemical Cell and System Having a Liquid Electrolyte – 67
Oxygen Concentration Flammability Threshold Tests for the Constellation Program – 10

OZONE
Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM(sub 2.5), and Regional Haze – 69

PACIFIC OCEAN
The Cretaceous/Paleogene Transition on the East Tasman Plateau, Southwestern Pacific – 169

PACKETS (COMMUNICATION)
Packet-Based and Pseudo-Packet Based Cryptographic Communications System and Method – 91

PAINTS
Camouflage Creams with New Properties – 23

PAIR PRODUCTION
Top Pair Production Cross Section at Square Root of s Equals 1.96 TEV and a Search V Plus A Current in Top Quark Decay – 116
Top Pair Production III: Testing the Standard Model in Top Quark Decays – 130

PALEOBIOLOGY
The Cretaceous/Paleogene Transition on the East Tasman Plateau, Southwestern Pacific – 169

PALEOMAGNETISM
The Cretaceous/Paleogene Transition on the East Tasman Plateau, Southwestern Pacific – 169

PALEONTOLOGY
The Cretaceous/Paleogene Transition on the East Tasman Plateau, Southwestern Pacific – 169

PALLADIUM
Comparative Corrosion Behavior of Two Palladium Containing Titanium Alloys – 20

PARALLEL PROCESSING (COMPUTERS)
Parallel H-1-Based Auxiliary Space AMG Solver for H(curl) Problems – 89

PARAMETERIZATION
SIMsim: An End-to-end Simulator for the ESA Mission – 158

PARITY
Search for R-Parity Violating Supersymmetry with the D0 Detector – 133

PARTICLE ACCELERATORS
Analog Signal Pre-Processing for the Fermilab Main Injectore BPM Upgrade – 138
B Masses and Lifetimes at the Tevatron – 117
B Mixing and Lifetimes at the Tevatron – 111
Beam Diagnostics, Collimation, Injection/Extraction, Targetry. Accidents and Commissioning: Working Group C&G Summary Report – 124
Beam-Induced Damage to the Tevatron Components and What has been Done About it – 136
Bs Mixing at the Tevatron – 132
B(sup 0)(Sub s) Mixing at CDF – 134
Channeling Collimation Studies at the Fermilab Tevatron – 111
CKM physics at CDF – 120
Critical Speed Measurements in the Tevatron Cold Compressors – 122
Cryogenics for the Supercondcuting Module Test Facility – 136
Design, Fabrication, and Test of an SRF Cryomodule Prototype at Fermilab – 125
Diffraction at the Tevetron: CDF Results – 122
Efficiency and Lifetime of Carbon Foils – 32
Electrical Production Testing of the DO Silicon Microstrip Tracker Detector Modules – 117
Electron Beam Generation in Tevatron Electron Lenses – 132
Heavy Flavor Production at the Tevatron – 127
High Q(sup 2) QCD Physics at the Tevatron – 117
High-Intensity Beam Collimation and Targetry – 124
Hydro Static Water Level Systems at Fermilab – 57
Inclusive Jet Production using the k(sub T) Algorithm at CDF – 121
Latest Results on Orbitally Excited Strange Bottom Mesons with the CDF II Detector – 134
Measurement and Correction of linear Optics an Coupling at Tevatron Complex – 113
Measurement of the Branching Fraction Ratio B--\g D K/B--\gD pi with the CDF II Detector – 123
Measurement of the Inclusive Jet Cross Section Using the Midpoint Algorithm in Run II at the Collider Detector at FERMILAB (CDF) – 124
MUCOOL RF Program – 126
New Results on the B(sup -)(sub c) Meson at the Tevatron – 118
QCD and Top-Quark Results from the Tevatron – 129
Rare B Decays at CDF – 135
Rare Decays of Heavy Flavor at the Tevatron – 115
Roll Measurement of Tevatron Dipoles and Quadrupoles – 133
Search for 3rd Generation Vector Leptoquarks in the Di-tau Di-jet Channel in Proton Antiproton Collisions at square root(s)=1.96 – 123
Search for Chargino-Neutralino Production at the Collider Detector at Fermilab – 122
Search for Low Mass Higgs at the Tevatron – 135
Search for Physics beyond the Standard Model at the Tevatron – 135
Search for R-Parity Violating Supersymmetry with the D0 Detector – 133
Search for Supersymmetry in Trilepton Final States with the D0 Detector – 130
Search for the Single Top Quarks Produced in s-Channel via Electroweak Interactions at s=1.96 at the Tevatron – 123
Searches for GMSB, AMSB and Split SUSY with the D0 Detector – 125
Searches for New Phenomena at the Tevatron and at HERA – 123
Sonic Helium Detectors in the Fermilab Tevatron – 138
Standard Model Higgs Searches and Perspectives at the Tevatron – 129
Status and Performance of the CDF Run II Silicon Detector (FERMILAB-CONF-06-390-E) – 135
Status of the CDF Silicon Detector – 134
Supersymmetry Searches at the Tevatron – 119
Surge Recovery Techniques for the Tevatron Cold Compressors – 139
SUSY Higgs Searches at D0, Tevatron – 134
Tau identification at D0 – 126
Tevatron-for-LHC Report: Preparations for Discoveries – 123
Thermal Analysis of SC Quadrupoles in Accelerator Interaction Regions – 125
Update for the MuCool Test Area – 139

W and Z Production at the Tevatron – 112

W Boson Measurements at the Tevatron – 117

Wire Bond Vibration of Forward Pixel Tracking Detector of CMS – 130

PARTICLE BEAMS

Electron Production and Collective Field Generation in Intense Particle Beams – 140

PARTICLE COLLISIONS

Inclusive Jet Production using the k(sub T) Algorithm at CDF – 122

Search for 3rd Generation Vector Leptoquarks in the Di-tau Di-jet Channel in Proton Antiproton Collisions at square root(s)=1.96 – 123

PARTICLE DECAY

B Mixing and Lifetimes at the Tevatron – 111

Rare B decays in Collider Experiments – 109

Time-Integrated Charge Asymmetries at D0 – 125

Top Pair Production Cross Section at Square Root of s Equals 1.96 TEV and a Search V Plus A Current in Top Quark Decay – 116

Top Pair Production III: Testing the Standard Model in Top Quark Decays – 130

PARTICLE ENERGY

Particle and Energy Transport in the SOL and DIII-D and NSTX – 106

PARTICLE INTERACTIONS

CKM physics at CDF – 120

PARTICLE MASS

Measurement of the W Boson and Top-Quark Masses at CDF – 150

PARTICLE PRODUCTION

Search for Chargino-Neutralino Production at the Collider Detector at Fermilab – 122

PARTICLE SPIN

New Developments in Charge Transfer Multiplet Calculations: Projection Operations, Mixed-Spin States and pi-Bonding – 120

PARTONS

Heavy Quarks at RHIC from Parton Transport Theory – 102

Nucleon Structure and Generalized Parton Distributions – 109

Studying the Underlying Event at CDF – 150

PATENT APPLICATIONS

Apparatus and Method for Automated Parcel Screening – 151

Apparatus for Transport and Analysis of Particles Using Dielectrophoresis – 21

Biomimetic Organic/Inorganic Composite Processes for Their Production and Methods of Use, PAT-APPL-11-433-725 – 23

Biomimetic Organic/Inorganic Composites, Processes for Their Production, and Methods of Use, PAT-APPL-11- – 21

Circuit for Accessing a Chalcogenide Memory Array – 47

Coatings, Coated Articles and Methods of Manufacture Thereof, PAT-APPL-11-418-626 – 21

Coatings, Coated Articles and Methods of Manufacture Thereof, PAT-APPL-11-418-871 – 21

Combined Frequency-Time Domain Power Adaptation for CDMA Communication System – 42

Cyanine Dyes as Labeling Reagents for Detection of Biological and Other Materials by Luminescence Methods – 23

Data Monitoring and Recovery – 8

Dragless Flight Control System for Flying Objects – 1

Dual Microwave Cavity Accelerometer – 54

Dynamic Acoustic Thermometer – 51

Engine Valve Actuation for Combustion Enhancement – 63

Fast Faraday Cup with High Band Width – 107

Fiber Waveguides and Methods of Making the Same – 52

Foil Structure for Regenerators – 63

Glycodendrimers having Biological Activity – 38

Growth of In-Situ Thin Films by Reactive Evaporation – 148

Hafnium Nitride Buffer Layers for Growth of GaN on Silicon – 48

High Efficiency Organic Photovoltaic Cells Employing Hybridized Mixed Planar Heterojunctions – 50

High Frequency Magnetic Thin Film Filter – 31

Hybrid-Secondary Uncluttered Permanent Magnet Machine and Method – 47

Integrated Photoelectrochemical Cell and System Having a Liquid Electrolyte – 67

Intersubband Mid-Infrared Electroluminescent Semiconductor Devices – 126

Ion Exchange Waveguides and Methods Fabrication – 146

Low Current Plasmatron Fuel Converter Having Enlarged Volume Discharges – 62

Low Profile Tension Style Flexible Joint – 7

Magnetic Switching with Expanded Hard-Axis Magnetization Volume at Magnetoresistive Bit Ends – 52

Magnetostrictive Wavelet Method for Measuring Pulse Propagation Time – 132

Method and Device and for Ultra Sonic Vibration Detection During High-Performance Machining – 46

Method and Device for Generating Approximate Message Authentication Codes – 90

Method and Device for Online Dynamic Semantic Video Compression and Video Indexing – 151

Method and Means for Generating High Order Hermite Functions for Simulation of Electromagnetic Wave Devices – 95

Method and System for Operating an Atomic Clock with Alternating Polarization Light – 145

Method and Systems for Cooperative Transmission in Multi-Hop Ad-Hoc Networks – 45

Method for Computing Subjective Dissimilarities Among Discrete Entities – 93

Method for Forming Magnetically Modified Electrodes and Articles Produced Thereby – 68

Method for Photolithography Using Multiple Illuminations and a Single Fine Feature Mask – 48

Method of Preparing Nanocrystals – 24

Methods and Devices for High-Throughput Dielectrophoretic Concentration – 125

Methods for Providing Prioritized Communications Using a Carrier Sense Multiple Access Protocol – 42

Methods of Making Monolayers – 24

Microfabricated Elastomeric Valve and Pump Systems – 40

Minimizing Degradation of SiC Bipolar Semiconductor Devices – 54

Mixing Utility Liquid Viscometric Apparatus – 57

Nanocrystals with Linear and Branched Topology – 106

Nanoporous Chelating Fibers – 26

Noninvasive Characterization of a Flowing Multiphase Fluid Using Ultrasonic Interferometry – 56

Optical System for Generating Three-Dimensional Images – 144

Packet-Based and Pseudo-Packet Based Cryptographic Communications System and Method – 91

Phase Matched Parametric Light Generation in Monolithically Integrated Intersubband Optical Devices – 144

Plasma Generators, Reactor Systems and Related Methods – 147

Polymer and Small Molecule Based Hybrid Light Source – 53

Powder Metallurgy Crucible for Alluminum Nitride Crystal Growth – 35

Process for Removing an Organic Layer During Fabrication of an Organic Electronic Device and the Organic Electronic Device Formed By the Process – 55

Quench Monitoring and Control System and Method of Operating Same – 147

Recycling of Used Perfluorosulfonic Acid Membranes – 83

Relative Humidity Sensor Enclosed with Formed Heating Element – 52

Scalable and Dynamic Quality of Service Control – 45

Shape Memory System With Integrated Actuation Using Embedded Particles – 35

Siloxane-Polymer Dielectric Compositions and Related Organic Field-Effect Transistors – 52

Single Chip Radio with Integrated Antenna – 46

Siso Model Predictive Controller – 91

Solid State Electrochemical Composite – 29

Spray Shadowing for Stress Relief and Mechanical Locking in Thick Protective Coatings – 39

Stabilization of Self-Assembled Monolayers – 26

System and Method for Dual Stacked Panel Display – 51

System and Method for Multi-Perspective Collaborative Modeling – 43

Systems and Methods for Automatically Placing Nodes in an Ad Hoc Network – 45

Systems and Methods for Immobilization – 54

Systems and Methods for Tuning Filters – 51

Target Identification System and Method – 50

Technique for Measuring Cell-Membrane Properties in Cultured Cells Grown on Biomaterials in an Ussing Chamber – 24

Thin, Flexible Actuator Array to Produce Complex Shapes and Force Distributions – 131

User Definable Hierarchy for Database Management – 152

Variable Structure Diagnostics Approach Achieving Optimized Low-Frequency Data Sampling for EMA Motoring Systems – 7

Visualization and Processing of Multidimensional Data Using Prefiltering and Sorting Criteria – 96

Water Soluble Tooling Materials for Composite Structures – 6

Wavelength-Selective 1XN2 Switches with Two Dimensional Input Output Fiber Arrays – 47

PATTERN RECOGNITION

Curved Track Segment Finding Using Tiny Triplet Finder (TTF) – 121

PAVEMENTS

Anti-Icing Pavement Coating Study at Chicago O'Hare International Airport – 2

Enhancement of Resilient Modulus Data for the Design of Pavement Structures in Florida – 151

Evaluation of the Dynamic Complex Modulus Test and Indirect Diametral Test for Implementing the AASHTO 2002 Design Guide for Pavement Structures in Florida – 3

PAYLOADS

EXPRESS Pallet Payload Interface Requirements – 13

PERFORMANCE PREDICTION

Broadband Performance of TPF's High-contrast Imaging Testbed: Modeling and Simulations – 142

PERFORMANCE TESTS

Evaluating the Performance Impact of Xen on MPI and Process Execution for HPC Systems – 88

Technical Note: Some Issues Related to the Selection of Polymers for Aerospace Oxygen Systems – 38

PERFORMANCE

Advanced Vehicle Technologies for Efficient Powertrain Performance – 154

PERMANENT MAGNETS

Hybrid-Secondary Uncluttered Permanent Magnet Machine and Method – 47

PERTURBATION THEORY

Motion of the Mantle in the Translational Modes of the Earth and Mercury – 170

Search for the Rare Decay KL-\gpiO piO gamma – 129

PHASE TRANSFORMATIONS

Phase Transformation in Cast Superaustenitic Stainless Steels – 36

PHENOMENOLOGY

Phenomenology of Universal Extra Dimensions – 161

PHENOTYPE

Microelectronic Arrays for Cell-Based Functional Genomics/ High Throughput Phenotyping by Electrokinetic Assembly – 30

PHOTOCATHODES

In-Situ Cleaning of Metal Photo-Cathodes in rf Guns – 121

PHOTOELECTROCHEMICAL DEVICES

Integrated Photoelectrochemical Cell and System Having a Liquid Electrolyte – 68

PHOTOELECTROCHEMISTRY

Integrated Photoelectrochemical Cell and System Having a Liquid Electrolyte – 68

PHOTOGRAPHS

The International Space Station Supports International Polar Year (IPY) – 58

PHOTOLITHOGRAPHY

Method for Photolithography Using Multiple Illuminations and a Single Fine Feature Mask – 48

PHOTOMETERS

Megapixel Multi-band QWIP Focal Plane Arrays – 58

PHOTONS

Public Release of a One Dimensional Version of the Photon Clean Method (PCM1D) – 114

PHOTOVOLTAIC CELLS

High Efficiency Organic Photovoltaic Cells Employing Hybridized Mixed Planar Heterojunctions – 51

PHYSICAL FACTORS

Structure for Identifying, Locating and Quantifying Physical Phenomena – 65

PHYSICS

Heavy Flavor Production at the Tevatron – 127

PILOTLESS AIRCRAFT

An Assessment of Pilot Control Interfaces for Unmanned Aircraft – 7

Detecting Changes in Terrain Using Unmanned Aerial Vehicles – 61

The NASA Dryden Flight Research Center Unmanned Aircraft System Service Capabilities – 1

PISTON ENGINES

High-Octane and Mid-Octane Detonation Performance of Leaded and Unleaded Fuels in Naturally Aspirated, Piston, Spark Ignition Aircraft Engines – 2

PIXELS

Impact of Multiscale Retinex Computation on Performance of Segmentation Algorithms – 58

Megapixel Multi-band QWIP Focal Plane Arrays – 58

Wire Bond Vibration of Forward Pixel Tracking Detector of CMS – 130

PLANET DETECTION

Developments in Planet Detection using Transit Timing Variations – 162

PLANETARY ATMOSPHERES

Accurate Cross Sections for Excitation of Resonance Transitions in Atomic Oxygen – 172

Examination of B. subtilis var. niger Spore Killing by Dry Heat Methods – 155

PLANETARY CORES

Motion of the Mantle in the Translational Modes of the Earth and Mercury – 170

PLANETARY EVOLUTION

Processes in Early Planetesimals: Evidence from Ureilite Meteorites – 72

PLANETARY GEOLOGY
Aqueous Alteration of Basalts: Earth, Moon, and Mars – 166

PLANETARY MANTLES
Motion of the Mantle in the Translational Modes of the Earth and Mercury – 170

PLANETARY PROTECTION
Examination of B. subtilis var. niger Spore Killing by Dry Heat Methods – 155

PLANETARY SURFACES
Applications of Time-Reversal Processing for Planetary Surface Communications – 44

PLANETS
Developments in Planet Detection using Transit Timing Variations – 162

PLANNING
EVA Task Timing and Timeline Planning – 157

PLASMA ACCELERATORS
Energy Measurements of Trapped Electrons from a Plasma Wakefield Accelerator – 121

PLASMA GENERATORS
Plasma Generators, Reactor Systems and Related Methods – 147

PLASMA INTERACTIONS
Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System – 171

PLASMAS (PHYSICS)
Energy Measurements of Trapped Electrons from a Plasma Wakefield Accelerator – 121

Results from the UCLA/FNPL Underdense Plasma Lens Experiment – 107

PLASMATRONS
Low Current Plasmatron Fuel Converter Having Enlarged Volume Discharges – 62

PLATENS
Method and Apparatus for Reworking a Microwave Module – 53

PLATINUM ALLOYS
Oxidation Kinetics of a NiPtTi High Temperature Shape Memory Alloy – 35

PLUMES
Coupling of Realistic Real Estimates with Genomics for Assessing Contaminant Attenuation and Long-Term Plume Containment – 114

PLUTONIUM
Program Pu FUtures 2006 – 19

PNEUMATICS
Low Profile Tension Style Flexible Joint – 7

POINT TO POINT COMMUNICATION
Applications of Time-Reversal Processing for Planetary Surface Communications – 44

POLAR REGIONS
Mars Odyssey: Off-nadir Imaging – 167

Neutral Atmospheric Influences of the Solar Proton Events in October-November 2003 – 173

The International Space Station Supports International Polar Year (IPY) – 58

POLARIMETRY
Polarimetric Analysis of Scatterometer Data for Ocean Surface Wind Measurement – 73

Windsat Validation Using Seawinds, Windrad and POLSCAT Measurements – 76

POLARIZATION
Image Formation in High Contrast Optical Systems: The Role of Polarization – 143

POLARIZED LIGHT
Method and System for Operating an Atomic Clock with Alternating Polarization Light – 145

POLICIES
Assuring Crew Health Protection – 81

Policy Document on Earth Observation for Urban Planning and Management: State of the Art and Recommendations for Application of Earth Observation in Urban Planning – 67

Policy Innovation Impacts on Scrubber Electricity Usage – 70

POLLUTION CONTROL
Detecting and Quantifying Reductive Dechlorination During Monitored Natural attenuation at the Savannah River CBRP Site – 32

Evaluation of Carbon Monoxide Concentration With and Without Catalytic Emission Controls from Gasoline Propulsion Engines – 63

Oxygenates Fact Book: A Compilation of Information on the Benefits of Oxygenates in Gasoline – 69

Technical Assistance Project for the Minnesota Pollution Control Agency – 68

POLLUTION MONITORING
Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM(sub 2.5), and Regional Haze – 69

POLYMERS
Technical Note: Some Issues Related to the Selection of Polymers for Aerospace Oxygen Systems – 38

POPULATIONS
Method and System for Operating an Atomic Clock with Alternating Polarization Light – 145

POROSITY
Characterization of Damaged Materials – 17

POSEIDON SATELLITE
Societal Benefits of Ocean Altimetry Data – 80

POSITION (LOCATION)
Data Visualization as a Tool for Improved Decision Making within Transit Agencies – 152

Dynamic Acoustic Thermometer – 51

Efficacy of Utility Database Management – 89

Structure for Identifying, Locating and Quantifying Physical Phenomena – 65

POSITRONS
Measurement and Correction of linear Optics an Coupling at Tevatron Complex – 113

Start-to-end Beam Optics Development and Multi-Particle Tracking for the ILC Undulator-based Positron Source – 108

POTABLE WATER
Assessment of Silver Based Disinfection Technology for CEV and Future US Spacecraft – 85

POTASSIUM
CO2 Capture by Absorption with Potassium Carbonate Fourth Quarterly Report 2006. Quarterly Progress Report. Reporting Period: October 1, 2006 through December 31, 2006 – 72

POWDER METALLURGY
Powder Metallurgy Crucible for Alluminum Nitride Crystal Growth – 35

POWDER (PARTICLES)
Final Report for the ASC Gas-Powder Two-Phase Flow Modeling Project AD2006-09 – 57

POWER EFFICIENCY
Applications of Time-Reversal Processing for Planetary Surface Communications – 44

POWER PLANTS
Toxicological Evaluation of Realistic Emissions of Source Aerosols (Teresa): Application to Power Plant-Derived PM2.5 – 69

PRECISION
Combination of CDF and D0 Results on the Mass of the Top Quark. August 2006. Volume 2 – 112

PREDICTION ANALYSIS TECHNIQUES
Mid-frequency Band Dynamics of Large Space Structures – 13

PREDICTIONS
Composite Nanomechanics: A Mechanistic Properties Prediction – 27

Siso Model Predictive Controller – 91

PRESSURE VESSELS
Interrelationship of Nondestructive Evaluation Methodologies Applied to Testing of Composite Overwrapped Pressure Vessels – 27

Strain Measurement Using FBG on COPV in Stress Rupture Test – 25

PROBABILITY THEORY
Comparison of the Exclusion Volume and Probability Threshold Methods of Debris Avoidance for the STS Orbiter – 10

PROCEDURES
Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan. Part 1: ASC Software Quality Engineering Practices, Version 2.0 – 94

PRODUCTION ENGINEERING
Biomimetic Organic/Inorganic Composite Processes for Their Production and Methods of Use, PAT-APPL-11-433-725 – 24

Biomimetic Organic/Inorganic Composites, Processes for Their Production, and Methods of Use, PAT-APPL-11- – 21

PRODUCTION
Heavy Flavor Production at the Tevatron – 127

PROGRAM VERIFICATION (COMPUTERS)
Language Generation and Verification in the NRL Protocol Analyzer – 98

PVS Strategies for Proving Abstraction Properties of Automata – 101

Support for Whole-Program Analysis and the Verification of the One-Definition Rule in C++ – 92

PROJECTILES
Systems and Methods for Immobilization – 54

PROPELLANTS
Propellant Analysis and Distillation Unit Design – 17

PROPULSION SYSTEM CONFIGURATIONS
Evaluation of Carbon Monoxide Concentration With and Without Catalytic Emission Controls from Gasoline Propulsion Engines – 63

Thermal Design and Flight Experience of the Mars Exploration Rover Spacecraft Computer-Controlled, Propulsion Line Heaters – 61

PROPULSION SYSTEM PERFORMANCE
Evaluation of Carbon Monoxide Concentration With and Without Catalytic Emission Controls from Gasoline Propulsion Engines – 63

PROPULSION
Evaluation of Carbon Monoxide Concentration With and Without Catalytic Emission Controls from Gasoline Propulsion Engines – 63

PROTECTION
Energy Star (Trade Name) and Other Climate Protection Partnerships 2005 Annual Report – 80

Protection of Alodine Coatings from Thermal Aging by Removable Polymer Coatings – 39

PROTECTIVE COATINGS
Spray Shadowing for Stress Relief and Mechanical Locking in Thick Protective Coatings – 39

PROTOCOL (COMPUTERS)
A Formal Language for Cryptographic Protocol Requirements – 98

Considerations for Isochronous Data Services over the Proximity-1 Space Link – 167

Language Generation and Verification in the NRL Protocol Analyzer – 98

Methods for Providing Prioritized Communications Using a Carrier Sense Multiple Access Protocol – 42

Secure, Autonomous, Intelligent Controller for Integrating Distributed Sensor Webs – 5

Space-based Networking Technology Developments in the Interplanetary Network Directorate Information Technology Program – 152

PROTON BEAMS
Using the Fermilab Proton Source for a Muon to Electron Conversion Experiment – 128

PROTON-ANTIPROTON INTERACTIONS
Search for 3rd Generation Vector Leptoquarks in the Di-tau Di-jet Channel in Proton Antiproton Collisions at square root(s)=1.96 – 124

PROTONS
Happex: Starange Quarks in the Proton and 4He – 138

Using the Fermilab Proton Source for a Muon to Electron Conversion Experiment – 128

PROTOTYPES
Design, Fabrication, and Test of an SRF Cryomodule Prototype at Fermilab – 125

Development of a Prototype Automation Simulation Scenario Generator for Air Traffic Management Software Simulations – 3

PROVING
Contact Interface Verification for DYNA3D. Scenario 1: Basic Contact – 92

Contact Interface Verification for DYNA3D. Scenario 2: Multi-Surface Contact – 18

Fusing Quantitative Requirements Analysis with Model-based Systems Engineering – 101

PSYCHOMETRICS
Method for Computing Subjective Dissimilarities Among Discrete Entities – 93

PUMPS
Microfabricated Elastomeric Valve and Pump Systems – 40

PUPILS
The Sensitivity of Shaped Pupil Coronagraphs to Optical Aberrations – 143

PURIFICATION
Assessment of Silver Based Disinfection Technology for CEV and Future US Spacecraft – 85

PYRAMIDS
Two-Sided Pyramid Wavefront Sensor in the Direct Phase Mode – 144

PYROXENES
Processes in Early Planetesimals: Evidence from Ureilite Meteorites – 72

QUADRUPOLES
Handling Collision Debris In Quad-and Dipole-First LHC IR Options – 127

Roll Measurement of Tevatron Dipoles and Quadrupoles – 133

Study of 2-in-1 Large-Aperture Nb3Sn IR Quadrupoles for the LHC Luminosity Upgrade – 103

Thermal Analysis of SC Quadrupoles in Accelerator Interaction Regions – 125

QUALITATIVE ANALYSIS
Qualitative Process Theory – 28

QUALITY CONTROL
Certification Process for Commercial Batteries for Payloads – 16

Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan. Part 1: ASC Software Quality Engineering Practices, Version 2.0 – 94

Scalable and Dynamic Quality of Service Control – 45

Summary of Beam Quality Diagnostics and Control Working Group – 116

QUANTITATIVE ANALYSIS
Fusing Quantitative Requirements Analysis with Model-based Systems Engineering – 101

QUANTUM CASCADE LASERS
Operation of Terahertz Quantum-cascade Lasers at 164 K in Pulsed Mode and at 117 K in Continuous-wave Mode – 142

QUANTUM CHROMODYNAMICS
Closing Talk: QCD Moriond 2006 – 111

Future Science at the Relativistic Heavy Ion Collider – 103

High Q(sup 2) QCD Physics at the Tevatron – 117

QCD and Top-Quark Results from the Tevatron – 129

SUSY-QCD Coupling Relation – 118

QUANTUM EFFICIENCY
Megapixel Multi-band QWIP Focal Plane Arrays – 58

QUANTUM NUMBERS
New Developments in Charge Transfer Multiplet Calculations: Projection Operations, Mixed-Spin States and pi-Bonding – 120

QUANTUM THEORY
Update on the Next-to-Leading order Monte Carol MCFM – 135

QUANTUM WELL LASERS
Operation of Terahertz Quantum-cascade Lasers at 164 K in Pulsed Mode and at 117 K in Continuous-wave Mode – 142

QUANTUM WELLS
Growth and Properties of Lattice Matched GaAsSbN Epilayer on GaAs for Solar Cell Applications – 132

Influence of Growth Parameters and Annealing on Properties of MBE Grown GaAsSbN SQWs – 149

Megapixel Multi-band QWIP Focal Plane Arrays – 58

QUARKS
B-Tagging at CDF and DO Lesson for LHC – 102

Combination of CDF and D0 Results on the Mass of the Top Quark. August 2006. Volume 2 – 112

Counting Rules, Holographic Wave Functions, Meromorphization and Quark-Hadron Duality – 138

Happex: Starange Quarks in the Proton and 4He – 138

Heavy Quarks at RHIC from Parton Transport Theory – 102

Improved Action for Heavy Quarks – 129

Measurement of the Mass of the Top Quark in Dilepton Final States with the DO-Detector – 115

Measurement of the Top Quark Mass with a Matrix Element Method – 128

Measurement of the W Boson and Top-Quark Masses at CDF – 150

QCD and Top-Quark Results from the Tevatron – 129

Search for New Phenomena in the CDF Top Quark Sample – 150

Search for the Pentquark Partners: Theta++, SigmaO and NO – 119

Search for the Single Top Quarks Produced in s-Channel via Electroweak Interactions at s=1.96 at the Tevatron – 123

Study of B(sub s) Mixing at the CDFII Experiment with a Newly Developed Opposite Side beta-Flavour Tagging Algorithm Using Kaons – 117

Top Pair Production Cross Section at Square Root of s Equals 1.96 TEV and a Search V Plus A Current in Top Quark Decay – 116

Top Pair Production III: Testing the Standard Model in Top Quark Decays – 130

QUENCHING (COOLING)
Quench Monitoring and Control System and Method of Operating Same – 147

RADIATION DAMAGE
Radiation Damage to Scintillator in the D0 Luminosity Monitor – 128

RADIATION DETECTORS
Bias Selectable Dual Band AlGaN Ultraviolet Detectors – 53

RADIATION EFFECTS
Radiation-Hardened Electronics for the Space Environment – 15

RADIO ANTENNAS
Co-axial Joint Technology Applied to Antenna Backup Structures – 11

RADIO COMMUNICATION
Deep Space Ka-band Link Management and the MRO Demonstration: Long-term Weather Statistics Versus Forecasting – 77

RADIO EQUIPMENT
Single Chip Radio with Integrated Antenna – 46

RADIO FREQUENCIES
Cutting Edge RFID Technologies for NASA Applications – 154

Designing Focusing Solenoids for Superconducting RF Accelerators – 114

Growth and Properties of Lattice Matched GaAsSbN Epilayer on GaAs for Solar Cell Applications – 131

Induction Barrier RF and Applications in Main Injector – 110

In-Situ Cleaning of Metal Photo-Cathodes in rf Guns – 121

ISS Asset Tracking Using SAW RFID Technology – 55

MUCOOL RF Program – 126

Progress on a Cryogenically Cooled RF Gun Polarized Electron Source – 102

Reliability of Cascaded THz Frequency Chains with Planar GaAs Circuits – 46

RADIOACTIVE ISOTOPES
Processes in Early Planetesimals: Evidence from Ureilite Meteorites – 72

RADIOACTIVE WASTES
Measurement and Prediction of Radiolytic Hydrogen Production in Defense Waste Processing Slurries at Savannah River Site – 71

RAIL TRANSPORTATION
Human Factors Guidelines for Intelligent Transportation Systems at the Highway-Rail Intersection: Technical Report – 86

RAILS
Adhesive Anchors for Retrofit/Repair of Bridge Rails: Summary Report – 22

Human Factors Guidelines for Intelligent Transportation Systems at the Highway-Rail Intersection: Technical Report – 85

Repair/Retrofit Anchorage Designs for Bridge Rails – 22

RAIN
Impact of Rainfall on the Retrieval of Soil Moisture Using AMSR-E Data – 79

Improved Hurricane Boundary Layer Observations with the Imaging Wind and Rain Airborne Profiler – 76

RAMAN SPECTRA
Feasibility of Single Molecule DNA Sequencing Using Surface-Enhanced Raman Scattering – 140

RANDOM VIBRATION
On the Use of 3dB Qualification Margin for Structural Parts on Expendable Launch Vehicles – 10

RANGEFINDING
Lightning Charge Retrievals: Dimensional Reduction, LDAR Constraints, and a First Comparison with LIS Satellite Data – 76

REACTION KINETICS
Novel Approach to Experimental Studies of Mineral Dissolution Kinetics. Annual Technical Progress Report. Period September 1, 2005 through August 31, 2006 – 29

REACTIVITY
Biogenic UO-2- Characterization and Surface Reactivity – 31

Growth of In-Situ Thin Films by Reactive Evaporation – 148

READOUT
Readout System for Arrays of Frisch-ring CdZnTe Detectors – 136

REAGENTS
Cyanine Dyes as Labeling Reagents for Detection of Biological and Other Materials by Luminescence Methods – 23

REAL TIME OPERATION
Considerations for Isochronous Data Services over the Proximity-1 Space Link – 167

Real-time Enhancement, Registration, and Fusion for an Enhanced Vision System – 60

Real-time Sub-cm Differential Orbit Determination of two Low-Earth Orbiters with GPS Bias Fixing – 12

Recent Results from the Swift Burst Alert Telescope – 157

RECESSES
Nitride-Based Transistors with a Protective Layer and a Low-Damage Recess and Methods of Fabrication Thereof – 148

RECONNAISSANCE
Detecting Changes in Terrain Using Unmanned Aerial Vehicles – 61

RECYCLING
Recycling of Used Perfluorosulfonic Acid Membranes – 83

RED GIANT STARS
SN 1987A after 18 Years: Mid-Infrared GEMINI and SPITZER Observations of the Remnant – 159

REGENERATORS
Foil Structure for Regenerators – 63

RELATIVISTIC EFFECTS
Electron Impact Excitation of Forbidden and Allowed Transitions in O(II) – 131

RELATIVISTIC ELECTRON BEAMS
Effect of EMIC Wave Normal Angle Distribution on Relativistic Electron Scattering Based on the Newly Developed Self-consistent RC/EMIC Waves Model by Khazanov et al. [2006] – 150

RELATIVISTIC PARTICLES
Fundamental Channeling Questions at Ultra Relativistic Energies – 103

REMOTE SENSING
Compact, Lightweight Dual-Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 67

Microwave Remote Sensing Modeling of Ocean Surface Salinity and Winds Using an Empirical Sea Surface Spectrum – 74

Policy Document on Earth Observation for Urban Planning and Management: State of the Art and Recommendations for Application of Earth Observation in Urban Planning – 67

System and Method for Identifying, Reporting, and Evaluating Presence of Substance – 95

REMOVAL
Process for Removing an Organic Layer During Fabrication of an Organic Electronic Device and the Organic Electronic Device Formed By the Process – 55

RENEWABLE ENERGY
Technical Assistance Project for the Minnesota Pollution Control Agency – 68

REQUIREMENTS
EXPRESS Pallet Payload Interface Requirements – 13

RESEARCH AND DEVELOPMENT
A Brief Historical Review of Vestibular and Sensorimotor Research Associated with Space Flight – 81

Intelligent Vision Systems Independent Research and Development (IR&D) 2006 – 99

Photoinjectors R&D For Future Light Sources & Linear Colliders – 105

RESEARCH
Basic Research Needs for Superconductivity. Report of the Basic Energy Sciences Workshop on Superconductivity, May 8-11, 2006 – 104

RESERVOIRS
Graded-density Reservoirs for Accessing High Pressure Low Temperature Material States – 18

RESONATORS
Design of 325MHz Single and Triple Spoke Resonators at FNAL – 104

RESOURCES MANAGEMENT
Panel Resource Management (PRM) Implementation and Effects within Safety Review Panel Settings and Dynamics – 4

RETAINING
Seismic Retrofitting Manual for Highway Structures. Part 2: Retaining Structures, Slopes, Tunnels,Culverts and Roadways (December 2006) – 66

RETINA
RSD, Retinal Scanning Display Pilot Study and Evaluation – 49

RETROFITTING
Seismic Retrofitting Manual for Highway Structures. Part 1: Bridges (December 2006) – 74

Seismic Retrofitting Manual for Highway Structures. Part 2: Retaining Structures, Slopes, Tunnels,Culverts and Roadways (December 2006) – 66

REVERBERATION CHAMBERS
Pulsed Power 3 GHz Feasibility Study in FOI 36.7 m3 Mode Stirred Reverberation Chamber – 46

RHEOLOGY
Mixing Utility Liquid Viscometric Apparatus – 57

RING CURRENTS
Effect of EMIC Wave Normal Angle Distribution on Relativistic Electron Scattering Based on the Newly Developed Self-consistent RC/EMIC Waves Model by Khazanov et al. [2006] – 150

RISK
Investigating Surety Methodologies for Cognitive Systems – 82

Risks in Using USB Flash Drives and u3 – 94

RIVERS
Detecting and Quantifying Reductive Dechlorination During Monitored Natural attenuation at the Savannah River CBRP Site – 32

Measurement and Prediction of Radiolytic Hydrogen Production in Defense Waste Processing Slurries at Savannah River Site – 71

ROBOTICS
Automated On-board Terrain Analysis for Precision Landings – 15

Considerations for Isochronous Data Services over the Proximity-1 Space Link – 167

From Prime to Extended Mission: Evolution of the MER Tactical Uplink Process – 99

Intelligent Vision Systems Independent Research and Development (IR&D) 2006 – 99

Systems and Methods for Automatically Placing Nodes in an Ad Hoc Network – 45

ROCKS
Linking Home Plate and Algonquin Class Rocks through Microtextural Analysis: Evidence for Hydrovolcanism in the Inner Basin of Columbia Hills, Gusev Crater – 66

ROLL
Roll Measurement of Tevatron Dipoles and Quadrupoles – 133

ROVING VEHICLES
An Update of the Ground Testing of the Li-ion Batteries in Support of JPL's 2003 Mars Exploration Rover Mission – 167

Crystal Water on Mars: Insights from the Mars Exploration Rovers – 156

From Prime to Extended Mission: Evolution of the MER Tactical Uplink Process – 99

RUNWAYS
Anti-Icing Pavement Coating Study at Chicago O'Hare International Airport – 2

RUPTURING
Strain Measurement Using FBG on COPV in Stress Rupture Test – 25

SAFETY MANAGEMENT
Voluntary Aviation Safety Information-Sharing Process: Preliminary Audit of Distributed FOQA and ASAP Archives Against Industry Statement of Requirements – 4

SAFETY
The NASA Dryden Flight Research Center Unmanned Aircraft System Service Capabilities – 1

SALINITY
Compact, Lightweight Dual- Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 41

Compact, Lightweight Dual-Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 67

Microwave Remote Sensing Modeling of Ocean Surface Salinity and Winds Using an Empirical Sea Surface Spectrum – 74

The Aquarius Scatterometer: An Active System for Measuring Surface Roughness for Sea-Surface Brightness Temperature Correction – 74

SAMPLES
Apparatus and Method for Automated Parcel Screening – 151

SAMPLING
Effects of High-frequency Wind Sampling on Simulated Mixed Layer Depth and Upper Ocean Temperature – 73

Sampling-Based Computational Strategy for the Representation of Epistemic Uncertainty in Model Predictions with evidence Theory – 94

SATELLITE OBSERVATION
Effects of High-frequency Wind Sampling on Simulated Mixed Layer Depth and Upper Ocean Temperature – 73

Lightning Charge Retrievals: Dimensional Reduction, LDAR Constraints, and a First Comparison with LIS Satellite Data – 76

SATURN (PLANET)
Cassini Observes the Active South Pole of Enceladus – 160

SCANNERS
Study of Interactions Between Microbes and Minerals by Scanning Transmission X-Ray Microscopy (STXM) – 34

SCANNING
RSD, Retinal Scanning Display Pilot Study and Evaluation – 49

SCATTERING AMPLITUDE
Improved Action for Heavy Quarks – 130

SCATTERING FUNCTIONS
Low-Energy Elastic Electron Scattering by Atomic Oxygen – 141

SCATTEROMETERS
Polarimetric Analysis of Scatterometer Data for Ocean Surface Wind Measurement – 73

The Aquarius Scatterometer: An Active System for Measuring Surface Roughness for Sea-Surface Brightness Temperature Correction – 74

Windsat Validation Using Seawinds, Windrad and POLSCAT Measurements – 76

SCHEDULES
From Prime to Extended Mission: Evolution of the MER Tactical Uplink Process – 99

SCHEDULING
Space-based Networking Technology Developments in the Interplanetary Network Directorate Information Technology Program – 152

SCHOTTKY DIODES
Reliability of Cascaded THz Frequency Chains with Planar GaAs Circuits – 46

SCIENTIFIC VISUALIZATION
Data Visualization as a Tool for Improved Decision Making within Transit Agencies – 152

SCINTILLATION COUNTERS
Extruded Scintillator for the Calorimetry Applications – 130

Radiation Damage to Scintillator in the D0 Luminosity Monitor – 128

SCRUBBERS
Policy Innovation Impacts on Scrubber Electricity Usage – 70

SEA SURFACE TEMPERATURE
The Aquarius Scatterometer: An Active System for Measuring Surface Roughness for Sea-Surface Brightness Temperature Correction – 74

SEATS
Evaluation of the Reproducibility of the FAA Oil Burner Fire Test for Aircraft Seat Cushions – 6

Laboratory-Scale and Full-Scale Fire Testing of Lightweight Aircraft Seat Cushion Materials – 5

SECURITY
Modeling Urban Surface Transportation Network Dependability and Security – 43

Security Problems in Mobile ad hoc Networks – 44

SEDIMENTS
Anomalous Iridium Enrichment at the Triassic-Jurassic Boundary, Blomidon Formation, Fundy Basin, Canada – 75

Linking Home Plate and Algonquin Class Rocks through Microtextural Analysis: Evidence for Hydrovolcanism in the Inner Basin of Columbia Hills, Gusev Crater – 66

Sedimentation Patterns of Meteoritic Ejecta in Eltanin Impact Deposits at Site PS58/281 – 168

SEGMENTED MIRRORS
Target Selection and Imaging Requirements for JWST Fine Phasing – 143

SEGMENTS
Impact of Multiscale Retinex Computation on Performance of Segmentation Algorithms – 58

SEISMOLOGY
Seismic Retrofitting Manual for Highway Structures. Part 1: Bridges (December 2006) – 74

SELENOLOGY
Evidence for a Past High-Eccentricity Lunar Orbit – 170

SELF ASSEMBLY
Stabilization of Self-Assembled Monolayers – 26

SELF CONSISTENT FIELDS
Effect of EMIC Wave Normal Angle Distribution on Relativistic Electron Scattering Based on the Newly Developed Self-consistent RC/EMIC Waves Model by Khazanov et al. [2006] – 150

SEMICONDUCTOR DEVICES
Intersubband Mid-Infrared Electroluminescent Semiconductor Devices – 126

Minimizing Degradation of SiC Bipolar Semiconductor Devices – 54

New Family of Multilevel Matrix Converters for Wind Power Applications. Final Report. July 2002-March 2006 – 55

SEMICONDUCTOR LASERS
Intersubband Mid-Infrared Electroluminescent Semiconductor Devices – 126

SEMICONDUCTORS (MATERIALS)
Electrical Production Testing of the DO Silicon Microstrip Tracker Detector Modules – 118

Readout System for Arrays of Frisch-ring CdZnTe Detectors – 136

Status of the CDF Silicon Detector – 134

SENSITIVITY
Simple Approach for Obtaining High Resolution, High Sensitivity 1H NMR Metabolite Spectra of Biofluids with Limited Mass Supply – 20

SENSORIMOTOR PERFORMANCE
A Brief Historical Review of Vestibular and Sensorimotor Research Associated with Space Flight – 81

SENSORS
Secure, Autonomous, Intelligent Controller for Integrating Distributed Sensor Webs – 5

SEQUENCING
Feasibility of Single Molecule DNA Sequencing Using Surface-Enhanced Raman Scattering – 140

From Prime to Extended Mission: Evolution of the MER Tactical Uplink Process – 99

Spitzer Space Telescope Sequencing Operations Software, Strategies, and Lessons Learned – 159

SEYFERT GALAXIES
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 163

SHADOWS
Spray Shadowing for Stress Relief and Mechanical Locking in Thick Protective Coatings – 39

SHALES
Development of a Materials and Engineering Database for Shales of Eastern Kansas – 90

SHAPE MEMORY ALLOYS
Oxidation Kinetics of a NiPtTi High Temperature Shape Memory Alloy – 35

Shape Memory System With Integrated Actuation Using Embedded Particles – 35

SHAPES
Jets at CDF – 113

Shape Memory System With Integrated Actuation Using Embedded Particles – 35

Thin, Flexible Actuator Array to Produce Complex Shapes and Force Distributions – 131

SHEETS
Multi-Dimensioned Easily Adjustable Single Sheet Container Formula with Indicia – 84

SHUTDOWNS
DIII-D Studies of Massive Gas Injection Fast Shutdowns for Disruption Mitigation – 107

SIGNAL PROCESSING
Analog Signal Pre-Processing for the Fermilab Main Injectore BPM Upgrade – 138

DSP Implementation of the Multiscale Retinex Image Enhancement Algorithm – 59

Real-time Enhancement, Registration, and Fusion for an Enhanced Vision System – 60

SIGNAL TO NOISE RATIOS

Image Enhancement, Image Quality, and Noise – 60

SILICATES

Durability of Silicate Glasses: An Historical Approach – 39

SILICON ALLOYS

Mechanistic Selection and Growth of Twinned Bicrysalline Primary Si in near Eutectic Al-Si Alloys – 36

SILICON DIOXIDE

Methods of Making Monolayers – 24

SILICONES

Measurement and Prediction of Water Outgassing from TR55 Silicone by the Isoconversional Technique – 18

SILICON

Electrical Production Testing of the DO Silicon Microstrip Tracker Detector Modules – 118

Hafnium Nitride Buffer Layers for Growth of GaN on Silicon – 48

Status and Performance of the CDF Run II Silicon Detector (FERMILAB-CONF-06-390-E) – 135

Status of the CDF Silicon Detector – 134

SILOXANES

Siloxane-Polymer Dielectric Compositions and Related Organic Field-Effect Transistors – 52

SILVER

Assessment of Silver Based Disinfection Technology for CEV and Future US Spacecraft – 85

SIM

ESA PlanetQuest: Status and Recent Progress – 156

Search for Terrestrial Planets with ESA Planet Quest – 155

SIMULATION

An Update of the Ground Testing of the Li-ion Batteries in Support of JPL's 2003 Mars Exploration Rover Mission – 167

Broadband Performance of TPF's High-contrast Imaging Testbed: Modeling and Simulations – 142

Efficiency and Lifetime of Carbon Foils – 32

Measurement and ALE3D Simulation of Violence in a Deflagration Experiment with LX-10 and Aermet-100 Alloy – 18

Method and Means for Generating High Order Hermite Functions for Simulation of Electromagnetic Wave Devices – 95

Studying the Underlying Event at CDF – 150

Three Dimensional Constraint Effects on the Estimated (Delta)CTOD during the Numerical Simulation of Different Fatigue Threshold Testing Techniques – 28

Understanding the Mechanism of Human P450 CYP1A2 Using Coupled Qunatum-Classical Simulations in a Dynamical Environment – 34

SIMULATORS

Human-Factors Perspective On Simulator Fidelity Assessment – 84

SIMsim: An End-to-end Simulator for the ESA Mission – 157

SISO (CONTROL SYSTEMS)

Siso Model Predictive Controller – 91

SKY SURVEYS (ASTRONOMY)

Running the Sloan Digital Sky Survey Data Archive – 160

SLOPES

Seismic Retrofitting Manual for Highway Structures. Part 2: Retaining Structures, Slopes, Tunnels,Culverts and Roadways (December 2006) – 66

Using Historic Models of C(sub n)(sup 2) to Predict r(sub 0) and Regimes Affected by Atmospheric Turbulence for Horizontal, Slant and Topological Paths – 78

SLURRIES

Measurement and Prediction of Radiolytic Hydrogen Production in Defense Waste Processing Slurries at Savannah River Site – 71

SOFIA (AIRBORNE OBSERVATORY)

SOFIA: Stratospheric Observatory For Infrared Astronomy – 161

SOFTWARE ENGINEERING

Development of a Prototype Automation Simulation Scenario Generator for Air Traffic Management Software Simulations – 3

From Prime to Extended Mission: Evolution of the MER Tactical Uplink Process – 99

Organization's Orderly Interest Exploration: Inception, Development and Insights of AIAA's Topics Database – 98

SOIL MOISTURE

Compact, Lightweight Dual- Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 41

Compact, Lightweight Dual-Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 67

Impact of Rainfall on the Retrieval of Soil Moisture Using AMSR-E Data – 79

SOILS

Report on Bioavailability of Chemical Wastes with Respect to the Potential for Soil Bioremediation – 32

SOLAR CELLS

High Efficiency Organic Photovoltaic Cells Employing Hybridized Mixed Planar Heterojunctions – 51

SOLAR ORBITS

Simplectic Correctors for Canonical Heliocentric N-Body Maps – 160

SOLAR PROTONS

Neutral Atmospheric Influences of the Solar Proton Events in October-November 2003 – 173

SOLAR SAILS

Development of New Modeling and Analysis Tools for Solar Sails – 16

SOLAR STORMS

Neutral Atmospheric Influences of the Solar Proton Events in October-November 2003 – 173

SOLAR TERRESTRIAL INTERACTIONS

Neutral Atmospheric Influences of the Solar Proton Events in October-November 2003 – 173

SOLAR WIND

Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System – 171

SOLENOIDS

Designing Focusing Solenoids for Superconducting RF Accelerators – 114

Superconducting Solenoid Magnet Test Results – 114

SOLID STATE

Solid State Electrochemical Composite – 30

SOLID WASTES

Combustion Emissions from Hazardous Waste Incinerators, Boilers and Industrial Furnaces, and Municipal Solid Waste Incinerators: Results from Five STAR Grants and Research Needs – 71

SORBENTS

Characteristics of Post-Sorbent and High Temperature Catalytic Oxidizer Beds After Long-Term On-Orbit Use – 83

SOUND FIELDS

Acoustic Longitudinal Field NIF Optic Feature Detection Map Using Time-Reversal and MUSIC – 146

SOURCE PROGRAMS

Ion Source Choices An H Source for the High Intensity Neutrino Source – 119

SPACE COMMUNICATION

Co-axial Joint Technology Applied to Antenna Backup Structures – 11

Deep Space Ka-band Link Management and the MRO Demonstration: Long-term Weather Statistics Versus Forecasting – 77

Use of the 37-38 GHz and 40-40.5 GHz Ka-bands for Deep Space Communications – 11

SPACE DEBRIS

Comparison of the Exclusion Volume and Probability Threshold Methods of Debris Avoidance for the STS Orbiter – 10

ISS Debris Avoidance Maneuver Threshold Analysis – 14

Optical Studies of Space Debris at GEO: Survey and Follow-up with Two Telescopes – 10

Orbital Debris Studies at NASA – 156

SPACE EXPLORATION

Applications of Time-Reversal Processing for Planetary Surface Communications – 44

Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

SPACE FLIGHT

A Brief Historical Review of Vestibular and Sensorimotor Research Associated with Space Flight – 81

SPACE INFRARED TELESCOPE FACILITY

Execution of the Spitzer In-orbit Checkout and Science Verification Plan – 158

Spitzer Space Telescope Sequencing Operations Software, Strategies, and Lessons Learned – 159

SPACE MISSIONS

Ares V an Enabling Capability for Future Space Astrophysics Missions – 9

Considerations for Isochronous Data Services over the Proximity-1 Space Link – 167

SPACE PLASMAS

New Accurate Oscillator Strengths and Electron Excitation Collision Strengths for N1 – 163

SPACE SHUTTLE ORBITERS

Comparison of the Exclusion Volume and Probability Threshold Methods of Debris Avoidance for the STS Orbiter – 10

EVA Hazards due to TPS Inspection and Repair – 8

SPACE SHUTTLES

Crew Exploration Vehicle Environmental Control and Life Support Emergency Gas Consumable Sizing – 82

EXPRESS Pallet Payload Interface Requirements – 12

International Space Station (ISS) Environmental Control and Life Support (ECLS) System Overview of Events: February 2006 - 2007 – 82

Investigation of MMOD Impact on Shuttle Payload Bay Door Radiator – 13

SPACE STATION FREEDOM

Orbital Debris Studies at NASA – 156

SPACE TRANSPORTATION SYSTEM

Comparison of the Exclusion Volume and Probability Threshold Methods of Debris Avoidance for the STS Orbiter – 10

STS 116 Return Samples: Assessment of Air Quality aboard the Shuttle (STS-116) and International Space Station (12A.1) – 82

SPACEBORNE ASTRONOMY

SOFIA: Stratospheric Observatory For Infrared Astronomy – 161

The Chandra X-ray Observatory: An Astronomical Facility Available to the World – 158

SPACECRAFT CABIN ATMOSPHERES

Testing of an Amine-Based Pressure-Swing System for Carbon Dioxide and Humidity Control – 84

SPACECRAFT CONSTRUCTION MATERIALS

Technical Note: Some Issues Related to the Selection of Polymers for Aerospace Oxygen Systems – 38

SPACECRAFT ENVIRONMENTS

STS 116 Return Samples: Assessment of Air Quality aboard the Shuttle (STS-116) and International Space Station (12A.1) – 82

Testing of an Amine-Based Pressure-Swing System for Carbon Dioxide and Humidity Control – 84

SPACECRAFT LAUNCHING

From ESAS to Ares: A Chronology – 9

Mid-frequency Band Dynamics of Large Space Structures – 13

SPACECRAFT MAINTENANCE

EVA Hazards due to TPS Inspection and Repair – 8

SPACECRAFT MANEUVERS

ISS Debris Avoidance Maneuver Threshold Analysis – 14

SPACECRAFT POWER SUPPLIES

An Overview of Space Power Systems for NASA Missions – 14

SPACECRAFT PROPULSION

Thermal Design and Flight Experience of the Mars Exploration Rover Spacecraft Computer-Controlled, Propulsion Line Heaters – 62

SPACECREWS

Assuring Crew Health Protection – 81

SPARK IGNITION

High-Octane and Mid-Octane Detonation Performance of Leaded and Unleaded Fuels in Naturally Aspirated, Piston, Spark Ignition Aircraft Engines – 2

SPECIFICATIONS

Extended Abstract: Organizing Automaton Specifications to Achieve Faithful Representation – 97

SPECTRA

DSP Implementation of the Multiscale Retinex Image Enhancement Algorithm – 59

Microwave Remote Sensing Modeling of Ocean Surface Salinity and Winds Using an Empirical Sea Surface Spectrum – 74

SPECTROMETERS

Differential Mobility Spectrometry: Preliminary Findings on Determination of Fundamental Constants – 149

SPECTROSCOPY

Spectroscopic Investigations of Fragment Species in the Coma – 171

SPECTRUM ANALYSIS

Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae – 162

SPHERULES

Primary Mineralogical and Chemical Characteristics of the Major K/T and Late Eocene Impact Deposits – 75

SPIN RESONANCE

Cassini Observes the Active South Pole of Enceladus – 160

SPIN

Future of Spin Physics at BNL – 105

SPLINES

Electron Collisional Excitation Rates for OI USING the B-Spline R-Matrix Approach – 163

SPORES

Examination of B. subtilis var. niger Spore Killing by Dry Heat Methods – 155

SPRAYERS

Spray Shadowing for Stress Relief and Mechanical Locking in Thick Protective Coatings – 39

SPREADSHEETS

Translation Tool – 153

SPUTTERING

Thermal Modeling Tool for a Spherical Capsule in a Sputtering Chamber – 140

STABILITY

Coherent Instabilities at the FNAL Booster – 110

STAINLESS STEELS

Phase Transformation in Cast Superaustenitic Stainless Steels – 36

STANDARD MODEL (PARTICLE PHYSICS)

Measurements of sin2Beta and cos2Beta from b -\g cc(bar)s Decays at BaBar – 108

Phenomenology of Universal Extra Dimensions – 161

Search for Chargino-Neutralino Production at the Collider Detector at Fermilab – 122

Search for Physics beyond the Standard Model at the Tevatron – 135

Standard Model: Alchemy and Astrology – 161

STANDARDS

Assuring Crew Health Protection – 81

STARS

ESA PlanetQuest: Status and Recent Progress – 156

Measuring Extended Structure in Stars Using the Keck Interferometer Nuller – 158

STATIC LOADS

Static and Dynamic Performance of RC Bridge Bents with Architectural-Flared Columns – 65

STATIC TESTS
Repair/Retrofit Anchorage Designs for Bridge Rails – 22

STATISTICAL ANALYSIS
ProUCL Version 4.0, Technical Guide – 93

ProUCL Version 4.0, User Guide – 93

STELLAR ENVELOPES
SN 1987A after 18 Years: Mid-Infrared GEMINI and SPITZER Observations of the Remnant – 159

STERILIZATION
Examination of B. subtilis var. niger Spore Killing by Dry Heat Methods – 155

STOCHASTIC PROCESSES
A Framework for Performing Multiscale Stochastic Progressive Failure Analysis of Composite Structures – 26

STORAGE RINGS (PARTICLE ACCELERATORS)
Linear Lattic Modeling of the Recycler Ring at FERMILAB – 109

Searches for New Phenomena at the Tevatron and at HERA – 123

STORM SURGES
Design Hurricane Storm Surge Pilot Study – 78

STORMS
Observations of Lightning on Earth from the Lunar Surface – 165

STRAIN MEASUREMENT
Strain Measurement Using FBG on COPV in Stress Rupture Test – 25

STRANDS
Magnetization Anomaly of Nb3Al Strands and Instability of Nb3Al Rutherford Cables – 148

STRATA
Anomalous Iridium Enrichment at the Triassic-Jurassic Boundary, Blomidon Formation, Fundy Basin, Canada – 75

STRESS ANALYSIS
Strain Measurement Using FBG on COPV in Stress Rupture Test – 25

STRONG INTERACTIONS (FIELD THEORY)
Standard Model: Alchemy and Astrology – 161

STRUCTURAL ANALYSIS
Development of New Modeling and Analysis Tools for Solar Sails – 16

STRUCTURAL DESIGN
Advanced Vehicle Technologies for Efficient Powertrain Performance – 154

Seismic Retrofitting Manual for Highway Structures. Part 2: Retaining Structures, Slopes, Tunnels,Culverts and Roadways (December 2006) – 66

STRUCTURAL FAILURE
Mid-frequency Band Dynamics of Large Space Structures – 13

STRUCTURAL MEMBERS
On the Use of 3dB Qualification Margin for Structural Parts on Expendable Launch Vehicles – 10

SUBASSEMBLIES
Characteristics of Post-Sorbent and High Temperature Catalytic Oxidizer Beds After Long-Term On-Orbit Use – 83

SUBSTRATES
Oxidations of Organic and Inorganic Substrates by Superoxo-, Hydroperoxo-, and Oxo-Compounds of the Transition Metals – 33

SULFUR DIOXIDES
Policy Innovation Impacts on Scrubber Electricity Usage – 70

SUPERCHARGERS
Turbocharging a Crank-Case Scavenged and Direct-Injected Two-Stroke Engine for Snowmobile Applications – 154

SUPERCONDUCTING CAVITY RESONATORS
Cryogenics for the Supercondcuting Module Test Facility – 136

SUPERCONDUCTING MAGNETS
Superconducting Solenoid Magnet Test Results – 114

SUPERCONDUCTIVITY
Basic Research Needs for Superconductivity. Report of the Basic Energy Sciences Workshop on Superconductivity, May 8-11, 2006 – 104

Cost Effective Open Geometry HTS MRI System amended to BSCCO 2212 Wire for High Field Magnets – 64

Designing Focusing Solenoids for Superconducting RF Accelerators – 114

Quench Monitoring and Control System and Method of Operating Same – 147

Wakefield Calculation for Superconducting TM(sub 110) Cavity Without Azimuthal Symmetry – 112

SUPERCONDUCTORS (MATERIALS)
Growth of In-Situ Thin Films by Reactive Evaporation – 149

Wakefield Calculation for Superconducting TM(sub 110) Cavity Without Azimuthal Symmetry – 112

SUPERHIGH FREQUENCIES
Deep Space Ka-band Link Management and the MRO Demonstration: Long-term Weather Statistics Versus Forecasting – 77

SUPERNOVA REMNANTS
SN 1987A after 18 Years: Mid-Infrared GEMINI and SPITZER Observations of the Remnant – 159

SUPERNOVAE
Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae – 162

SN 1987A after 18 Years: Mid-Infrared GEMINI and SPITZER Observations of the Remnant – 159

SUPERSYMMETRY
Search for R-Parity Violating Supersymmetry with the D0 Detector – 133

Search for Supersymmetry in Trilepton Final States with the D0 Detector – 130

Searches for GMSB, AMSB and Split SUSY with the D0 Detector – 125

Supersymmetry Searches at the Tevatron – 119

SUSY-QCD Coupling Relation – 118

SUPPLYING
Photovoltaic Incentive Design Handbook – 68

SURFACE ENERGY
Adhesion of Lunar Dust – 172

SURFACE FINISHING
Protection of Alodine Coatings from Thermal Aging by Removable Polymer Coatings – 39

SURFACE PROPERTIES
An Update of the Ground Testing of the Li-ion Batteries in Support of JPL's 2003 Mars Exploration Rover Mission – 167

SURFACE ROUGHNESS
Microwave Remote Sensing Modeling of Ocean Surface Salinity and Winds Using an Empirical Sea Surface Spectrum – 74

The Aquarius Scatterometer: An Active System for Measuring Surface Roughness for Sea-Surface Brightness Temperature Correction – 74

The Challenges of Landing on Mars – 169

SURFACE VEHICLES
Modeling Urban Surface Transportation Network Dependability and Security – 43

SURFACE WAVES
ISS Asset Tracking Using SAW RFID Technology – 55

SURGES
Surge Recovery Techniques for the Tevatron Cold Compressors – 139

SURVEYS
Camouflage Creams with New Properties – 23

Designing an Multi-petabyte Database for LSST – 164

Focal Plane Metrology for the LSST Camera – 165

LSST Camera Overview – 164

Optical Studies of Space Debris at GEO: Survey and Follow-up with Two Telescopes – 10

Reisevaner pa Fly 2005. (Norwegian Air Travel Survey, 2005.) – 3

Roadway Data Representation and Application Development: Developing a New Straight Line Diagram Application for the Florida Department of Transportation – 89

Space Human Factors Engineering Gap Analysis Project Final Report – 86

SWIFT OBSERVATORY
Recent Results from the Swift Burst Alert Telescope – 157

SWITCHES
Wavelength-Selective 1XN2 Switches with Two Dimensional Input Output Fiber Arrays – 47

SYMMETRY
Polarimetric Analysis of Scatterometer Data for Ocean Surface Wind Measurement – 73

Wakefield Calculation for Superconducting TM(sub 110) Cavity Without Azimuthal Symmetry – 112

SYNTHESIS
Novel Aryne Chemistry in Organic Synthesis – 34

SYNTHETIC APERTURE RADAR
The Glacier and Land Ice Surface Topography Interferometer (GLISTIN): A Novel Ka-band Digitally Beamformed Interferometer – 67

SYSTEM EFFECTIVENESS
Human-Factors Perspective On Simulator Fidelity Assessment – 84

SYSTEMS ENGINEERING
Design and Implementation of Ceph: A Scalable Distributed File System – 88

Execution of the Spitzer In-orbit Checkout and Science Verification Plan – 158

Fusing Quantitative Requirements Analysis with Model-based Systems Engineering – 101

Intelligent Vision Systems Independent Research and Development (IR&D) 2006 – 99

Propellant Analysis and Distillation Unit Design – 16

The Effects of Fault Counting Methods on Fault Model Quality – 97

SYSTEMS INTEGRATION
Integrated Photoelectrochemical Cell and System Having a Liquid Electrolyte – 68

Maintenance Procedure Display: Head Mounted Display (HMD) Evaluations – 82

Secure, Autonomous, Intelligent Controller for Integrating Distributed Sensor Webs – 5

TARGET ACQUISITION
Target Identification System and Method – 50

TARGET RECOGNITION
Target Identification System and Method – 50

TARGETS
High-Intensity Beam Collimation and Targetry – 124

Mars Odyssey: Off-nadir Imaging – 167

Target Identification System and Method – 50

TASKS
EVA Task Timing and Timeline Planning – 157

TECHNOLOGY UTILIZATION
Certification Process for Commercial Batteries for Payloads – 16

Cutting Edge RFID Technologies for NASA Applications – 154

Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

TEKTITES
Primary Mineralogical and Chemical Characteristics of the Major K/T and Late Eocene Impact Deposits – 75

TELECOMMUNICATION
Institute for Telecommunication Sciences Technical Progress Report, 2000 – 42

Institute for Telecommunication Sciences Technical Progress Report, 2001 – 43

Institute for Telecommunication Sciences Technical Progress Report, 2003 – 41

Institute for Telecommunication Sciences Technical Progress Report, 2004 – 41

Institute for Telecommunication Sciences Technical Progress Report, 2006 – 41

TELEMETRY
Characteristics of Post-Sorbent and High Temperature Catalytic Oxidizer Beds After Long-Term On-Orbit Use – 83

Considerations for Isochronous Data Services over the Proximity-1 Space Link – 167

TELESCOPES
Ares V an Enabling Capability for Future Space Astrophysics Missions – 9

Designing an Multi-petabyte Database for LSST – 164

Focal Plane Metrology for the LSST Camera – 165

Image Formation in High Contrast Optical Systems: The Role of Polarization – 143

LSST Camera Overview – 164

Recent Results from the Swift Burst Alert Telescope – 157

The Sensitivity of Shaped Pupil Coronagraphs to Optical Aberrations – 143

TEMPERATURE EFFECTS
Effects of High-frequency Wind Sampling on Simulated Mixed Layer Depth and Upper Ocean Temperature – 73

Properties of Fiberboard Overpack Material in the 9975 Shipping Package Following Thermal Aging – 23

Protection of Alodine Coatings from Thermal Aging by Removable Polymer Coatings – 39

Radiation-Hardened Electronics for the Space Environment – 15

TEMPERATURE MEASUREMENT
The Aquarius Scatterometer: An Active System for Measuring Surface Roughness for Sea-Surface Brightness Temperature Correction – 74

TEMPLATES
Multi-Dimensioned Easily Adjustable Single Sheet Container Formula with Indicia – 84

TENSORS
Efficient MATLAB Computations with Sparse and Factored Tensors – 87

TERRAIN ANALYSIS
Automated On-board Terrain Analysis for Precision Landings – 15

TERRAIN
Detecting Changes in Terrain Using Unmanned Aerial Vehicles – 61

TERRESTRIAL PLANETS
Search for Terrestrial Planets with ESA Planet Quest – 155

TEST FACILITIES
Cryogenics for the Supercondcuting Module Test Facility – 136

THERMAL ANALYSIS
Thermal Analysis of SC Quadrupoles in Accelerator Interaction Regions – 125

THERMAL EXPANSION
Thermal Properties of PZT95/5(1.8Nb) and PSZT Ceramics – 38

THERMAL PROTECTION
EVA Hazards due to TPS Inspection and Repair – 8

THERMODYNAMIC PROPERTIES
Thermal Properties of PZT95/5(1.8Nb) and PSZT Ceramics – 38

THERMOMETERS
Dynamic Acoustic Thermometer – 51

THICKNESS
Eddy Current System for Material Inspection and Flaw Visualization – 55

THIN FILMS
Growth of In-Situ Thin Films by Reactive Evaporation – 149

High Frequency Magnetic Thin Film Filter – 31

THREE DIMENSIONAL MODELS
Three Dimensional Constraint Effects on the Estimated (Delta)CTOD during the Numerical Simulation of Different Fatigue Threshold Testing Techniques – 28

TILES
EVA Hazards due to TPS Inspection and Repair – 8

TIME MEASUREMENT
Magnetostrictive Wavelet Method for Measuring Pulse Propagation Time – 132

TIN OXIDES
On-Line Coating of Glass with Tin Oxide by Atmospheric Pressure Chemical Vapor Deposition – 38

TITANIUM ALLOYS
Comparative Corrosion Behavior of Two Palladium Containing Titanium Alloys – 20

Oxidation Kinetics of a NiPtTi High Temperature Shape Memory Alloy – 34

TOKAMAK DEVICES
Particle and Energy Transport in the SOL and DIII-D and NSTX – 106

TOOLING
Water Soluble Tooling Materials for Composite Structures – 6

TOOLS
Apparatus and Method for Routing a Transmission Line through a Downhole Tool – 48

Method and Apparatus for Reworking a Microwave Module – 53

TOPOGRAPHY
The Glacier and Land Ice Surface Topography Interferometer (GLISTIN): A Novel Ka-band Digitally Beamformed Interferometer – 67

TOPOLOGY
Nanocrystals with Linear and Branched Topology – 106

TOXICITY
Note on Trasande et al., 'Public Health and Economic Consequences of Methylmercury Toxicity on the Developing Brain' – 70

TOXICOLOGY
Toxicological Evaluation of Realistic Emissions of Source Aerosols (Teresa): Application to Power Plant-Derived PM2.5 – 69

TRACE CONTAMINANTS
Characteristics of Post-Sorbent and High Temperature Catalytic Oxidizer Beds After Long-Term On-Orbit Use – 83

Volatile Organic Analyzer (VOA) in 2006: Repair, Revalidation, and Restart of Elektron Even – 15

TRACKING (POSITION)
Societal Benefits of Ocean Altimetry Data – 80

TRAINING DEVICES
Human-Factors Perspective On Simulator Fidelity Assessment – 84

TRANSFERRING
New Developments in Charge Transfer Multiplet Calculations: Projection Operations, Mixed-Spin States and pi-Bonding – 120

TRANSIENT RESPONSE
Contact Interface Verification for DYNA3D. Scenario 2: Multi-Surface Contact – 19

TRANSISTORS
Nitride-Based Transistors with a Protective Layer and a Low-Damage Recess and Methods of Fabrication Thereof – 148

TRANSITION METALS
Oxidations of Organic and Inorganic Substrates by Superoxo-, Hydroperoxo-, and Oxo-Compounds of the Transition Metals – 33

TRANSITION PROBABILITIES
Accurate Calculation of Oscillator Strengths for CI II Lines Using Non-orthogonal Wavefunctions – 164

TRANSLATING
Translation Tool – 153

Translator Database – 95

TRANSLATIONAL MOTION
Motion of the Mantle in the Translational Modes of the Earth and Mercury – 170

TRANSMISSION ELECTRON MICROSCOPY
Study of Interactions Between Microbes and Minerals by Scanning Transmission X-Ray Microscopy (STXM) – 34

TRANSMISSION LINES
Apparatus and Method for Routing a Transmission Line through a Downhole Tool – 48

TRANSMITTERS
Packet-Based and Pseudo-Packet Based Cryptographic Communications System and Method – 91

TRANSPORT THEORY
Heavy Quarks at RHIC from Parton Transport Theory – 102

TRANSPORTATION NETWORKS
Modeling Urban Surface Transportation Network Dependability and Security – 43

TRANSPORTATION
Decision Support for Bridge Programming and Budgeting – 90

Design Hurricane Storm Surge Pilot Study – 77

Efficacy of Utility Database Management – 89

Enhancement of Resilient Modulus Data for the Design of Pavement Structures in Florida – 151

Evaluation of the Dynamic Complex Modulus Test and Indirect Diametral Test for Implementing the AASHTO 2002 Design Guide for Pavement Structures in Florida – 3

Human Factors Guidelines for Intelligent Transportation Systems at the Highway-Rail Intersection: Technical Report – 85

Modeling Urban Surface Transportation Network Dependability and Security – 43

Roadway Data Representation and Application Development: Developing a New Straight Line Diagram Application for the Florida Department of Transportation – 89

TRAPPING
Method and System for Operating an Atomic Clock with Alternating Polarization Light – 145

TRMM SATELLITE
Observations of Lightning on Earth from the Lunar Surface – 165

TRUSSES
EXPRESS Pallet Payload Interface Requirements – 13

TUNABLE FILTERS
Systems and Methods for Tuning Filters – 51

TUNING
Systems and Methods for Tuning Filters – 51

TURBOCOMPRESSORS
Turbocharging a Crank-Case Scavenged and Direct-Injected Two-Stroke Engine for Snowmobile Applications – 154

TWO PHASE FLOW
Final Report for the ASC Gas-Powder Two-Phase Flow Modeling Project AD2006-09 – 57

ULTRAHIGH FREQUENCIES
Compact, Lightweight Dual- Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 41

Deep Space Ka-band Link Management and the MRO Demonstration: Long-term Weather Statistics Versus Forecasting – 77

ULTRAVIOLET DETECTORS
Bias Selectable Dual Band AlGaN Ultraviolet Detectors – 53

UMBILICAL CONNECTORS
Overview of Umbilical Extravehicular Activity (EVA) Interfaces in Life Support Systems on Spacecraft Vehicles and Applications for the Crew Exploration Vehicle (CEV) – 85

UNDERWATER ACOUSTICS
Applications of Time-Reversal Processing for Planetary Surface Communications – 44

URANIUM
Biogenic UO-2- Characterization and Surface Reactivity – 31

URBAN PLANNING
Policy Document on Earth Observation for Urban Planning and Management: State of the Art and Recommendations for Application of Earth Observation in Urban Planning – 67

URBAN TRANSPORTATION
Modeling Urban Surface Transportation Network Dependability and Security – 43

UREILITES
Processes in Early Planetesimals: Evidence from Ureilite Meteorites – 72

USER MANUALS (COMPUTER PROGRAMS)
Aerosol Attenuation Model for Scandinavian Environment; User Manual – 70

UTILITIES
Efficacy of Utility Database Management – 89

VALVES
Engine Valve Actuation for Combustion Enhancement – 63

Microfabricated Elastomeric Valve and Pump Systems – 40

VAPOR DEPOSITION
On-Line Coating of Glass with Tin Oxide by Atmospheric Pressure Chemical Vapor Deposition – 38

VELOCITY DISTRIBUTION
Electron Collisional Excitation Rates for OI USING the B-Spline R-Matrix Approach – 163

VENTS
Mars Odyssey: Off-nadir Imaging – 167

VESTIBULAR TESTS
A Brief Historical Review of Vestibular and Sensorimotor Research Associated with Space Flight – 81

VIBRATION TESTS
Method and Device and for Ultra Sonic Vibration Detection During High-Performance Machining – 47

VIBRATION
Wire Bond Vibration of Forward Pixel Tracking Detector of CMS – 131

VIDEO COMPRESSION
Method and Device for Online Dynamic Semantic Video Compression and Video Indexing – 151

VIDEO DATA
Detecting Changes in Terrain Using Unmanned Aerial Vehicles – 61

Method and Device for Online Dynamic Semantic Video Compression and Video Indexing – 151

VIDEO SIGNALS
Reduced Reference Video Calibration Algorithms – 90

VIEWING
Spitzer Space Telescope Sequencing Operations Software, Strategies, and Lessons Learned – 160

VIOLENCE
Measurement and ALE3D Simulation of Violence in a Deflagration Experiment with LX-10 and Aermet-100 Alloy – 18

VISIBILITY
Noise, Edge Extraction and Visibility of Features – 61

Real-time Enhancement, Registration, and Fusion for an Enhanced Vision System – 60

WALLS
Results from the CDX-U Lithium Wall and NSTX Lithium Pallet Injection and Evaporation Experiments – 106

WARNING SYSTEMS
Enhanced Images for Checked and Carry-on Baggage and Cargo Screening – 59

Parameters for Intrusion Analysis – 93

WATER POLLUTION
Detecting and Quantifying Reductive Dechlorination During Monitored Natural attenuation at the Savannah River CBRP Site – 32

WATER VAPOR
Testing of an Amine-Based Pressure-Swing System for Carbon Dioxide and Humidity Control – 84

WATER
Crystal Water on Mars: Insights from the Mars Exploration Rovers – 156

Hydro Static Water Level Systems at Fermilab – 57

Measurement and Prediction of Water Outgassing from TR55 Silicone by the Isoconversional Technique – 17

Non-molecular Phases of HF and H2O Under Detonation-like Conditions – 108

Water Soluble Tooling Materials for Composite Structures – 6

WAVE FRONTS
Target Selection and Imaging Requirements for JWST Fine Phasing – 143

The Sensitivity of Shaped Pupil Coronagraphs to Optical Aberrations – 143

Two-Sided Pyramid Wavefront Sensor in the Direct Phase Mode – 144

WAVE FUNCTIONS
Accurate Calculation of Oscillator Strengths for CI II Lines Using Non-orthogonal Wavefunctions – 164

Counting Rules, Holographic Wave Functions, Meromorphization and Quark-Hadron Duality – 138

WAVEFORMS
Magnetostrictive Wavelet Method for Measuring Pulse Propagation Time – 132

WAVEGUIDES
Fiber Waveguides and Methods of Making the Same – 52

Ion Exchange Waveguides and Methods Fabrication – 146

Phase Matched Parametric Light Generation in Monolithically Integrated Intersubband Optical Devices – 144

WAVELET ANALYSIS
Magnetostrictive Wavelet Method for Measuring Pulse Propagation Time – 132

WEATHER FORECASTING
Deep Space Ka-band Link Management and the MRO Demonstration: Long-term Weather Statistics Versus Forecasting – 77

WIND EFFECTS
Effects of High-frequency Wind Sampling on Simulated Mixed Layer Depth and Upper Ocean Temperature – 73

WIND MEASUREMENT
Effects of High-frequency Wind Sampling on Simulated Mixed Layer Depth and Upper Ocean Temperature – 73

Polarimetric Analysis of Scatterometer Data for Ocean Surface Wind Measurement – 73

WIND (METEOROLOGY)
Windsat Validation Using Seawinds, Windrad and POLSCAT Measurements – 76

WIND PROFILES
Improved Hurricane Boundary Layer Observations with the Imaging Wind and Rain Airborne Profiler – 77

WIND VELOCITY MEASUREMENT
Windsat Validation Using Seawinds, Windrad and POLSCAT Measurements – 76

WIND VELOCITY
Improved Hurricane Boundary Layer Observations with the Imaging Wind and Rain Airborne Profiler – 77

Polarimetric Analysis of Scatterometer Data for Ocean Surface Wind Measurement – 73

WINDPOWER UTILIZATION
New Family of Multilevel Matrix Converters for Wind Power Applications. Final Report. July 2002-March 2006 – 55

WIRELESS COMMUNICATION
Applications of Time-Reversal Processing for Planetary Surface Communications – 44

Method and Systems for Cooperative Transmission in Multi-Hop Ad-Hoc Networks – 45

NASA Bluetooth Wireless Communications – 12

Systems and Methods for Automatically Placing Nodes in an Ad Hoc Network – 45

WIRE
Cost Effective Open Geometry HTS MRI System amended to BSCCO 2212 Wire for High Field Magnets – 64

Wire Bond Vibration of Forward Pixel Tracking Detector of CMS – 130

X RAY ASTRONOMY
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 163

The Chandra X-ray Observatory: An Astronomical Facility Available to the World – 158

X RAY ASTROPHYSICS FACILITY
The Chandra X-ray Observatory: An Astronomical Facility Available to the World – 159

X RAY IMAGERY
Enhanced Images for Checked and Carry-on Baggage and Cargo Screening – 59
Hard X-ray Imaging for Measuring Laser Absortion Spatial Profiles on the National Ignition Facility – 145
X RAYS
Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System – 171
Hard X-ray Imaging for Measuring Laser Absortion Spatial Profiles on the National Ignition Facility – 145
X-38 CREW RETURN VEHICLE
Developing the Parachute System for NASA's Orion: An Overview at Inception – 14
YAG LASERS
Numerical Simulation of a Flashlamp Pumped Nd:YAG Laser (Numerisk Simulering av en Blixlampspumpad Nd:YAG Laser) – 146
ZODIACAL DUST
Measuring Extended Structure in Stars Using the Keck Interferometer Nuller – 158

Personal Author Index

Abdulla, G.
Designing an Multi-petabyte Database for LSST – 164

Abdullin, S.
Tevatron-for-LHC Report: Preparations for Discoveries – 123

Abercomby, K. J.
Optical Studies of Space Debris at GEO: Survey and Follow-up with Two Telescopes – 10

Acosta, D.
Tevatron-for-LHC Report: Preparations for Discoveries – 123

Adam, Niklas M.
Assessment of Silver Based Disinfection Technology for CEV and Future US Spacecraft – 85

Adams, Douglas S.
Mid-frequency Band Dynamics of Large Space Structures – 13

Aggarwal, P.
Bias Selectable Dual Band AlGaN Ultraviolet Detectors – 53

Agol, E.
Developments in Planet Detection using Transit Timing Variations – 161

Ahang, Z.
Coatings, Coated Articles and Methods of Manufacture Thereof, PAT-APPL-11-418-626 – 21

Alderman, R. A.
Relative Humidity Sensor Enclosed with Formed Heating Element – 52

Alessi, J.
Ion Source Choices An H Source for the High Intensity Neutrino Source – 119

Alexeev, N.
Low Current Plasmatron Fuel Converter Having Enlarged Volume Discharges – 62

Alford, K. L.
Methods of Making Monolayers – 24

Alivisatos, A. P.
Nanocrystals with Linear and Branched Topology – 106

Allberg, H.
RSD, Retinal Scanning Display Pilot Study and Evaluation – 49

Allendorf, M.
On-Line Coating of Glass with Tin Oxide by Atmospheric Pressure Chemical Vapor Deposition – 37

Almazeedi, K.
New Family of Multilevel Matrix Converters for Wind Power Applications. Final Report. July 2002-March 2006 – 55

Ambrosio, G.
Feasibility Study of Nb3Al Rutherford Cable for High Field Accelerator Magnet Application – 127

Amendt, P.
Hard X-ray Imaging for Measuring Laser Absortion Spatial Profiles on the National Ignition Facility – 145

Amro, N. A.
Stabilization of Self-Assembled Monolayers – 26

Andreev, N.
Development of Rutherford-type Cables for High Field Accelerator Magnets at Fermilab – 148

Feasibility Study of Nb3Al Rutherford Cable for High Field Accelerator Magnet Application – 127

Angal-Kalimin, D.
ILC Beam Delivery WG Summary: Optics, Collimation and Background – 110

Angkititrakul, S.
New Family of Multilevel Matrix Converters for Wind Power Applications. Final Report. July 2002-March 2006 – 55

Ankenbrandt, C.
Using the Fermilab Proton Source for a Muon to Electron Conversion Experiment – 128

Antar, G.
DIII-D Studies of Massive Gas Injection Fast Shutdowns for Disruption Mitigation – 107

Apollinari, G.
Design of 325MHz Single and Triple Spoke Resonators at FNAL – 104

Arabian, A. K.
Apparatus and Method for Automated Parcel Screening – 151

Archer, Myla
Extended Abstract: Organizing Automaton Specifications to Achieve Faithful Representation – 97

PVS Strategies for Proving Abstraction Properties of Automata – 101

Arendt, Richard G.
SN 1987A after 18 Years: Mid-Infrared GEMINI and SPITZER Observations of the Remnant – 159

Armitage, R. D.
Hafnium Nitride Buffer Layers for Growth of GaN on Silicon – 48

Arnold, Steven M.
A Framework for Performing Multiscale Stochastic Progressive Failure Analysis of Composite Structures – 25

Arnold William
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

Aronson, S.
Future of Spin Physics at BNL – 105

Artz, G. J.
Water Soluble Tooling Materials for Composite Structures – 6

Asai, S.
Tevatron-for-LHC Report: Preparations for Discoveries – 123

Atac, M.
Wire Bond Vibration of Forward Pixel Tracking Detector of CMS – 130

Atramentov, O.
Tevatron-for-LHC Report: Preparations for Discoveries – 123

Atwood, D.
High-Octane and Mid-Octane Detonation Performance of Leaded and Unleaded Fuels in Naturally Aspirated, Piston, Spark Ignition Aircraft Engines – 2

Auerbech, D.
Energy Measurements of Trapped Electrons from a Plasma Wakefield Accelerator – 121

Autermann, C.
Search for R-Parity Violating Supersymmetry with the D0 Detector – 133

Bachnak, R.
Eddy Current System for Material Inspection and Flaw Visualization – 54

Backstrom, M.
Pulsed Power 3 GHz Feasibility Study in FOI 36.7 m3 Mode Stirred Reverberation Chamber – 46

Badakov, H.
Results from the UCLA/FNPL Underdense Plasma Lens Experiment – 107

Bader, B. W.
Efficient MATLAB Computations with Sparse and Factored Tensors – 87

Baer, H.
Tevatron-for-LHC Report: Preparations for Discoveries – 123

Baker, David L.
NASA Hydrogen Peroxide Propellant Hazards Technical Manual – 40

Baker, K.
Two-Sided Pyramid Wavefront Sensor in the Direct Phase Mode – 144

Bakhtiari, M.
DIII-D Studies of Massive Gas Injection Fast Shutdowns for Disruption Mitigation – 107

Balazs, B.
Measurement and Prediction of Water Outgassing from TR55 Silicone by the Isoconversional Technique – 17

Bandara, S. V.
Megapixel Multi-band QWIP Focal Plane Arrays – 58

Banks, Curtis
Strain Measurement Using FBG on COPV in Stress Rupture Test – 25

Bannochie, C. J.
Measurement and Prediction of Radiolytic Hydrogen Production in Defense Waste Processing Slurries at Savannah River Site – 71

Barido, Richard A.
Overview of Umbilical Extravehicular Activity (EVA) Interfaces in Life Support Systems on Spacecraft Vehicles and Applications for the Crew Exploration Vehicle (CEV) – 84

Barker, E. S.
Optical Studies of Space Debris at GEO: Survey and Follow-up with Two Telescopes – 10

Barlow, C.
Microelectronic Arrays for Cell-Based Functional Genomics/ High Throughput Phenotyping by Electrokinetic Assembly – 30

Bar-Ness, Y.
Combined Frequency-Time Domain Power Adaptation for CDMA Communication System – 42

Barnhart, R. C.
Data Monitoring and Recovery – 8

Barragan, Michelle H.
Propellant Analysis and Distillation Unit Design – 16

Barrera, Louis K.
Propellant Analysis and Distillation Unit Design – 16

Bar-Sever, Yoaz E.
Real-time Sub-cm Differential Orbit Determination of two Low-Earth Orbiters with GPS Bias Fixing – 12

Barton, Richard J.
Applications of Time-Reversal Processing for Planetary Surface Communications – 44

Bartram, B.
Spray Shadowing for Stress Relief and Mechanical Locking in Thick Protective Coatings – 39

Bartschat, K.
Low-Energy Elastic Electron Scattering by Atomic Oxygen – 141

Barzi, E.
Development of Rutherford-type Cables for High Field Accelerator Magnets at Fermilab – 148

Feasibility Study of Nb3Al Rutherford Cable for High Field Accelerator Magnet Application – 127

Bastow, K. F.
Flavone Acetic Acid Analogs and Methods of Use Thereof – 30

Basu, P.
Systems and Methods for Automatically Placing Nodes in an Ad Hoc Network – 45

Batygin, Y.
Start-to-end Beam Optics Development and Multi-Particle Tracking for the ILC Undulator-based Positron Source – 108

Bauer, Jeff
The NASA Dryden Flight Research Center Unmanned Aircraft System Service Capabilities – 1

Bawendi, M. G.
Method of Preparing Nanocrystals – 24

Baysinger, Mike
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

Bazzano, A.
A Possible Magnetar Nature for IGR J16358-4726 – 157

Beck, J. D.
Apparatus for Transport and Analysis of Particles Using Dielectrophoresis – 21

Becla, J.
Designing an Multi-petabyte Database for LSST – 164

Bednarcyk, Brett A.
A Framework for Performing Multiscale Stochastic Progressive Failure Analysis of Composite Structures – 25

Beedlow, P. A.
Summary of NHEERL Ecological Research on Global Climate Change – 79

Beeson, Harold
Technical Note: Some Issues Related to the Selection of Polymers for Aerospace Oxygen Systems – 38

Beiersdorfer, P.
Results from the CDX-U Lithium Wall and NSTX Lithium Pallet Injection and Evaporation Experiments – 106

Bell, M. G.
Results from the CDX-U Lithium Wall and NSTX Lithium Pallet Injection and Evaporation Experiments – 106

Bell, R. E.
Results from the CDX-U Lithium Wall and NSTX Lithium Pallet Injection and Evaporation Experiments – 106

Bellantoni, L.
Wakefield Calculation for Superconducting TM(sub 110) Cavity Without Azimuthal Symmetry – 112

Bellas, A.
Policy Innovation Impacts on Scrubber Electricity Usage – 70

Benke, M.
Modeling Urban Surface Transportation Network Dependability and Security – 43

BEnnion, B.
Understanding the Mechanism of Human P450 CYP1A2 Using Coupled Qunatum-Classical Simulations in a Dynamical Environment – 34

Benoit, G.
Fiber Waveguides and Methods of Making the Same – 52

Benzerara, K.
Study of Interactions Between Microbes and Minerals by Scanning Transmission X-Ray Microscopy (STXM) – 34

Berggren, P.
RSD, Retinal Scanning Display Pilot Study and Evaluation – 49

Bernhard, R. P.
Investigation of MMOD Impact on Shuttle Payload Bay Door Radiator – 13

Berry, M.
Energy Measurements of Trapped Electrons from a Plasma Wakefield Accelerator – 121

Beyanin, A.
Phase Matched Parametric Light Generation in Monolithically Integrated Intersubband Optical Devices – 144

Beyerlein, S.
Advanced Vehicle Technologies for Efficient Powertrain Performance – 154

Chassis Dynamometer Testing of Aqueous Ethanol in a Transit Van – 153

Beznosko, D.
Extruded Scintillator for the Calorimetry Applications – 130

Bharatan, Sudhakar
Growth and Properties of Lattice Matched GaAsSbN Epilayer on GaAs for Solar Cell Applications – 131

Influence of Growth Parameters and Annealing on Properties of MBE Grown GaAsSbN SQWs – 149

Bhata, S. N.
Microelectronic Arrays for Cell-Based Functional Genomics/ High Throughput Phenotyping by Electrokinetic Assembly – 30

Bibler, N. E.
Measurement and Prediction of Radiolytic Hydrogen Production in Defense Waste Processing Slurries at Savannah River Site – 71

Bickford, J. A.
Dual Microwave Cavity Accelerometer – 54

Biesiadecki, Jeffrey
Autonomous Detection of Dust Devils and Clouds on Mars – 154

Biggs, S. J.
Thin, Flexible Actuator Array to Produce Complex Shapes and Force Distributions – 131

Bigos, M.
User Definable Hierarchy for Database Management – 152

Bliss, David A.
Spitzer Space Telescope Sequencing Operations Software, Strategies, and Lessons Learned – 159

Blumenfeld, J.
Energy Measurements of Trapped Electrons from a Plasma Wakefield Accelerator – 121

Boccippio, D. J.
Lightning Charge Retrievals: Dimensional Reduction, LDAR Constraints, and a First Comparison with LIS Satellite Data – 76

Bodewits, D.
Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System – 171

Boedo, J. A.
DIII-D Studies of Massive Gas Injection Fast Shutdowns for Disruption Mitigation – 107

Particle and Energy Transport in the SOL and DIII-D and NSTX – 105

Bogert, D.
Using the Fermilab Proton Source for a Muon to Electron Conversion Experiment – 128

Bogert, Philip B.
The Effect of Delamination on Damage Path and Failure Load Prediction for Notched Composite Laminates – 27

Bolotnikov, A. E.
Readout System for Arrays of Frisch-ring CdZnTe Detectors – 136

Bonacuse, P. J.
Bias Selectable Dual Band AlGaN Ultraviolet Detectors – 53

Booth, Andrew
Measuring Extended Structure in Stars Using the Keck Interferometer Nuller – 158

Borissov, E.
Development of Rutherford-type Cables for High Field Accelerator Magnets at Fermilab – 148

Bossert, R. J.
Sonic Helium Detectors in the Fermilab Tevatron – 138

Bossert, R.
Critical Speed Measurements in the Tevatron Cold Compressors – 122

Botez, D.
Intersubband Mid-Infrared Electroluminescent Semiconductor Devices – 126

Boucheron, E. A.
Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan. Part 1: ASC Software Quality Engineering Practices, Version 2.0 – 94

Bouchet, Patrice
SN 1987A after 18 Years: Mid-Infrared GEMINI and SPITZER Observations of the Remnant – 159

Bourdon, C. J.
Hydrodynamic Effects on Coalescence – 56

Bowers, Al
SOFIA: Stratospheric Observatory For Infrared Astronomy – 160

Bowers, Albion H.
Gliding Experiments of the Wright Brothers: The Wrights and Flight Research 1899-1908 – 6

Boyd, John
Differential Mobility Spectrometry: Preliminary Findings on Determination of Fundamental Constants – 149

Boyles, Carole
Execution of the Spitzer In-orbit Checkout and Science Verification Plan – 158

Bozovic, E.
Basic Research Needs for Superconductivity. Report of the Basic Energy Sciences Workshop on Superconductivity, May 8-11, 2006 – 104

Bradbury, N.
Turbocharging a Crank-Case Scavenged and Direct-Injected Two-Stroke Engine for Snowmobile Applications – 154

Bradshaw, R. W.
Protection of Alodine Coatings from Thermal Aging by Removable Polymer Coatings – 39

Brahic, A.
Cassini Observes the Active South Pole of Enceladus – 160

Brandt, O.
Measurement of the Mass of the Top Quark in Dilepton Final States with the DO-Detector – 115

Brandt, S. A.
Design and Implementation of Ceph: A Scalable Distributed File System – 87

Breckinridge, James B.
Image Formation in High Contrast Optical Systems: The Role of Polarization – 143

Brett, A.
CMS DAQ Event Builder Based on Gigabit Ethernet – 133

Brinkhuis, Henk
The Cretaceous/Paleogene Transition on the East Tasman Plateau, Southwestern Pacific – 168

Briscoe, M.
Apparatus and Method for Routing a Transmission Line through a Downhole Tool – 48

Bromberg, L.
Low Current Plasmatron Fuel Converter Having Enlarged Volume Discharges – 62

Brooks, C. F.
Hydrodynamic Effects on Coalescence – 56

Bross, A.
MUCOOL RF Program – 126

Bross, M.
Update for the MuCool Test Area – 139

Brown, G. E.
Biogenic UO-2- Characterization and Surface Reactivity – 31

Durability of Silicate Glasses: An Historical Approach – 39

Study of Interactions Between Microbes and Minerals by Scanning Transmission X-Ray Microscopy (STXM) – 34

Bryan, D.
Roadway Data Representation and Application Development: Developing a New Straight Line Diagram Application for the Florida Department of Transportation – 89

Buchholz, D.
DO Hot Topics – 113

Buckle, I. G.
Seismic Retrofitting Manual for Highway Structures. Part 1: Bridges (December 2006) – 74

Buckley, P. R.
Shape Memory System With Integrated Actuation Using Embedded Particles – 35

Buechler, D. E.
Observations of Lightning on Earth from the Lunar Surface – 165

Burke, D.
LSST Camera Overview – 164

Burnham, A. K.
Measurement and Prediction of Water Outgassing from TR55 Silicone by the Isoconversional Technique – 17

Burns, G. R.
Thermal Properties of PZT95/5(1.8Nb) and PSZT Ceramics – 38

Burns, J. A.
Cassini Observes the Active South Pole of Enceladus – 160

Burov, A.
Coherent Instabilities at the FNAL Booster – 109

Status of High Energy Electron Cooling in FNAL's Recycler Ring – 119

Burrows, L. J.
Ion Exchange Waveguides and Methods Fabrication – 146

Burt, G.
Wakefield Calculation for Superconducting TM(sub 110) Cavity Without Azimuthal Symmetry – 112

Buth, C. E.
Repair/Retrofit Anchorage Designs for Bridge Rails – 22

Bylina, E. J.
Visualization and Processing of Multidimensional Data Using Prefiltering and Sorting Criteria – 96

Cahill, P.
Evaluation of the Reproducibility of the FAA Oil Burner Fire Test for Aircraft Seat Cushions – 5

Calders, E.
Investigating Surety Methodologies for Cognitive Systems – 81

Callahan, Michael R.
Assessment of Silver Based Disinfection Technology for CEV and Future US Spacecraft – 85

Camarda, G. S.
Readout System for Arrays of Frisch-ring CdZnTe Detectors – 136

Camley, R. E.
High Frequency Magnetic Thin Film Filter – 31

Campbell, Melissa
Testing of an Amine-Based Pressure-Swing System for Carbon Dioxide and Humidity Control – 84

Cano, E.
CMS DAQ Event Builder Based on Gigabit Ethernet – 133

Cao, Y.
Methods of Fabricating Devices by Transfer of Organic Material – 49

Capizzo, Pete
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

Carbrea, S.
Top Pair Production Cross Section at Square Root of s Equals 1.96 TEV and a Search V Plus A Current in Top Quark Decay – 116

Carcagno, R.
Superconducting Solenoid Magnet Test Results – 114

Carigan, R. A.
Fundamental Channeling Questions at Ultra Relativistic Energies – 103

Carison, M. A.
Apparatus and Method for Automated Parcel Screening – 151

Carlin, A.
Global Climate Control: Is There a Better Strategy Than Reducing Greenhouse Gas Emissions – 71

If Geoengineering Is the First Best Step Towards Global Climate Change Control, How Could It Best Be Implemented – 79

Carlson, K.
Status of High Energy Electron Cooling in FNAL's Recycler Ring – 119

Carpenter, M. H.
Public Release of a One Dimensional Version of the Photon Clean Method (PCM1D) – 114

Carrano, C. J.
Using Historic Models of C(sub n)(sup 2) to Predict r(sub 0) and Regimes Affected by Atmospheric Turbulence for Horizontal, Slant and Topological Paths – 78

Carrigan, R. A.
Channeling Collimation Studies at the Fermilab Tevatron – 111

Carroll, N. M.
Anti-Icing Pavement Coating Study at Chicago O'Hare International Airport – 2

Carswell, J.
Improved Hurricane Boundary Layer Observations with the Imaging Wind and Rain Airborne Profiler – 76

Casey, B.
Radiation Damage to Scintillator in the D0 Luminosity Monitor – 128

Castano, Andres
Autonomous Detection of Dust Devils and Clouds on Mars – 154

Castano, Rebecca
Autonomous Detection of Dust Devils and Clouds on Mars – 154

Castro, J. M.
In-Situ Cleaning of Metal Photo-Cathodes in rf Guns – 121

Catanzarite, Joseph H.
Search for Terrestrial Planets with ESA Planet Quest – 155

Caudell, T.
Investigating Surety Methodologies for Cognitive Systems – 81

Celinski, Z. J.
High Frequency Magnetic Thin Film Filter – 31

Chae, Y.
On-Line Coating of Glass with Tin Oxide by Atmospheric Pressure Chemical Vapor Deposition – 37

Chakraborty, J.
Roadway Data Representation and Application Development: Developing a New Straight Line Diagram Application for the Florida Department of Transportation – 89

Challis, Peter
SN 1987A after 18 Years: Mid-Infrared GEMINI and SPITZER Observations of the Remnant – 159

Chamis, Christos C.
Composite Nanomechanics: A Mechanistic Properties Prediction – 27

Champagne, Nathan J.
Using EIGER for Antenna Design and Analysis – 97

Chan, J.
Feasibility of Single Molecule DNA Sequencing Using Surface-Enhanced Raman Scattering – 140

Chan, Steven
Impact of Rainfall on the Retrieval of Soil Moisture Using AMSR-E Data – 79

Chandane, S. S.
Static and Dynamic Performance of RC Bridge Bents with Architectural-Flared Columns – 64

Chang, J.
Variable Structure Diagnostics Approach Achieving Optimized Low-Frequency Data Sampling for EMA Motoring Systems – 7

Changy, P.
Improved Hurricane Boundary Layer Observations with the Imaging Wind and Rain Airborne Profiler – 76

Chavis, Katherine
Intelligent Vision Systems Independent Research and Development (IR&D) 2006 – 99

Chen, C. H.
Methods and Compositions for Modulating Mitochondrial Aldehyde Dehydrogenase-2 – 19

Chen, E.
CO2 Capture by Absorption with Potassium Carbonate Fourth Quarterly Report 2006. Quarterly Progress Report. Reporting Period: October 1, 2006 through December 31, 2006 – 72

Chen, I. S.
Feedback Control System and Method for Maintaining Constant Resistance Operation of Electrically Heated Elements – 48

Cheng, A.
Study of Normal Operational Landing Performance on Subsonic, Civil, Narrow-Body Jet Aircraft During Instrument Landing System Approaches – 2

Cheng, Patti
Differential Mobility Spectrometry: Preliminary Findings on Determination of Fundamental Constants – 149

Cheu, E.
Time-Integrated Charge Asymmetries at D0 – 125

Chi, Z.
FPGA Curved Track Fitter with Very Low Resource Usage – 128

Chiang, A.
User Definable Hierarchy for Database Management – 152

Chidester, S.
Characterization of Damaged Materials – 17

Chidester, Thomas R.
Voluntary Aviation Safety Information-Sharing Process: Preliminary Audit of Distributed FOQA and ASAP Archives Against Industry Statement of Requirements – 4

Chien, Steve
Autonomous Detection of Dust Devils and Clouds on Mars – 154

Choong, V. E.
Polymer and Small Molecule Based Hybrid Light Source – 53

Chou, H. P.
Microfabricated Elastomeric Valve and Pump Systems – 40

Chou, W.
Efficiency and Lifetime of Carbon Foils – 32

Induction Barrier RF and Applications in Main Injector – 110

Choulis, S.
Polymer and Small Molecule Based Hybrid Light Source – 53

Christian, D. J.
Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System – 171

Christian, H. J., Jr.
Observations of Lightning on Earth from the Lunar Surface – 165

Christiansen, E. L.
Investigation of MMOD Impact on Shuttle Payload Bay Door Radiator – 13

Chu, T.
Improved Hurricane Boundary Layer Observations with the Imaging Wind and Rain Airborne Profiler – 76

Chunchu, Prasad B.
The Effect of Delamination on Damage Path and Failure Load Prediction for Notched Composite Laminates – 27

Cittolin, S.
CMS DAQ Event Builder Based on Gigabit Ethernet – 133

Clare, Loren
Space-based Networking Technology Developments in the Interplanetary Network Directorate Information Technology Program – 152

Clark, B. C.
Crystal Water on Mars: Insights from the Mars Exploration Rovers – 156

Claylon, C. E.
Energy Measurements of Trapped Electrons from a Plasma Wakefield Accelerator – 121

Clement, B.
Space-based Networking Technology Developments in the Interplanetary Network Directorate Information Technology Program – 152

Clendenin, J. E.
In-Situ Cleaning of Metal Photo-Cathodes in rf Guns – 121

Cochran, Anita L.
Spectroscopic Investigations of Fragment Species in the Coma – 171

Cohen, R.
Electron Production and Collective Field Generation in Intense Particle Beams – 140

Cohn, D. R.
Low Current Plasmatron Fuel Converter Having Enlarged Volume Discharges – 62

Colavita, M. Mark
Measuring Extended Structure in Stars Using the Keck Interferometer Nuller – 158

Colby, E. R.
In-Situ Cleaning of Metal Photo-Cathodes in rf Guns – 121

Coleman, W. J.
Visualization and Processing of Multidimensional Data Using Prefiltering and Sorting Criteria – 96

Collier, N. O.
Efficacy of Utility Database Management – 89

Collis, Ward J.
Growth and Properties of Lattice Matched GaAsSbN Epilayer on GaAs for Solar Cell Applications – 131

Influence of Growth Parameters and Annealing on Properties of MBE Grown GaAsSbN SQWs – 149

Columus, H.
Method for Computing Subjective Dissimilarities Among Discrete Entities – 93

Combi, M. R.
Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System – 171

Combi, Michael R.
Gas Dynamics and Kinetics in the Cometary Coma: Theory and Observations – 170

On The Effect of Electron Collisions in the Excitation of Cometary HCN – 172

Spectroscopic Investigations of Fragment Species in the Coma – 171

Contreras, R.
Improved Hurricane Boundary Layer Observations with the Imaging Wind and Rain Airborne Profiler – 76

Convery, M. E.
High Q(sup 2) QCD Physics at the Tevatron – 117

Cook, C. J.
System and Method for Identifying, Reporting, and Evaluating Presence of Substance – 95

Cook, Steven A.
From ESAS to Ares: A Chronology – 9

Cooke, B. J.
Target Identification System and Method – 50

Coppolino, Robert N.
Mid-frequency Band Dynamics of Large Space Structures – 13

Cordon, D.
Chassis Dynamometer Testing of Aqueous Ethanol in a Transit Van – 153

Corelis, D. J.
Thermal Properties of PZT95/5(1.8Nb) and PSZT Ceramics – 38

Cornford, Steven L.
Fusing Quantitative Requirements Analysis with Model-based Systems Engineering – 101

Craig, R.
Measurement of the Inclusive Jet Cross Section Using the Midpoint Algorithm in Run II at the Collider Detector at FERMILAB (CDF) – 124

Crane, Tracie
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

Crawford, R. L.
Coupling of Realistic Real Estimates with Genomics for Assessing Contaminant Attenuation and Long-Term Plume Containment – 114

Crawford, R. W.
Reformulated Diesel Fuel – 62

Crossaairt, D. S.
Optical System for Generating Three-Dimensional Images – 144

Cuhadar-Doenzelmann, T.
Rare B decays in Collider Experiments – 109

Cui, Y.
Readout System for Arrays of Frisch-ring CdZnTe Detectors – 136

Cummings, E. B.
Methods and Devices for High-Throughput Dielectrophoretic Concentration – 125

Cummings, M. A.
Update for the MuCool Test Area – 139

Curtis, Gary N.
Co-axial Joint Technology Applied to Antenna Backup Structures – 11

Czarapata, P. C.
Beam-Induced Damage to the Tevatron Components and What has been Done About it – 136

Dankanich, John
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

Danziger, John
SN 1987A after 18 Years: Mid-Infrared GEMINI and SPITZER Observations of the Remnant – 159

Darve, C.
Design, Fabrication, and Test of an SRF Cryomodule Prototype at Fermilab – 125

Daso, E. O.
Bias Selectable Dual Band AlGaN Ultraviolet Detectors – 53

Daugherty, W. L.
Properties of Fiberboard Overpack Material in the 9975 Shipping Package Following Thermal Aging – 23

Dautenhahn, N.
Final Report for the Network Authentication Investigation and Pilot – 87

Davarian, Faramaz
Deep Space Ka-band Link Management and the MRO Demonstration: Long-term Weather Statistics Versus Forecasting – 77

Daverman, R. D.
Thin, Flexible Actuator Array to Produce Complex Shapes and Force Distributions – 131

Davis, G.
Designing Focusing Solenoids for Superconducting RF Accelerators – 114

Davis, J.
CO2 Capture by Absorption with Potassium Carbonate Fourth Quarterly Report 2006. Quarterly Progress Report. Reporting Period: October 1, 2006 through December 31, 2006 – 72

de Grout, F. M. F.
New Developments in Charge Transfer Multiplet Calculations: Projection Operations, Mixed-Spin States and pi-Bonding – 120

Dean, Bruce H.
Target Selection and Imaging Requirements for JWST Fine Phasing – 143

DeBoer, M. P.
Hydrodynamic Effects on Coalescence – 56

DeBuizer, James M.
SN 1987A after 18 Years: Mid-Infrared GEMINI and SPITZER Observations of the Remnant – 159

DeGeronimo, G.
Readout System for Arrays of Frisch-ring CdZnTe Detectors – 136

DeGraff, B.
Critical Speed Measurements in the Tevatron Cold Compressors – 122

Dehaven, M.
Characterization of Damaged Materials – 17

Deibelg, C. E.
Fast Faraday Cup with High Band Width – 107

DeJongh, F.
Using the Fermilab Proton Source for a Muon to Electron Conversion Experiment – 128

DeJonghe, L. C.
Solid State Electrochemical Composite – 29

DeLand, Matthew T.
Neutral Atmospheric Influences of the Solar Proton Events in October-November 2003 – 173

DelGenio, A. D.
Cassini Observes the Active South Pole of Enceladus – 160

DelSanto, M.
A Possible Magnetar Nature for IGR J16358-4726 – 157

Dempsey, B. J.
Anti-Icing Pavement Coating Study at Chicago O'Hare International Airport – 2

Den Braven, K.
Turbocharging a Crank-Case Scavenged and Direct-Injected Two-Stroke Engine for Snowmobile Applications – 154

Deneri, K.
Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System – 171

Deng, Y.
Integrated Photoelectrochemical Cell and System Having a Liquid Electrolyte – 67

Denk, T.
Cassini Observes the Active South Pole of Enceladus – 160

Denstadli, J. M.
Reisevaner pa Fly 2005. (Norwegian Air Travel Survey, 2005.) – 3

Deshpande, A.
Future of Spin Physics at BNL – 105

DeVaughan, K.
Radiation Damage to Scintillator in the D0 Luminosity Monitor – 128

Dewald, E. L.
Hard X-ray Imaging for Measuring Laser Absortion Spatial Profiles on the National Ignition Facility – 145

Dewel, D. H.
In-Situ Cleaning of Metal Photo-Cathodes in rf Guns – 121

DiAntonio, C.
Thermal Properties of PZT95/5(1.8Nb) and PSZT Ceramics – 38

Dietz, S.
Production Scale-Up of Activated Carbons for Ultracapacitors. (Final Report, September 30, 2004-September 30, 2006) – 50

Dillard, A. E.
Study of Normal Operational Landing Performance on Subsonic, Civil, Narrow-Body Jet Aircraft During Instrument Landing System Approaches – 2

Dilworth, M. R.
Visualization and Processing of Multidimensional Data Using Prefiltering and Sorting Criteria – 96

Dimarco, J.
Superconducting Solenoid Magnet Test Results – 114

Dimiduk, T. G.
Hydrodynamic Effects on Coalescence – 56

Dinardo, Steve
Compact, Lightweight Dual- Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 41

Compact, Lightweight Dual-Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 67

Windsat Validation Using Seawinds, Windrad and POLSCAT Measurements – 76

Dinh, L. N.
Measurement and Prediction of Water Outgassing from TR55 Silicone by the Isoconversional Technique – 17

Donati, S.
CDF II Detector and Trigger for B Physics – 115

Dones, L.
Cassini Observes the Active South Pole of Enceladus – 160

Dorval, R. K.
Optical System for Generating Three-Dimensional Images – 144

Douglas, E. P.
Biomimetic Organic/Inorganic Composite Processes for Their Production and Methods of Use, PAT-APPL-11-433-725 – 23

Biomimetic Organic/Inorganic Composites, Processes for Their Production, and Methods of Use, PAT-APPL-11- – 21

Dowman, Ian
Policy Document on Earth Observation for Urban Planning and Management: State of the Art and Recommendations for Application of Earth Observation in Urban Planning – 67

Downes, H.
Processes in Early Planetesimals: Evidence from Ureilite Meteorites – 72

Draeger, E. W.
Understanding the Mechanism of Human P450 CYP1A2 Using Coupled Qunatum-Classical Simulations in a Dynamical Environment – 34

Drake, R. R.
Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan. Part 1: ASC Software Quality Engineering Practices, Version 2.0 – 94

Drave, S.
Update for the MuCool Test Area – 139

Drozhdin, A. I.
Beam-Induced Damage to the Tevatron Components and What has been Done About it – 136

Channeling Collimation Studies at the Fermilab Tevatron – 111

Dryer, M.
Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System – 171

Duncan, R.
Glycodendrimers having Biological Activity – 38

Dwek, Eli
SN 1987A after 18 Years: Mid-Infrared GEMINI and SPITZER Observations of the Remnant – 159

Dyshkant, A.
Extruded Scintillator for the Calorimetry Applications – 130

Dzhafaroy, E.
Method for Computing Subjective Dissimilarities Among Discrete Entities – 93

Earnest, G. S.
Evaluation of Carbon Monoxide Concentration With and Without Catalytic Emission Controls from Gasoline Propulsion Engines – 63

Economy, J.
Nanoporous Chelating Fibers – 26

Edlin, George
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

Edwards, H. C.
Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan. Part 1: ASC Software Quality Engineering Practices, Version 2.0 – 94

Edwards, H.
Progress on a Cryogenically Cooled RF Gun Polarized Electron Source – 102

Results from the UCLA/FNPL Underdense Plasma Lens Experiment – 107

Ehlers, Manfred
Policy Document on Earth Observation for Urban Planning and Management: State of the Art and Recommendations for Application of Earth Observation in Urban Planning – 67

Eichler, D.
A Possible Magnetar Nature for IGR J16358-4726 – 157

Eldridge, J. M.
Final Report for the Network Authentication Investigation and Pilot – 87

Elehberger, J.
Method and Device and for Ultra Sonic Vibration Detection During High-Performance Machining – 46

Elementi, L.
Development of Rutherford-type Cables for High Field Accelerator Magnets at Fermilab – 148

Roll Measurement of Tevatron Dipoles and Quadrupoles – 133

Eliasson, P. E.
Benchmarking, Crosschecking DFS in the ILC Main Linac – 137

Elliott, K. B.
Bias Selectable Dual Band AlGaN Ultraviolet Detectors – 53

Ellis, R. K.
Closing Talk: QCD Moriond 2006 – 111

Update on the Next-to-Leading order Monte Carol MCFM – 135

Emma, P. J.
Electron Beam Alignment Strategy in the LCLS Undulators – 120

Enari, Y.
Radiation Damage to Scintillator in the D0 Luminosity Monitor – 128

English, A.
Technique for Measuring Cell-Membrane Properties in Cultured Cells Grown on Biomaterials in an Ussing Chamber – 24

Erickson, R.
New Family of Multilevel Matrix Converters for Wind Power Applications. Final Report. July 2002-March 2006 – 55

Esener, S.
Microelectronic Arrays for Cell-Based Functional Genomics/ High Throughput Phenotyping by Electrokinetic Assembly – 30

Esteban-Fernandez, Daniel
Improved Hurricane Boundary Layer Observations with the Imaging Wind and Rain Airborne Profiler – 76

Estill, J. C.
Long-Term Corrosion Behavior of Alloy 22 in 5 M CaCl2 at 120 C – 20

Evans, Cynthia A.
The International Space Station Supports International Polar Year (IPY) – 58

Evans, G. H.
Final Report for the ASC Gas-Powder Two-Phase Flow Modeling Project AD2006-09 – 57

Evans, K. J.
Long-Term Corrosion Behavior of Alloy 22 in 5 M CaCl2 at 120 C – 20

Ewell, R. C.
An Update of the Ground Testing of the Li-ion Batteries in Support of JPL's 2003 Mars Exploration Rover Mission – 166

Fabisinski, Leo
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

Facchetti, A.
Siloxane-Polymer Dielectric Compositions and Related Organic Field-Effect Transistors – 52

Fang, Houfei
Development of New Modeling and Analysis Tools for Solar Sails – 16

Farrington, S. M.
Rare B Decays at CDF – 135

Feather, Martin S.
Fusing Quantitative Requirements Analysis with Model-based Systems Engineering – 101

Feher, S.
Superconducting Solenoid Magnet Test Results – 114

Feldman, Paul D.
Spectroscopic Investigations of Fragment Species in the Coma – 171

Fellinger, T. L.
Measurement and Prediction of Radiolytic Hydrogen Production in Defense Waste Processing Slurries at Savannah River Site – 71

Ferguson, M. K.
Magnetostrictive Wavelet Method for Measuring Pulse Propagation Time – 132

Feria, V. Alfonso
Co-axial Joint Technology Applied to Antenna Backup Structures – 11

Fiedland, I.
Seismic Retrofitting Manual for Highway Structures. Part 1: Bridges (December 2006) – 74

Fieero, F.
Mixing Utility Liquid Viscometric Apparatus – 57

Field, J. A.
Detecting and Quantifying Reductive Dechlorination During Monitored Natural attenuation at the Savannah River CBRP Site – 32

Field, R. D.
Studying the Underlying Event at CDF – 150

Filler, R. P.
Channeling Collimation Studies at the Fermilab Tevatron – 111

Findlay, A.
Turbocharging a Crank-Case Scavenged and Direct-Injected Two-Stroke Engine for Snowmobile Applications – 154

Finger, M.
A Possible Magnetar Nature for IGR J16358-4726 – 157

Fink, Patrick W.
Cutting Edge RFID Technologies for NASA Applications – 154

Using EIGER for Antenna Design and Analysis – 97

Fink, Y.
Fiber Waveguides and Methods of Making the Same – 52

Fishman, K.
Seismic Retrofitting Manual for Highway Structures. Part 2: Retaining Structures, Slopes, Tunnels,Culverts and Roadways (December 2006) – 66

Flavlora, Y. E.
Optical System for Generating Three-Dimensional Images – 144

Flechtner, G. J.
Methods and Devices for High-Throughput Dielectrophoretic Concentration – 125

Fleming, Eric L.
Neutral Atmospheric Influences of the Solar Proton Events in October-November 2003 – 173

Flliller, R. P.
Progress on a Cryogenically Cooled RF Gun Polarized Electron Source – 102

Fluss, M. J.
Program Pu FUtures 2006 – 19

Forbus, Kenneth D
Qualitative Process Theory – 28

Ford, G.
A Brief Historical Review of Vestibular and Sensorimotor Research Associated with Space Flight – 81

Forges, F.
Durability of Silicate Glasses: An Historical Approach – 39

Forman, M. A.
Reduced-Volume Antennas with Integrated High-Impedance Electromagnetic Surfaces – 43

Forrest, S.
High Efficiency Organic Photovoltaic Cells Employing Hybridized Mixed Planar Heterojunctions – 50

Methods of Fabricating Devices by Transfer of Organic Material – 49

Forrester, S. S.
Search for 3rd Generation Vector Leptoquarks in the Di-tau Di-jet Channel in Proton Antiproton Collisions at square root(s)=1.96 – 123

Forsythe, C. A.
Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan. Part 1: ASC Software Quality Engineering Practices, Version 2.0 – 94

Foster, J. L., Jr.
ISS Debris Avoidance Maneuver Threshold Analysis – 14

Foster, J. L.
Comparison of the Exclusion Volume and Probability Threshold Methods of Debris Avoidance for the STS Orbiter – 10

Fotedar, S.
Technique for Measuring Cell-Membrane Properties in Cultured Cells Grown on Biomaterials in an Ussing Chamber – 24

Fowler, L. P.
Magnetostrictive Wavelet Method for Measuring Pulse Propagation Time – 132

Frazier, Wayne
NASA Hydrogen Peroxide Propellant Hazards Technical Manual – 40

Freedman, Adam
The Aquarius Scatterometer: An Active System for Measuring Surface Roughness for Sea-Surface Brightness Temperature Correction – 74

Freitas, A.
SUSY-QCD Coupling Relation – 118

Fried, L. E.
Non-molecular Phases of HF and H2O Under Detonation-like Conditions – 108

Fried, L.
Kinetic Modeling of Slow Energy Release in Non-Ideal Carbon Rich Explosives – 17

Friedman, A.
Electron Production and Collective Field Generation in Intense Particle Beams – 140

Frisbee, J. H., Jr.
ISS Debris Avoidance Maneuver Threshold Analysis – 14

Frisbee, J. H.
Comparison of the Exclusion Volume and Probability Threshold Methods of Debris Avoidance for the STS Orbiter – 10

Fritze, M.
Method for Photolithography Using Multiple Illuminations and a Single Fine Feature Mask – 48

FROM
Megapixel Multi-band QWIP Focal Plane Arrays – 58

Frost, C.
Low Profile Tension Style Flexible Joint – 7

Frost, G. D.
Relative Humidity Sensor Enclosed with Formed Heating Element – 52

Fry, C. D.
Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System – 171

Fukunaga, Alex
Autonomous Detection of Dust Devils and Clouds on Mars – 154

Fuller, Michael
The Cretaceous/Paleogene Transition on the East Tasman Plateau, Southwestern Pacific – 168

Galea, C.
Tau identification at D0 – 126

Gallagher, D. L.
Effect of EMIC Wave Normal Angle Distribution on Relativistic Electron Scattering Based on the Newly Developed Self-consistent RC/EMIC Waves Model by Khazanov et al. [2006] – 150

Gallinaro, M.
Jets at CDF – 113

Gallup, L.
Advanced Vehicle Technologies for Efficient Powertrain Performance – 154

Gamayunov, K.
Effect of EMIC Wave Normal Angle Distribution on Relativistic Electron Scattering Based on the Newly Developed Self-consistent RC/EMIC Waves Model by Khazanov et al. [2006] – 150

Gao, J.
Space-based Networking Technology Developments in the Interplanetary Network Directorate Information Technology Program – 152

Gao, Jay L.
Considerations for Isochronous Data Services over the Proximity-1 Space Link – 167

Garcia, A.
Evaluation of Carbon Monoxide Concentration With and Without Catalytic Emission Controls from Gasoline Propulsion Engines – 63

Garcia, Jean
Measuring Extended Structure in Stars Using the Keck Interferometer Nuller – 158

Garcia, Mark
Execution of the Spitzer In-orbit Checkout and Science Verification Plan – 158

Garland, Jay L.
Assessment of Silver Based Disinfection Technology for CEV and Future US Spacecraft – 85

Garrick-Betthell, Ian
Evidence for a Past High-Eccentricity Lunar Orbit – 170

Gassner, G. L.
Electron Beam Alignment Strategy in the LCLS Undulators – 120

Gattuso, C.
Status of High Energy Electron Cooling in FNAL's Recycler Ring – 119

Gentry, Gregory J.
International Space Station (ISS) Environmental Control and Life Support (ECLS) System Overview of Events: February 2006 - 2007 – 82

George, K. A.
Measurements of sin2Beta and cos2Beta from b -\g cc(bar)s Decays at BaBar – 108

Gerberich, H.
Search for Excited and Exotic Muons at CDF – 116

Gershtein, Y.
Searches for GMSB, AMSB and Split SUSY with the D0 Detector – 125

Gersonde, Rainer
Meteoritic Microfossils in Eltanin Impact Deposits – 169

Sedimentation Patterns of Meteoritic Ejecta in Eltanin Impact Deposits at Site PS58/281 – 168

Summary of Results from Analyses of Deposits of the Deep-Ocean Impact of the Eltanin Asteroid – 167

Ghetie, A.
Scalable and Dynamic Quality of Service Control – 45

Gianasi, E.
Glycodendrimers having Biological Activity – 38

Gibson, A. P.
Measurement of the Top Quark Mass with a Matrix Element Method – 128

Gies, Dennis
Compact, Lightweight Dual- Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 41

Gilbert, John
Execution of the Spitzer In-orbit Checkout and Science Verification Plan – 158

Gilmore, K.
LSST Camera Overview – 164

Ginsburg, C. M.
Superconducting Solenoid Magnet Test Results – 114

Gitzendanner, R.
An Update of the Ground Testing of the Li-ion Batteries in Support of JPL's 2003 Mars Exploration Rover Mission – 166

Glaesemann, K.
Kinetic Modeling of Slow Energy Release in Non-Ideal Carbon Rich Explosives – 17

Gmachi, C. F.
Phase Matched Parametric Light Generation in Monolithically Integrated Intersubband Optical Devices – 144

Gobbi, B.
Wire Bond Vibration of Forward Pixel Tracking Detector of CMS – 130

Gogus, E.
A Possible Magnetar Nature for IGR J16358-4726 – 157

Goldberg, A.
Atomic, Crystal, Elastic, Thermal, Nuclear, and Other Properties of Beryllium – 149

Joining of Beryllium – 36

Gollwitzer, K.
Roll Measurement of Tevatron Dipoles and Quadrupoles – 133

Gombosi, T. I.
On The Effect of Electron Collisions in the Excitation of Cometary HCN – 172

Gomez, Gerard
A Dynamical Systems Approach to the Design of the Science Orbit Around Europa – 88

Gomez-Ceballos, G.
B Mixing and Lifetimes at the Tevatron – 111

Gonin, I.
Design of 325MHz Single and Triple Spoke Resonators at FNAL – 104

Gonzalez, W. D.
Dayside Global Ionospheric Response to the Major Interplanetary Events of October 29-30, 2003 "Halloween Storms" – 73

Goodman, N.
Non-molecular Phases of HF and H2O Under Detonation-like Conditions – 108

Goodman, S. J.
Observations of Lightning on Earth from the Lunar Surface – 165

Gorda, B.
Evaluating the Performance Impact of Xen on MPI and Process Execution for HPC Systems – 88

Gordon, S. A.
Bias Selectable Dual Band AlGaN Ultraviolet Detectors – 53

Gorelov, I. V.
Latest Results on Orbitally Excited Strange Bottom Mesons with the CDF II Detector – 134

Gottschalk, E.
Curved Track Segment Finding Using Tiny Triplet Finder (TTF) – 121

FPGA Curved Track Fitter with Very Low Resource Usage – 128

Goulianos, K.
Diffraction at the Tevetron: CDF Results – 122

Gower, L. B.
Biomimetic Organic/Inorganic Composite Processes for Their Production and Methods of Use, PAT-APPL-11-433-725 – 23

Biomimetic Organic/Inorganic Composites, Processes for Their Production, and Methods of Use, PAT-APPL-11- – 21

Graf, John
Testing of an Amine-Based Pressure-Swing System for Carbon Dioxide and Humidity Control – 84

Granot, Jonathan
Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae – 162

Grant, Joseph
Strain Measurement Using FBG on COPV in Stress Rupture Test – 25

Graveman, R. F.
Method and Device for Generating Approximate Message Authentication Codes – 90

Greeley, Ronald
Autonomous Detection of Dust Devils and Clouds on Mars – 154

Green, Joseph J.
Target Selection and Imaging Requirements for JWST Fine Phasing – 143

The Sensitivity of Shaped Pupil Coronagraphs to Optical Aberrations – 143

Greene, Ben
NASA Hydrogen Peroxide Propellant Hazards Technical Manual – 40

Greer, S.
Using the Fermilab Proton Source for a Muon to Electron Conversion Experiment – 128

Griego, J. R.
Mixing Utility Liquid Viscometric Apparatus – 57

Griffith, D. T.
Finite Element Calculations Illustrating a Method of Model Reduction for the Dynamics of Structures with Localized Nonlinearities – 94

Griffiths, C.
Note on Trasande et al., 'Public Health and Economic Consequences of Methylmercury Toxicity on the Developing Brain' – 70

Griffiths, Richard E.
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 162

Grillet, A. M.
Hydrodynamic Effects on Coalescence – 56

Grinfeld, Pavel
Motion of the Mantle in the Translational Modes of the Earth and Mercury – 170

Grinstein, S.
Status of the CDF Silicon Detector – 134

Grivaz, J. F.
Search for Physics beyond the Standard Model at the Tevatron – 135

Gront, S.
Recycling of Used Perfluorosulfonic Acid Membranes – 83

Gront, W.
Recycling of Used Perfluorosulfonic Acid Membranes – 83

Guarnieri, F. L.
Dayside Global Ionospheric Response to the Major Interplanetary Events of October 29-30, 2003 "Halloween Storms" – 73

Guerra, J. A.
Hydro Static Water Level Systems at Fermilab – 57

Guillorn, M. A.
Apparatus for Controlled Alignment of Catalytically Grown Nanostructures – 49

Gunapala, S. D.
Megapixel Multi-band QWIP Focal Plane Arrays – 58

Gutierrez, L. A. L.
Process for Removing an Organic Layer During Fabrication of an Organic Electronic Device and the Organic Electronic Device Formed By the Process – 55

Gyekenyesi, J. P.
Bias Selectable Dual Band AlGaN Ultraviolet Detectors – 53

Gygi, F.
Understanding the Mechanism of Human P450 CYP1A2 Using Coupled Qunatum-Classical Simulations in a Dynamical Environment – 34

Haba, Yoshito
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 162

Hackbarth, Dean R.
Co-axial Joint Technology Applied to Antenna Backup Structures – 11

Hackler, L.
Study of Normal Operational Landing Performance on Subsonic, Civil, Narrow-Body Jet Aircraft During Instrument Landing System Approaches – 2

Hadder, G. R.
Reformulated Diesel Fuel – 62

Haddi, A.
Durability of Silicate Glasses: An Historical Approach – 39

Haerdtlein, J.
Support for Whole-Program Analysis and the Verification of the One-Definition Rule in C++ – 92

Hagen, S.
Design Hurricane Storm Surge Pilot Study – 77

Hale, L.
Focal Plane Metrology for the LSST Camera – 165

Hall, D. R.
Apparatus and Method for Routing a Transmission Line through a Downhole Tool – 48

Hall, R. M.
Evaluation of Carbon Monoxide Concentration With and Without Catalytic Emission Controls from Gasoline Propulsion Engines – 63

Hall, T.
Apparatus and Method for Routing a Transmission Line through a Downhole Tool – 48

Hamers, R. J.
Apparatus for Transport and Analysis of Particles Using Dielectrophoresis – 21

Hamilton, H. R.
Development of a Standard Accelerated Corrosion Test for Acceptance of Post-Tensioning Grouts in Florida – 29

Hamza, A.
Graded-density Reservoirs for Accessing High Pressure Low Temperature Material States – 18

Handler, Louis M.
Composite Nanomechanics: A Mechanistic Properties Prediction – 27

Hansen, Jennifer
Gliding Experiments of the Wright Brothers: The Wrights and Flight Research 1899-1908 – 6

Hansen, Kenneth C.
On The Effect of Electron Collisions in the Excitation of Cometary HCN – 172

Hansen, S. U.
Hydro Static Water Level Systems at Fermilab – 57

Hansson, E.
Security Problems in Mobile ad hoc Networks – 44

Hanushevsky, A.
Designing an Multi-petabyte Database for LSST – 164

Happer, W.
Method and System for Operating an Atomic Clock with Alternating Polarization Light – 145

Harris, Walter M.
Gas Dynamics and Kinetics in the Cometary Coma: Theory and Observations – 170

Harshbarger, S. D.
Apparatus and Method for Automated Parcel Screening – 151

Hart, S.
Fiber Waveguides and Methods of Making the Same – 52

Hasegawa, K.
Beam Diagnostics, Collimation, Injection/Extraction, Targetry. Accidents and Commissioning: Working Group C&G Summary Report – 124

Hastrup, Rolf
Use of the 37-38 GHz and 40-40.5 GHz Ka-bands for Deep Space Communications – 11

Hatakeyama, K.
Heavy Flavor Production at the Tevatron – 127

Hays, C. P.
W Boson Measurements at the Tevatron – 117

Hays, C.
Search for Excited and Exotic Muons at CDF – 116

Heaphy, R.
Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan. Part 1: ASC Software Quality Engineering Practices, Version 2.0 – 94

Heavey, Brandon
The Glacier and Land Ice Surface Topography Interferometer (GLISTIN): A Novel Ka-band Digitally Beamformed Interferometer – 66

Hedman, B.
New Developments in Charge Transfer Multiplet Calculations: Projection Operations, Mixed-Spin States and pi-Bonding – 120

Helfenstein P.
Cassini Observes the Active South Pole of Enceladus – 160

Helton, J. C.
Sampling-Based Computational Strategy for the Representation of Epistemic Uncertainty in Model Predictions with evidence Theory – 94

Henderson, S.
Beam Diagnostics, Collimation, Injection/Extraction, Targetry. Accidents and Commissioning: Working Group C&G Summary Report – 124

Henriksson, M.
Numerical Simulation of a Flashlamp Pumped Nd:YAG Laser (Numerisk Simulering av en Blixlampspumpad Nd:YAG Laser) – 146

Herkenhoff, Ken E.
Linking Home Plate and Algonquin Class Rocks through Microtextural Analysis: Evidence for Hydrovolcanism in the Inner Basin of Columbia Hills, Gusev Crater – 66

Hernandez, M. P.
Systems and Methods for Tuning Filters – 51

Heron, Vance A.
Fusing Quantitative Requirements Analysis with Model-based Systems Engineering – 101

Hess, C.
Superconducting Solenoid Magnet Test Results – 114

Heyman, J. S.
Dynamic Acoustic Thermometer – 51

Hill, C.
Megapixel Multi-band QWIP Focal Plane Arrays – 58

Hill, R. J.
Modern Description of Semileptonic Meson Form Factors – 113

Hines, Glenn D.
Automated On-board Terrain Analysis for Precision Landings – 15

Detecting Changes in Terrain Using Unmanned Aerial Vehicles – 61

DSP Implementation of the Multiscale Retinex Image Enhancement Algorithm – 59

Image Enhancement, Image Quality, and Noise – 60

Impact of Multiscale Retinex Computation on Performance of Segmentation Algorithms – 58

Real-time Enhancement, Registration, and Fusion for an Enhanced Vision System – 60

The Automatic Assessment and Reduction of Noise Using Edge Pattern Analysis in Nonlinear Image Enhancement – 59

Hines, Glenn
Advanced Image Processing of Aerial Imagery – 60

Enhanced Images for Checked and Carry-on Baggage and Cargo Screening – 59

Hirsch, David
Technical Note: Some Issues Related to the Selection of Polymers for Aerospace Oxygen Systems – 38

Hjelm, A.
Aerosol Attenuation Model for Scandinavian Environment; User Manual – 69

Ho, D.
Graded-density Reservoirs for Accessing High Pressure Low Temperature Material States – 18

Hobgood, H. M.
Minimizing Degradation of SiC Bipolar Semiconductor Devices – 54

Hocking, R. K.
New Developments in Charge Transfer Multiplet Calculations: Projection Operations, Mixed-Spin States and pi-Bonding – 120

Hodges, Richard
The Glacier and Land Ice Surface Topography Interferometer (GLISTIN): A Novel Ka-band Digitally Beamformed Interferometer – 66

Hodgon, K. O.
New Developments in Charge Transfer Multiplet Calculations: Projection Operations, Mixed-Spin States and pi-Bonding – 120

Hoekstra, R.
Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System – 171

Hoff, T. E.
Photovoltaic Incentive Design Handbook – 68

Hoffman, Ronald R.
Maintenance Procedure Display: Head Mounted Display (HMD) Evaluations – 82

Hohlfeld, M.
Search for Supersymmetry in Trilepton Final States with the D0 Detector – 130

Holden, Kritina L.
Maintenance Procedure Display: Head Mounted Display (HMD) Evaluations – 82

Hollmann, E. M.
DIII-D Studies of Massive Gas Injection Fast Shutdowns for Disruption Mitigation – 107

Holt, Alan C.
EXPRESS Pallet Payload Interface Requirements – 12

Hong, S.
Methods Utilizing Scanning Probe Microscope Tips and Products Thereof or Produced Thereby – 39

Hong, Y. W.
Method and Systems for Cooperative Transmission in Multi-Hop Ad-Hoc Networks – 45

Hoon, Y.
Combined Frequency-Time Domain Power Adaptation for CDMA Communication System – 42

Houf, W. G.
On-Line Coating of Glass with Tin Oxide by Atmospheric Pressure Chemical Vapor Deposition – 37

Howard, W. M.
Measurement and ALE3D Simulation of Violence in a Deflagration Experiment with LX-10 and Aermet-100 Alloy – 18

Hsiao, S. Vincent
Windsat Validation Using Seawinds, Windrad and POLSCAT Measurements – 76

Hsu, J. S.
Electric Machine for Hybrid Motor Vehicle – 62

Hybrid-Secondary Uncluttered Permanent Magnet Machine and Method – 47

Hsu, P. C.
Characterization of Damaged Materials – 17

Hu, J. Z.
Simple Approach for Obtaining High Resolution, High Sensitivity 1H NMR Metabolite Spectra of Biofluids with Limited Mass Supply – 20

Hu, M.
Status of High Energy Electron Cooling in FNAL's Recycler Ring – 119

Hu, Qing
Operation of Terahertz Quantum-cascade Lasers at 164 K in Pulsed Mode and at 117 K in Continuous-wave Mode – 142

Huang, J. C.
Deriving Benefit Measures with Higher Precision: A Study of Economic Values of Air Quality – 71

Huang, M.
Quench Monitoring and Control System and Method of Operating Same – 147

Hubbard, M. L.
Development of a Materials and Engineering Database for Shales of Eastern Kansas – 90

Hudy, Cynthia
Space Human Factors Engineering Gap Analysis Project Final Report – 86

Huey, R. W.
Human Factors Guidelines for Intelligent Transportation Systems at the Highway-Rail Intersection: Technical Report – 85

Hughes, S. M.
Nanocrystals with Linear and Branched Topology – 106

Humphrey, Donald L.
Oxidation Kinetics of a NiPtTi High Temperature Shape Memory Alloy – 34

Humprhey, M.
System and Method for Multi-Perspective Collaborative Modeling – 43

Hunter, Don
Compact, Lightweight Dual- Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 41

Compact, Lightweight Dual-Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 67

Hust, G. A.
Long-Term Corrosion Behavior of Alloy 22 in 5 M CaCl2 at 120 C – 20

Hutcherson, J.
Space-based Networking Technology Developments in the Interplanetary Network Directorate Information Technology Program – 152

Hyde, J. L.
Investigation of MMOD Impact on Shuttle Payload Bay Door Radiator – 13

Hynn, W.
User Definable Hierarchy for Database Management – 152

Iau, Y. Y.
Method and System for Operating an Atomic Clock with Alternating Polarization Light – 145

Ibaugh, A.
Roadway Data Representation and Application Development: Developing a New Straight Line Diagram Application for the Florida Department of Transportation – 89

Iijima, B. A.
Dayside Global Ionospheric Response to the Major Interplanetary Events of October 29-30, 2003 "Halloween Storms" – 73

Ingersoll, A. P.
Cassini Observes the Active South Pole of Enceladus – 160

Inoue, Hajime
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 162

In'TZand, Jean J. M.
Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae – 162

Ishimoto, I.
Update for the MuCool Test Area – 139

Istok, J. D.
Detecting and Quantifying Reductive Dechlorination During Monitored Natural attenuation at the Savannah River CBRP Site – 32

Itoh, Takeshi
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 162

Ivancic, William D.
Secure, Autonomous, Intelligent Controller for Integrating Distributed Sensor Webs – 5

Iyer, Shanthi
Growth and Properties of Lattice Matched GaAsSbN Epilayer on GaAs for Solar Cell Applications – 131

Influence of Growth Parameters and Annealing on Properties of MBE Grown GaAsSbN SQWs – 149

Jabeen, S.
Search for the Single Top Quarks Produced in s-Channel via Electroweak Interactions at s=1.96 at the Tevatron – 123

Jackman, Charles H.
Neutral Atmospheric Influences of the Solar Proton Events in October-November 2003 – 173

Jackson, F.
ILC Beam Delivery WG Summary: Optics, Collimation and Background – 110

Jacobson, C. P.
Solid State Electrochemical Composite – 29

James, John T.
STS 116 Return Samples: Assessment of Air Quality aboard the Shuttle (STS-116) and International Space Station (12A.1) – 82

Jeevarajan, Judith
Certification Process for Commercial Batteries for Payloads – 16

Jenkins, J. Steven
Fusing Quantitative Requirements Analysis with Model-based Systems Engineering – 101

Jenness, J. W.
Human Factors Guidelines for Intelligent Transportation Systems at the Highway-Rail Intersection: Technical Report – 85

Jennings, E.
Space-based Networking Technology Developments in the Interplanetary Network Directorate Information Technology Program – 152

Jensen, K. E.
Method of Preparing Nanocrystals – 24

Jernigan, T. C.
DIII-D Studies of Massive Gas Injection Fast Shutdowns for Disruption Mitigation – 107

Jhavar, R.
Engine Valve Actuation for Combustion Enhancement – 63

Jin, Kyoung-Wook
Impact of Rainfall on the Retrieval of Soil Moisture Using AMSR-E Data – 79

Joannopoulos, J. D.
Fiber Waveguides and Methods of Making the Same – 52

Jobson, Daniel J.
Advanced Image Processing of Aerial Imagery – 60

Automated On-board Terrain Analysis for Precision Landings – 15

DSP Implementation of the Multiscale Retinex Image Enhancement Algorithm – 59

Enhanced Images for Checked and Carry-on Baggage and Cargo Screening – 59

Image Enhancement, Image Quality, and Noise – 60

Impact of Multiscale Retinex Computation on Performance of Segmentation Algorithms – 58

Noise, Edge Extraction and Visibility of Features – 61

Real-time Enhancement, Registration, and Fusion for an Enhanced Vision System – 60

The Automatic Assessment and Reduction of Noise Using Edge Pattern Analysis in Nonlinear Image Enhancement – 59

Johnson, B.
Modeling Urban Surface Transportation Network Dependability and Security – 43

Johnson, J. D.
Sampling-Based Computational Strategy for the Representation of Epistemic Uncertainty in Model Predictions with evidence Theory – 94

Johnson, J.
Turbocharging a Crank-Case Scavenged and Direct-Injected Two-Stroke Engine for Snowmobile Applications – 154

Johnson, P. V.
Collisions of Electrons with Atomic Oxygen: Current Status – 141

Johnson, Sharon
Characteristics of Post-Sorbent and High Temperature Catalytic Oxidizer Beds After Long-Term On-Orbit Use – 83

Johnson, T. V.
Cassini Observes the Active South Pole of Enceladus – 160

Johnston, Allan H.
Test Results of Total Ionizing Dose Conducted at the Jet Propulsion Laboratory – 56

Jolly, M. R.
Magnetostrictive Wavelet Method for Measuring Pulse Propagation Time – 132

Jones, David
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

Jones, O. S.
Hard X-ray Imaging for Measuring Laser Absorption Spatial Profiles on the National Ignition Facility – 145

Jordan, Nicole C.
Overview of Umbilical Extravehicular Activity (EVA) Interfaces in Life Support Systems on Spacecraft Vehicles and Applications for the Crew Exploration Vehicle (CEV) – 84

Jostlein, H.
Hydro Static Water Level Systems at Fermilab – 57

Roll Measurement of Tevatron Dipoles and Quadrupoles – 133

Jung, C.
Mechanistic Selection and Growth of Twinned Bicrysalline Primary Si in near Eutectic Al-Si Alloys – 36

Kahn, S.
LSST Camera Overview – 164

Kallivayalil, Nitya
On The Effect of Electron Collisions in the Excitation of Cometary HCN – 172

Kamerdzhiev, V.
Electron Beam Generation in Tevatron Electron Lenses – 132

Kaneko, Yuki
Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae – 162

Kanik, I.
Collisions of Electrons with Atomic Oxygen: Current Status – 141

Kariis, H.
Camouflage Creams with New Properties – 22

Karresand, M.
Parameters for Intrusion Analysis – 93

Kasdin, N. Jeremy
The Sensitivity of Shaped Pupil Coronagraphs to Optical Aberrations – 143

Kashikhin, V. S.
Development of Rutherford-type Cables for High Field Accelerator Magnets at Fermilab – 148

Kashikhin, V. V.
Designing Focusing Solenoids for Superconducting RF Accelerators – 114

Study of 2-in-1 Large-Aperture Nb3Sn IR Quadrupoles for the LHC Luminosity Upgrade – 103

Katti, R. R.
Magnetic Switching with Expanded Hard-Axis Magnetization Volume at Magnetoresistive Bit Ends – 52

Keller, K.
Variable Structure Diagnostics Approach Achieving Optimized Low-Frequency Data Sampling for EMA Motoring Systems – 7

Kelley, Richard
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 162

Kempf, Michael J.
Examination of B. subtilis var. niger Spore Killing by Dry Heat Methods – 155

Kender, J. R.
Method and Device for Online Dynamic Semantic Video Compression and Video Indexing – 151

Kennedy, Timothy F.
Using EIGER for Antenna Design and Analysis – 97

Kerr, J. H.
Investigation of MMOD Impact on Shuttle Payload Bay Door Radiator – 13

Keys, Andrew S.
Radiation-Hardened Electronics for the Space Environment – 15

Khabiboulline, T.
Design of 325MHz Single and Triple Spoke Resonators at FNAL – 104

Khambatta, Cyrus F.
Development of a Prototype Automation Simulation Scenario Generator for Air Traffic Management Software Simulations – 3

Khayat, Michael
Using EIGER for Antenna Design and Analysis – 97

Khazanov, G. V.
Effect of EMIC Wave Normal Angle Distribution on Relativistic Electron Scattering Based on the Newly Developed Self-consistent RC/EMIC Waves Model by Khazanov et al. [2006] – 150

Kieffer, S.
Cassini Observes the Active South Pole of Enceladus – 160

Kikuchi, A.
Feasibility Study of Nb3Al Rutherford Cable for High Field Accelerator Magnet Application – 127

Magnetization Anomaly of Nb3Al Strands and Instability of Nb3Al Rutherford Cables – 148

Kilminster, B.
Search for Low Mass Higgs at the Tevatron – 135

Kim, B.
Multi-Dimensioned Easily Adjustable Single Sheet Container Formula with Indicia – 84

Kim, C.
Methods of Fabricating Devices by Transfer of Organic Material – 49

Kim, D. Y.
Multi-Dimensioned Easily Adjustable Single Sheet Container Formula with Indicia – 84

Kim, K. J.
Photoinjector Production of a Flat Beam with Transverse Emittance Ratio of 100 – 111

Kim, P.
Focal Plane Metrology for the LSST Camera – 165

Kim, R. H.
Multi-Dimensioned Easily Adjustable Single Sheet Container Formula with Indicia – 84

Kim, S. Y.
Multi-Dimensioned Easily Adjustable Single Sheet Container Formula with Indicia – 84

Kimpel, T. J.
Data Visualization as a Tool for Improved Decision Making within Transit Agencies – 152

Kindstroem, M.
RSD, Retinal Scanning Display Pilot Study and Evaluation – 49

King, Bruce
Policy Document on Earth Observation for Urban Planning and Management: State of the Art and Recommendations for Application of Earth Observation in Urban Planning – 67

King, S.
Eddy Current System for Material Inspection and Flaw Visualization – 54

Kinsella, Gary M
Thermal Design and Flight Experience of the Mars Exploration Rover Spacecraft Computer-Controlled, Propulsion Line Heaters – 61

Kiper, T. E.
Hydro Static Water Level Systems at Fermilab – 57

Kirby, N.
Energy Measurements of Trapped Electrons from a Plasma Wakefield Accelerator – 121

Kirschner, Larry E.
Examination of B. subtilis var. niger Spore Killing by Dry Heat Methods – 155

Kirshner, Robert P.
SN 1987A after 18 Years: Mid-Infrared GEMINI and SPITZER Observations of the Remnant – 159

Kiss, G.
Scalable and Dynamic Quality of Service Control – 45

Klebaner, A. L.
Cryogenics for the Supercondcuting Module Test Facility – 136

Surge Recovery Techniques for the Tevatron Cold Compressors – 139

Klebaner, A.
Update for the MuCool Test Area – 139

Klein, M.
Method and Device and for Ultra Sonic Vibration Detection During High-Performance Machining – 46

Klinman, D.
Immunostimulatory Nucleic Acid Molecules – 30

Knap, J.
Measurement and ALE3D Simulation of Violence in a Deflagration Experiment with LX-10 and Aermet-100 Alloy – 18

Knorovsky, G. A.
Laser Based Micro Forming and Assembly – 146

Knowies, K. R.
Circuit for Accessing a Chalcogenide Memory Array – 47

Ko, Malcolm K. W.
Neutral Atmospheric Influences of the Solar Proton Events in October-November 2003 – 173

Kokubun, Motohide
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 162

Kolda, T. G.
Efficient MATLAB Computations with Sparse and Factored Tensors – 87

Kolev, T. V.
Parallel H-1-Based Auxiliary Space AMG Solver for H(curl) Problems – 88

Komjathy, A.
Dayside Global Ionospheric Response to the Major Interplanetary Events of October 29-30, 2003 "Halloween Storms" – 73

Kona, Keerti S.
Compact, Lightweight Dual- Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 41

Compact, Lightweight Dual-Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 67

Kong, K.
Phenomenology of Universal Extra Dimensions – 161

Kong, P. C.
Plasma Generators, Reactor Systems and Related Methods – 147

Koresko, Chris
Measuring Extended Structure in Stars Using the Keck Interferometer Nuller – 158

Koshak, W. J.
Lightning Charge Retrievals: Dimensional Reduction, LDAR Constraints, and a First Comparison with LIS Satellite Data – 76

Kostin, M.
Efficiency and Lifetime of Carbon Foils – 32

Kotwal, A.
Search for Excited and Exotic Muons at CDF – 116

Kouveliotou, C.
A Possible Magnetar Nature for IGR J16358-4726 – 157

Kouveliotou, Chryssa
Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae – 162

Kozyra, J. U.
Dayside Global Ionospheric Response to the Major Interplanetary Events of October 29-30, 2003 "Halloween Storms" – 73

Kranc, S. C.
Efficacy of Utility Database Management – 89

Krider, E. P.
Lightning Charge Retrievals: Dimensional Reduction, LDAR Constraints, and a First Comparison with LIS Satellite Data – 76

Krieg, A. M.
Immunostimulatory Nucleic Acid Molecules – 30

Krimm, Hans
Recent Results from the Swift Burst Alert Telescope – 157

Krintz, C.
Evaluating the Performance Impact of Xen on MPI and Process Execution for HPC Systems – 88

Krisko, Paula
Orbital Debris Studies at NASA – 156

Krnavek, J. M.
A Brief Historical Review of Vestibular and Sensorimotor Research Associated with Space Flight – 81

Kronfeld, A. S.
Improved Action for Heavy Quarks – 129

Krummacher, B. C.
Polymer and Small Molecule Based Hybrid Light Source – 53

Krutelyov, V.
Rare Decays of Heavy Flavor at the Tevatron – 115

Krylo, Robert J.
Thermal Design and Flight Experience of the Mars Exploration Rover Spacecraft Computer-Controlled, Propulsion Line Heaters – 61

Kubher, D. D.
Low Profile Tension Style Flexible Joint – 7

Kugel, H.
Results from the CDX-U Lithium Wall and NSTX Lithium Pallet Injection and Evaporation Experiments – 106

Kuhn, Gerhard
Meteoritic Microfossils in Eltanin Impact Deposits – 169

Sedimentation Patterns of Meteoritic Ejecta in Eltanin Impact Deposits at Site PS58/281 – 168

Summary of Results from Analyses of Deposits of the Deep-Ocean Impact of the Eltanin Asteroid – 167

Kuhnert, Andreas C.
Broadband Performance of TPF's High-contrast Imaging Testbed: Modeling and Simulations – 142

Kumar, Sushil
Operation of Terahertz Quantum-cascade Lasers at 164 K in Pulsed Mode and at 117 K in Continuous-wave Mode – 142

Kunz, Nans
SOFIA: Stratospheric Observatory For Infrared Astronomy – 160

Kuo, I. F. W.
Non-molecular Phases of HF and H2O Under Detonation-like Conditions – 108

Kuo, S. C.
Flavone Acetic Acid Analogs and Methods of Use Thereof – 30

Kuroda, S.
ILC Beam Delivery WG Summary: Optics, Collimation and Background – 110

Kuzma, N. N.
Method and System for Operating an Atomic Clock with Alternating Polarization Light – 145

Kuznetsov, G.
Electron Beam Generation in Tevatron Electron Lenses – 132

Kwan, S.
Wire Bond Vibration of Forward Pixel Tracking Detector of CMS – 130

Kwok, W. K.
Basic Research Needs for Superconductivity. Report of the Basic Energy Sciences Workshop on Superconductivity, May 8-11, 2006 – 104

Kyongyop, K. O.
Single Chip Radio with Integrated Antenna – 46

Kyte, Frank T.
Anomalous Iridium Enrichment at the Triassic-Jurassic Boundary, Blomidon Formation, Fundy Basin, Canada – 75

Meteoritic Microfossils in Eltanin Impact Deposits – 169

Primary Mineralogical and Chemical Characteristics of the Major K/T and Late Eocene Impact Deposits – 75

Sedimentation Patterns of Meteoritic Ejecta in Eltanin Impact Deposits at Site PS58/281 – 168

Summary of Results from Analyses of Deposits of the Deep-Ocean Impact of the Eltanin Asteroid – 167

The Cretaceous/Paleogene Transition on the East Tasman Plateau, Southwestern Pacific – 168

Labow, Gordon J.
Neutral Atmospheric Influences of the Solar Proton Events in October-November 2003 – 173

Landen, O. L.
Hard X-ray Imaging for Measuring Laser Absortion Spatial Profiles on the National Ignition Facility – 145

Lane, S. M.
Feasibility of Single Molecule DNA Sequencing Using Surface-Enhanced Raman Scattering – 140

Lanfranco, G.
Design of 325MHz Single and Triple Spoke Resonators at FNAL – 104

Lange, I.
Policy Innovation Impacts on Scrubber Electricity Usage – 70

Lannon, K.
Search for New Phenomena in the CDF Top Quark Sample – 150

Lara, Martin
A Dynamical Systems Approach to the Design of the Science Orbit Around Europa – 88

Larsson, U.
Characterization of a Micromachined Membrane Deformable Mirror – 145

Laskaris, E. T.
Quench Monitoring and Control System and Method of Operating Same – 147

Latina, A.
Benchmarking, Crosschecking DFS in the ILC Main Linac – 137

Laubach, Sharon
From Prime to Extended Mission: Evolution of the MER Tactical Uplink Process – 99

Lauchi, N.
Siso Model Predictive Controller – 91

Lawless, D. F.
Dragless Flight Control System for Flying Objects – 1

Lawson, D. C.
Circuit for Accessing a Chalcogenide Memory Array – 47

Lawson, J. K.
Using Historic Models of C(sub n)(sup 2) to Predict r(sub 0) and Regimes Affected by Atmospheric Turbulence for Horizontal, Slant and Topological Paths – 78

Lear, D. M.
Investigation of MMOD Impact on Shuttle Payload Bay Door Radiator – 13

Lebedev, V.
Measurement and Correction of linear Optics an Coupling at Tevatron Complex – 113

Lebedov, V.
Coherent Instabilities at the FNAL Booster – 109

Leben, Robert
Societal Benefits of Ocean Altimetry Data – 80

LeCocq, C. M.
Electron Beam Alignment Strategy in the LCLS Undulators – 120

Leddy, J.
Method for Forming Magnetically Modified Electrodes and Articles Produced Thereby – 68

Lee, E.
Electron Production and Collective Field Generation in Intense Particle Beams – 140

Focal Plane Metrology for the LSST Camera – 165

Lee, J. E.
Plasma Generators, Reactor Systems and Related Methods – 147

Lee, J. S.
Polarimetric Analysis of Scatterometer Data for Ocean Surface Wind Measurement – 73

Lee, J. Y.
Single Molecule Screening of Disease DNA without Amplification – 33

Lee, K. H.
Flavone Acetic Acid Analogs and Methods of Use Thereof – 30

Lee, S. E.
ProUCL Version 4.0, User Guide – 93

Lee, Tong
Effects of High-frequency Wind Sampling on Simulated Mixed Layer Depth and Upper Ocean Temperature – 73

Lefevre, R.
Inclusive Jet Production using the k(sub T) Algorithm at CDF – 121

Lehman, S. K.
Acoustic Longitudinal Field NIF Optic Feature Detection Map Using Time-Reversal and MUSIC – 146

Leifeste, Mark R.
Interrelationship of Nondestructive Evaluation Methodologies Applied to Testing of Composite Overwrapped Pressure Vessels – 26

Lellogg, G.
Basic Research Needs for Superconductivity. Report of the Basic Energy Sciences Workshop on Superconductivity, May 8-11, 2006 – 104

Lemmon, Mark
Autonomous Detection of Dust Devils and Clouds on Mars – 154

Leonard, Elizabeth
Extended Abstract: Organizing Automaton Specifications to Achieve Faithful Representation – 97

Lerner, N. D.
Human Factors Guidelines for Intelligent Transportation Systems at the Highway-Rail Intersection: Technical Report – 85

LeVan, P. D.
Megapixel Multi-band QWIP Focal Plane Arrays – 58

Lewellen, J.
Summary of Beam Quality Diagnostics and Control Working Group – 116

Lewis, John F.
Crew Exploration Vehicle Environmental Control and Life Support Emergency Gas Consumable Sizing – 82

Li, B.
Circuit for Accessing a Chalcogenide Memory Array – 47

Li, F.
Process for Removing an Organic Layer During Fabrication of an Organic Electronic Device and the Organic Electronic Device Formed By the Process – 55

Li, Jia
Growth and Properties of Lattice Matched GaAsSbN Epilayer on GaAs for Solar Cell Applications – 131

Influence of Growth Parameters and Annealing on Properties of MBE Grown GaAsSbN SQWs – 149

Li, M.
On-Line Coating of Glass with Tin Oxide by Atmospheric Pressure Chemical Vapor Deposition – 37

Lian, J. I.
Reisevaner pa Fly 2005. (Norwegian Air Travel Survey, 2005.) – 3

Lian, T.
Comparative Corrosion Behavior of Two Palladium Containing Titanium Alloys – 20

Lightstone, F.
Understanding the Mechanism of Human P450 CYP1A2 Using Coupled Qunatum-Classical Simulations in a Dynamical Environment – 34

Limero, Thomas
Differential Mobility Spectrometry: Preliminary Findings on Determination of Fundamental Constants – 149

Volatile Organic Analyzer (VOA) in 2006: Repair, Revalidation, and Restart of Elektron Even – 15

Lin, Amy
Testing of an Amine-Based Pressure-Swing System for Carbon Dioxide and Humidity Control – 84

Lin, Robert
Reliability of Cascaded THz Frequency Chains with Planar GaAs Circuits – 46

Ling, C. C.
Enhancement of Resilient Modulus Data for the Design of Pavement Structures in Florida – 151

Linick, Susan H.
Execution of the Spitzer In-orbit Checkout and Science Verification Plan – 158

Lisse, C. M.
Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System – 171

Litaker, Harry L., Jr.
Maintenance Procedure Display: Head Mounted Display (HMD) Evaluations – 82

Liu, C.
Nanoporous Chelating Fibers – 26

Liu, G. Y.
Stabilization of Self-Assembled Monolayers – 26

Liu, J. K.
Megapixel Multi-band QWIP Focal Plane Arrays – 58

Liu, J.
Methods of Making Monolayers – 24

Liu, T.
Method and Device for Online Dynamic Semantic Video Compression and Video Indexing – 151

Liu, W. Timothy
Effects of High-frequency Wind Sampling on Simulated Mixed Layer Depth and Upper Ocean Temperature – 73

Liu, Z.
Novel Aryne Chemistry in Organic Synthesis – 33

Llaneras, R. E.
Human Factors Guidelines for Intelligent Transportation Systems at the Highway-Rail Intersection: Technical Report – 85

Loefvenbereg, J.
Risks in Using USB Flash Drives and u3 – 94

Logan, Michael J.
Detecting Changes in Terrain Using Unmanned Aerial Vehicles – 61

Lomabrdi, J. L.
Water Soluble Tooling Materials for Composite Structures – 6

Long, D. D.
Design and Implementation of Ceph: A Scalable Distributed File System – 87

Long, Stacia
Execution of the Spitzer In-orbit Checkout and Science Verification Plan – 158

Looper, Christopher A.
EVA Task Timing and Timeline Planning – 156

Lorenz, K. T.
Graded-density Reservoirs for Accessing High Pressure Low Temperature Material States – 18

Lou, Michael
Development of New Modeling and Analysis Tools for Solar Sails – 16

Lovell, Amy J.
On The Effect of Electron Collisions in the Excitation of Cometary HCN – 172

Lowndes, D. H.
Apparatus for Controlled Alignment of Catalytically Grown Nanostructures – 49

Lu, Sao-Dung
Testing of an Amine-Based Pressure-Swing System for Carbon Dioxide and Humidity Control – 84

Lucchesi, D.
Bs Mixing at the Tevatron – 132

Ludlam, T.
Future Science at the Relativistic Heavy Ion Collider – 103

Lunden, O.
Pulsed Power 3 GHz Feasibility Study in FOI 36.7 m3 Mode Stirred Reverberation Chamber – 46

Lusby, M.
System and Method for Identifying, Reporting, and Evaluating Presence of Substance – 95

Lykken, J. D.
Standard Model: Alchemy and Astrology – 161

Lyons, F.
Investigation of MMOD Impact on Shuttle Payload Bay Door Radiator – 13

Lyons, Valerie J.
An Overview of Space Power Systems for NASA Missions – 14

MacCallum, D. O.
Laser Based Micro Forming and Assembly – 146

Maccone, Claudio
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

Machin, Ricardo
Developing the Parachute System for NASA's Orion: An Overview at Inception – 14

Madej, R. F.
Method and Apparatus for Reworking a Microwave Module – 53

Madsen, E. L.
Report on Bioavailability of Chemical Wastes with Respect to the Potential for Soil Bioremediation – 32

Maeger, W.
Eddy Current System for Material Inspection and Flaw Visualization – 54

Magee, S. J.
Relative Humidity Sensor Enclosed with Formed Heating Element – 52

Mahoney, Michael J.
Status of MTP Data Analysis for TCSP – 78

Maichle, R.
ProUCL Version 4.0, User Guide – 93

Maienschein, J. L.
Characterization of Damaged Materials – 17

Measurement and ALE3D Simulation of Violence in a Deflagration Experiment with LX-10 and Aermet-100 Alloy – 18

Maitland, D. J.
Shape Memory System With Integrated Actuation Using Embedded Particles – 35

Maiwald, Frank
Reliability of Cascaded THz Frequency Chains with Planar GaAs Circuits – 46

Majeski, R.
Results from the CDX-U Lithium Wall and NSTX Lithium Pallet Injection and Evaporation Experiments – 106

Makara, J. N.
Surge Recovery Techniques for the Tevatron Cold Compressors – 139

Makdisi, F.
Seismic Retrofitting Manual for Highway Structures. Part 2: Retaining Structures, Slopes, Tunnels,Culverts and Roadways (December 2006) – 66

Maki, T.
Status and Performance of the CDF Run II Silicon Detector (FERMILAB-CONF-06-390-E) – 135

Makinen, T.
Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System – 171

Mal, P. K.
SUSY Higgs Searches at D0, Tevatron – 134

Malis, D.
Phase Matched Parametric Light Generation in Monolithically Integrated Intersubband Optical Devices – 144

Maltzahn, C.
Design and Implementation of Ceph: A Scalable Distributed File System – 87

Malyarenko, E. V.
Dynamic Acoustic Thermometer – 51

Mander, J.
Seismic Retrofitting Manual for Highway Structures. Part 1: Bridges (December 2006) – 74

Manderscheid, Jane M.
Composite Nanomechanics: A Mechanistic Properties Prediction – 27

Manna, L.
Nanocrystals with Linear and Branched Topology – 106

Mannucci, A. J.
Dayside Global Ionospheric Response to the Major Interplanetary Events of October 29-30, 2003 ''Halloween Storms'' – 73

Manteghi, Majid
Compact, Lightweight Dual- Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 41

Compact, Lightweight Dual-Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 67

Maqueda, R. J.
Particle and Energy Transport in the SOL and DIII-D and NSTX – 105

Marchionni, A.
Beam Intensity Upgrade at FERMILAB – 112

Marken, K.
Cost Effective Open Geometry HTS MRI System amended to BSCCO 2212 Wire for High Field Magnets – 64

Marker, T. R.
Laboratory-Scale and Full-Scale Fire Testing of Lightweight Aircraft Seat Cushion Materials – 5

Markowitz, Alex
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 162

Marks, T. J.
Siloxane-Polymer Dielectric Compositions and Related Organic Field-Effect Transistors – 52

Marlow, D.
Evaluation of Carbon Monoxide Concentration With and Without Catalytic Emission Controls from Gasoline Propulsion Engines – 63

Maron, G.
CMS DAQ Event Builder Based on Gigabit Ethernet – 133

Marshall, Jospeh R.
Organization's Orderly Interest Exploration: Inception, Development and Insights of AIAA's Topics Database – 98

Martin, Cam
Gliding Experiments of the Wright Brothers: The Wrights and Flight Research 1899-1908 – 6

Martin, G.
Seismic Retrofitting Manual for Highway Structures. Part 1: Bridges (December 2006) – 74

Martinez, A.
Critical Speed Measurements in the Tevatron Cold Compressors – 122

Surge Recovery Techniques for the Tevatron Cold Compressors – 139

Massa, V.
Scalable and Dynamic Quality of Service Control – 45

Matchev, K. T.
Phenomenology of Universal Extra Dimensions – 161

Mathai, M.
Polymer and Small Molecule Based Hybrid Light Source – 53

Matloff, Greg
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

Matney, Kevin
Growth and Properties of Lattice Matched GaAsSbN Epilayer on GaAs for Solar Cell Applications – 131

Mawst, L. J.
Intersubband Mid-Infrared Electroluminescent Semiconductor Devices – 126

Maxwell, R. S.
Measurement and Prediction of Water Outgassing from TR55 Silicone by the Isoconversional Technique – 17

Mazin, I.
Basic Research Needs for Superconductivity. Report of the Basic Energy Sciences Workshop on Superconductivity, May 8-11, 2006 – 104

McAdams, H. T.
Reformulated Diesel Fuel – 62

McClelland, M. A.
Measurement and ALE3D Simulation of Violence in a Deflagration Experiment with LX-10 and Aermet-100 Alloy – 18

McClelland, M.
Characterization of Damaged Materials – 17

McConologue, F.
Design of 325MHz Single and Triple Spoke Resonators at FNAL – 104

McDaniel, A. H.
On-Line Coating of Glass with Tin Oxide by Atmospheric Pressure Chemical Vapor Deposition – 37

McEwen, A.
Cassini Observes the Active South Pole of Enceladus – 160

McFadden, B.
Roadway Data Representation and Application Development: Developing a New Straight Line Diagram Application for the Florida Department of Transportation – 89

McFarland, K. S.
MINERVA: A Dedicated Neutrino Scattering Experiment at NuMI – 119

McGartland, A.
Note on Trasande et al., 'Public Health and Economic Consequences of Methylmercury Toxicity on the Developing Brain' – 70

McGinnis, D.
Using the Fermilab Proton Source for a Muon to Electron Conversion Experiment – 128

McGraw, G. J.
Methods and Devices for High-Throughput Dielectrophoretic Concentration – 125

McGuire, Kristopher
Growth and Properties of Lattice Matched GaAsSbN Epilayer on GaAs for Solar Cell Applications – 131

McKamey, Steve
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

McLoughlin, M. P.
Apparatus and Method for Automated Parcel Screening – 151

McMichael, L. D.
Contact Interface Verification for DYNA3D. Scenario 1: Basic Contact – 92

Contact Interface Verification for DYNA3D. Scenario 2: Multi-Surface Contact – 18

McNeil, Laurie E.
Growth and Properties of Lattice Matched GaAsSbN Epilayer on GaAs for Solar Cell Applications – 131

McWatters, Dalia
The Aquarius Scatterometer: An Active System for Measuring Surface Roughness for Sea-Surface Brightness Temperature Correction – 74

Meadows, Catherine
A Formal Language for Cryptographic Protocol Requirements – 98

Language Generation and Verification in the NRL Protocol Analyzer – 98

Mehdi, Imran
Reliability of Cascaded THz Frequency Chains with Planar GaAs Circuits – 46

Meier, David L.
SIMsim: An End-to-end Simulator for the ESA Mission – 157

Melechko, A. V.
Apparatus for Controlled Alignment of Catalytically Grown Nanostructures – 49

Mena, O.
Getting the Most for NOVA and T2K – 161

Menges, W. L.
Repair/Retrofit Anchorage Designs for Bridge Rails – 22

Merkulov, V. I.
Apparatus for Controlled Alignment of Catalytically Grown Nanostructures – 49

Meyer, A.
Searches for New Phenomena at the Tevatron and at HERA – 123

Michaels, R.
Happex: Starange Quarks in the Proton and 4He – 138

Michkin, Andrew H.
From Prime to Extended Mission: Evolution of the MER Tactical Uplink Process – 99

Milani, M. C.
Data Monitoring and Recovery – 8

Miles, John W.
Execution of the Spitzer In-orbit Checkout and Science Verification Plan – 158

Miller, E. L.
Design and Implementation of Ceph: A Scalable Distributed File System – 87

Miller, K. B.
Development of a Materials and Engineering Database for Shales of Eastern Kansas – 90

Miller, M. M.
Final Report for the Network Authentication Investigation and Pilot – 87

Miller, M.
Note on Trasande et al., 'Public Health and Economic Consequences of Methylmercury Toxicity on the Developing Brain' – 70

Miller, Robert D.
NASA Bluetooth Wireless Communications – 12

Milliken, W. C.
Packet-Based and Pseudo-Packet Based Cryptographic Communications System and Method – 91

Millings, M. R.
Detecting and Quantifying Reductive Dechlorination During Monitored Natural attenuation at the Savannah River CBRP Site – 32

Milliron, D.
Nanocrystals with Linear and Branched Topology – 106

Mills, K.
Investigating Surety Methodologies for Cognitive Systems – 81

Minard, K. R.
Simple Approach for Obtaining High Resolution, High Sensitivity 1H NMR Metabolite Spectra of Biofluids with Limited Mass Supply – 20

Ming, D. W.
Crystal Water on Mars: Insights from the Mars Exploration Rovers – 156

Ming, Douglas W.
Aqueous Alteration of Basalts: Earth, Moon, and Mars – 166

Minteer, S. D.
Method for Forming Magnetically Modified Electrodes and Articles Produced Thereby – 68

Mirabedini, A. R.
Intersubband Mid-Infrared Electroluminescent Semiconductor Devices – 126

Mirkin, C. A.
Methods Utilizing Scanning Probe Microscope Tips and Products Thereof or Produced Thereby – 39

Miron, E.
Method and System for Operating an Atomic Clock with Alternating Polarization Light – 145

Mitchell, M. P.
Foil Structure for Regenerators – 63

Mitra, Sayan
PVS Strategies for Proving Abstraction Properties of Automata – 101

Mittlefehldt, David W.
Linking Home Plate and Algonquin Class Rocks through Microtextural Analysis: Evidence for Hydrovolcanism in the Inner Basin of Columbia Hills, Gusev Crater – 66

Processes in Early Planetesimals: Evidence from Ureilite Meteorites – 72

Miyahira, Tetsuo F.
Test Results of Total Ionizing Dose Conducted at the Jet Propulsion Laboratory – 56

Mochly-Rosen, D.
Methods and Compositions for Modulating Mitochondrial Aldehyde Dehydrogenase-2 – 19

Mochs, D. P.
Ion Source Choices An H Source for the High Intensity Neutrino Source – 119

Moeckly, B. H.
Growth of In-Situ Thin Films by Reactive Evaporation – 148

Moehs, D. P.
Summary I: Accelerator Ion Sources, Fundamentals and Diagnostics – 110

Mohanty, G. B.
Looking for Exotica at the B Factories – 108

Mokhov, N. V.
Beam Diagnostics, Collimation, Injection/Extraction, Targetry. Accidents and Commissioning: Working Group C&G Summary Report – 124

Beam-Induced Damage to the Tevatron Components and What has been Done About it – 136

Channeling Collimation Studies at the Fermilab Tevatron – 111

Handling Collision Debris In Quad-and Dipole-First LHC IR Options – 127

High-Intensity Beam Collimation and Targetry – 124

ILC Beam Delivery WG Summary: Optics, Collimation and Background – 110

Moller, Delwyn K.
The Glacier and Land Ice Surface Topography Interferometer (GLISTIN): A Novel Ka-band Digitally Beamformed Interferometer – 66

Molnar, D.
Heavy Quarks at RHIC from Parton Transport Theory – 102

Molvik, A. W.
Electron Production and Collective Field Generation in Intense Particle Beams – 140

Morabito, David
Use of the 37-38 GHz and 40-40.5 GHz Ka-bands for Deep Space Communications – 11

Moretti, A.
MUCOOL RF Program – 126

Morris, Allan T.
Organization's Orderly Interest Exploration: Inception, Development and Insights of AIAA's Topics Database – 98

Morris, R. V.
Crystal Water on Mars: Insights from the Mars Exploration Rovers – 156

Moskowitz, B.
System and Method for Multi-Perspective Collaborative Modeling – 43

Mostafa, K.
Impact of Aspect Ratio on Two-Column Bent Seismic Performance – 65

Moy, A.
Technique for Measuring Cell-Membrane Properties in Cultured Cells Grown on Biomaterials in an Ussing Chamber – 24

Mueller, G.
Minimizing Degradation of SiC Bipolar Semiconductor Devices – 54

Mumolo, J.
Megapixel Multi-band QWIP Focal Plane Arrays – 58

Mundy, C. J.
Non-molecular Phases of HF and H2O Under Detonation-like Conditions – 108

Munisamy, S.
Biomimetic Organic/Inorganic Composite Processes for Their Production and Methods of Use, PAT-APPL-11-433-725 – 23

Biomimetic Organic/Inorganic Composites, Processes for Their Production, and Methods of Use, PAT-APPL-11- – 21

Munson, John C.
The Effects of Fault Counting Methods on Fault Model Quality – 97

Murphy, David W.
SIMsim: An End-to-end Simulator for the ESA Mission – 157

Murphy, Kendrah D.
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 162

Murray, C. D.
Cassini Observes the Active South Pole of Enceladus – 160

Murray, N.
Lightning Charge Retrievals: Dimensional Reduction, LDAR Constraints, and a First Comparison with LIS Satellite Data – 76

Murthy, P. L. N.
Bias Selectable Dual Band AlGaN Ultraviolet Detectors – 53

Mushotzky, Richard
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 162

Musser, S.
Seismic Retrofitting Manual for Highway Structures. Part 2: Retaining Structures, Slopes, Tunnels,Culverts and Roadways (December 2006) – 66

Muthuswamy, J.
Acoustic Immunosensor for Detecting Neurotransmitter GABA – 141

Naehlinder, S.
Human-Factors Perspective On Simulator Fidelity Assessment – 84

Nagaslaev, V. P.
Linear Lattic Modeling of the Recycler Ring at FERMILAB – 109

Nagaslaev, V.
Measurement and Correction of linear Optics an Coupling at Tevatron Complex – 113

Nakanishi, T.
Comparative Corrosion Behavior of Two Palladium Containing Titanium Alloys – 20

Nakayama, T.
Comparative Corrosion Behavior of Two Palladium Containing Titanium Alloys – 20

Nalette, Tim
Testing of an Amine-Based Pressure-Swing System for Carbon Dioxide and Humidity Control – 84

Nash, Sally K.
Panel Resource Management (PRM) Implementation and Effects within Safety Review Panel Settings and Dynamics – 4

Neakrase, Lynn
Autonomous Detection of Dust Devils and Clouds on Mars – 154

Neece, D.
Advanced Pattern Material for Investment Casting Applications – 37

Nelson, R. W.
Mass Spectrometric Immunoassay – 30

Nematia, Bijan
ESA PlanetQuest: Status and Recent Progress – 155

Nerheim, M. H.
Systems and Methods for Immobilization – 54

Neukum, G.
Cassini Observes the Active South Pole of Enceladus – 160

Neuner, J. W.
Feedback Control System and Method for Maintaining Constant Resistance Operation of Electrically Heated Elements – 48

Ney, Zane A.
EVA Task Timing and Timeline Planning – 156

Nguyen, T.
Eddy Current System for Material Inspection and Flaw Visualization – 54

Nichol, Janet
Policy Document on Earth Observation for Urban Planning and Management: State of the Art and Recommendations for Application of Earth Observation in Urban Planning – 67

Nichols, A. L.
Measurement and ALE3D Simulation of Violence in a Deflagration Experiment with LX-10 and Aermet-100 Alloy – 18

Nicol, T.
Design, Fabrication, and Test of an SRF Cryomodule Prototype at Fermilab – 125

Nielsen, E. H.
Running the Sloan Digital Sky Survey Data Archive – 160

Nikolaev, S.
Designing an Multi-petabyte Database for LSST – 164

Nikora, Allen P.
The Effects of Fault Counting Methods on Fault Model Quality – 97

Nilsson, C.
Camouflage Creams with New Properties – 22

Njoku, Eni
Compact, Lightweight Dual- Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 41

Compact, Lightweight Dual-Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 67

Impact of Rainfall on the Retrieval of Soil Moisture Using AMSR-E Data – 79

Noebe, Ronald D.
Oxidation Kinetics of a NiPtTi High Temperature Shape Memory Alloy – 34

Norbrega, F.
Roll Measurement of Tevatron Dipoles and Quadrupoles – 133

Norby, M.
LSST Camera Overview – 164

Norem, J.
MUCOOL RF Program – 126

Norris, B.
MUCOOL RF Program – 126

Nosochkov, Y.
Start-to-end Beam Optics Development and Multi-Particle Tracking for the ILC Undulator-based Positron Source – 108

Novak, Keith S.
Thermal Design and Flight Experience of the Mars Exploration Rover Spacecraft Computer-Controlled, Propulsion Line Heaters – 61

Novitski, I.
Thermal Analysis of SC Quadrupoles in Accelerator Interaction Regions – 125

Nuhn, H. D.
Electron Beam Alignment Strategy in the LCLS Undulators – 120

Nunna Kalyan
Growth and Properties of Lattice Matched GaAsSbN Epilayer on GaAs for Solar Cell Applications – 131

Nunna, Kalyan
Influence of Growth Parameters and Annealing on Properties of MBE Grown GaAsSbN SQWs – 149

Nutt, R.
Seismic Retrofitting Manual for Highway Structures. Part 1: Bridges (December 2006) – 74

Oberkampf, W. L.
Sampling-Based Computational Strategy for the Representation of Epistemic Uncertainty in Model Predictions with evidence Theory – 94

O'Brien, M. J.
Multigrid Methods for Mesh Relaxation – 91

OConnor, P.
LSST Camera Overview – 164

Readout System for Arrays of Frisch-ring CdZnTe Detectors – 136

Odom, E.
Advanced Vehicle Technologies for Efficient Powertrain Performance – 154

Ohara, Catherine M.
Target Selection and Imaging Requirements for JWST Fine Phasing – 143

Okajima, Takashi
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 162

Oktay, M. B.
Improved Action for Heavy Quarks – 129

Olszta, J. J.
Biomimetic Organic/Inorganic Composite Processes for Their Production and Methods of Use, PAT-APPL-11-433-725 – 23

Olszta, M. J.
Biomimetic Organic/Inorganic Composites, Processes for Their Production, and Methods of Use, PAT-APPL-11- – 21

Oman, P.
Modeling Urban Surface Transportation Network Dependability and Security – 43

Osakarsson, P. A.
RSD, Retinal Scanning Display Pilot Study and Evaluation – 49

Oyenekan, B.
CO2 Capture by Absorption with Potassium Carbonate Fourth Quarterly Report 2006. Quarterly Progress Report. Reporting Period: October 1, 2006 through December 31, 2006 – 72

Ozkan, M.
Microelectronic Arrays for Cell-Based Functional Genomics/ High Throughput Phenotyping by Electrokinetic Assembly – 30

Pacheco, A. R.
Development of a Standard Accelerated Corrosion Test for Acceptance of Post-Tensioning Grouts in Florida – 29

Page, T.
Designing Focusing Solenoids for Superconducting RF Accelerators – 114

Paisley, M. J.
Minimizing Degradation of SiC Bipolar Semiconductor Devices – 54

Palmer, J. S.
Laser Based Micro Forming and Assembly – 146

Palmquist, R. D.
Translation Tool – 153

Translator Database – 95

Panas, T.
Support for Whole-Program Analysis and the Verification of the One-Definition Rule in C++ – 92

Pannucchia, G.
Siso Model Predictive Controller – 91

Papale, William
Testing of an Amine-Based Pressure-Swing System for Carbon Dioxide and Humidity Control – 84

Pareizs, J. M.
Measurement and Prediction of Radiolytic Hydrogen Production in Defense Waste Processing Slurries at Savannah River Site – 71

Park, Sangwook
SN 1987A after 18 Years: Mid-Infrared GEMINI and SPITZER Observations of the Remnant – 159

Parsons, I. D.
Adaptive Mesh Refinement Algorithms for Parallel Unstructured Finite Element Codes – 96

Partridge, R.
Radiation Damage to Scintillator in the D0 Luminosity Monitor – 128

Patel, N. R.
Bias Selectable Dual Band AlGaN Ultraviolet Detectors – 53

Patel, S. K.
A Possible Magnetar Nature for IGR J16358-4726 – 157

Patel, Sandeep K.
Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae – 162

Patrick, Clinton
Intelligent Vision Systems Independent Research and Development (IR&D) 2006 – 99

Patterson, J. W.
End-Around Taxiway Screen Evaluation – 6

Peacock, A. D.
Detecting and Quantifying Reductive Dechlorination During Monitored Natural attenuation at the Savannah River CBRP Site – 32

Pearson, John
Reliability of Cascaded THz Frequency Chains with Planar GaAs Circuits – 46

Peercy, D. E.
Investigating Surety Methodologies for Cognitive Systems – 81

Peidra, J.
B Mixing and Lifetimes at the Tevatron – 111

Pellico, W.
Coherent Instabilities at the FNAL Booster – 109

Perl, M.
Focal Plane Metrology for the LSST Camera – 165

Perry, J.
Cassini Observes the Active South Pole of Enceladus – 160

Persson, R.
Aerosol Attenuation Model for Scandinavian Environment; User Manual – 69

Peter, E.
Electron Beam Alignment Strategy in the LCLS Undulators – 120

Peters, J.
Ion Source Choices An H Source for the High Intensity Neutrino Source – 119

Peterso, Laurie
Crew Exploration Vehicle Environmental Control and Life Support Emergency Gas Consumable Sizing – 82

Peterson, Laurie J.
Overview of Umbilical Extravehicular Activity (EVA) Interfaces in Life Support Systems on Spacecraft Vehicles and Applications for the Crew Exploration Vehicle (CEV) – 84

Petrovich, A.
Dual Microwave Cavity Accelerometer – 54

Pettit, Donald R.
The International Space Station Supports International Polar Year (IPY) – 58

Pezzaniti, J. L.
System and Method for Dual Stacked Panel Display – 51

Phillion, D.
Two-Sided Pyramid Wavefront Sensor in the Direct Phase Mode – 144

Phillips, N. S. L.
Phase Transformation in Cast Superaustenitic Stainless Steels – 36

Piamonteze, C.
New Developments in Charge Transfer Multiplet Calculations: Projection Operations, Mixed-Spin States and pi-Bonding – 120

Pickering, Karen D.
Assessment of Silver Based Disinfection Technology for CEV and Future US Spacecraft – 85

Piedra, J.
B(sup 0)(Sub s) Mixing at CDF – 134

Pieri, M.
CMS DAQ Event Builder Based on Gigabit Ethernet – 133

Piner, R.
Methods Utilizing Scanning Probe Microscope Tips and Products Thereof or Produced Thereby – 39

Ping, W. V.
Enhancement of Resilient Modulus Data for the Design of Pavement Structures in Florida – 151

Evaluation of the Dynamic Complex Modulus Test and Indirect Diametral Test for Implementing the AASHTO 2002 Design Guide for Pavement Structures in Florida – 3

Pink, R. J.
Plasma Generators, Reactor Systems and Related Methods – 147

Pinson, M. H.
Reduced Reference Video Calibration Algorithms – 90

Piot, P.
Photoinjector Production of a Flat Beam with Transverse Emittance Ratio of 100 – 111

Photoinjectors R&D For Future Light Sources & Linear Colliders – 105

Summary of Beam Quality Diagnostics and Control Working Group – 116

Pirre-Etcheverry, M.
Durability of Silicate Glasses: An Historical Approach – 39

Pischalnikov, Y.
Wire Bond Vibration of Forward Pixel Tracking Detector of CMS – 130

Pixton, D. S.
Apparatus and Method for Routing a Transmission Line through a Downhole Tool – 48

Pla-Dalmau, A.
Extruded Scintillator for the Calorimetry Applications – 130

Poirier, F.
Benchmarking, Crosschecking DFS in the ILC Main Linac – 137

Polanskey, Carol A.
Mars Odyssey: Off-nadir Imaging – 167

Porco, C. C.
Cassini Observes the Active South Pole of Enceladus – 160

Portell, X.
Supersymmetry Searches at the Tevatron – 119

Post, A. B.
Method and System for Operating an Atomic Clock with Alternating Polarization Light – 145

Pouet, B.
Method and Device and for Ultra Sonic Vibration Detection During High-Performance Machining – 46

Power, M. S.
Seismic Retrofitting Manual for Highway Structures. Part 2: Retaining Structures, Slopes, Tunnels,Culverts and Roadways (December 2006) – 66

Powers, Annie
ISS Asset Tracking Using SAW RFID Technology – 55

Prakash, S.
Process for Removing an Organic Layer During Fabrication of an Organic Electronic Device and the Organic Electronic Device Formed By the Process – 55

Prost, L. R.
Status of High Energy Electron Cooling in FNAL's Recycler Ring – 119

Ptak, Andrew
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 162

Puglia, F.
An Update of the Ground Testing of the Li-ion Batteries in Support of JPL's 2003 Mars Exploration Rover Mission – 166

Qian, Z.
MUCOOL RF Program – 126

Qiang, Q.
Search for the Pentquark Partners: Theta++, SigmaO and NO – 119

Quake, S. R.
Microfabricated Elastomeric Valve and Pump Systems – 40

Quattrochi, Dale
Policy Document on Earth Observation for Urban Planning and Management: State of the Art and Recommendations for Application of Earth Observation in Urban Planning – 67

Quinlan, D.
Support for Whole-Program Analysis and the Verification of the One-Definition Rule in C++ – 92

Rabinovich, A.
Low Current Plasmatron Fuel Converter Having Enlarged Volume Discharges – 62

Radyushkin, A. V.
Counting Rules, Holographic Wave Functions, Meromorphization and Quark-Hadron Duality – 138

Rae, D. F.
Thermal Properties of PZT95/5(1.8Nb) and PSZT Ceramics – 38

Raes, E.
Detecting and Quantifying Reductive Dechlorination During Monitored Natural attenuation at the Savannah River CBRP Site – 32

Rafo, S. B.
Megapixel Multi-band QWIP Focal Plane Arrays – 58

Rahaman, M. A.
New Results on the B(sup -)(sub c) Meson at the Tevatron – 118

Rahim, A. A.
Modeling Urban Surface Transportation Network Dependability and Security – 43

Rahman, Zia-ur
Advanced Image Processing of Aerial Imagery – 60

Automated On-board Terrain Analysis for Precision Landings – 15

Detecting Changes in Terrain Using Unmanned Aerial Vehicles – 61

DSP Implementation of the Multiscale Retinex Image Enhancement Algorithm – 59

Enhanced Images for Checked and Carry-on Baggage and Cargo Screening – 59

Image Enhancement, Image Quality, and Noise – 60

Impact of Multiscale Retinex Computation on Performance of Segmentation Algorithms – 58

Noise, Edge Extraction and Visibility of Features – 61

Real-time Enhancement, Registration, and Fusion for an Enhanced Vision System – 60

The Automatic Assessment and Reduction of Noise Using Edge Pattern Analysis in Nonlinear Image Enhancement – 59

Rahmat-Samii, Yahya
Compact, Lightweight Dual- Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 41

Compact, Lightweight Dual-Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 67

Raju, I. S.
Bias Selectable Dual Band AlGaN Ultraviolet Detectors – 53

Rakhno, I. L.
Handling Collision Debris In Quad-and Dipole-First LHC IR Options – 127

Ramirez-Ruiz, Enrico
Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae – 162

Rand, B. P.
High Efficiency Organic Photovoltaic Cells Employing Hybridized Mixed Planar Heterojunctions – 50

Rapisarda, S. M.
Analog Signal Pre-Processing for the Fermilab Main Injectore BPM Upgrade – 138

Rasmussen, A. P.
Focal Plane Metrology for the LSST Camera – 165

Rathbun, J.
Cassini Observes the Active South Pole of Enceladus – 160

Ratnakumar, B. V.
An Update of the Ground Testing of the Li-ion Batteries in Support of JPL's 2003 Mars Exploration Rover Mission – 166

Rawlings, J. B.
Siso Model Predictive Controller – 91

Rax, Bernard G.
Test Results of Total Ionizing Dose Conducted at the Jet Propulsion Laboratory – 56

Rebak, R. B.
Comparative Corrosion Behavior of Two Palladium Containing Titanium Alloys – 20

Long-Term Corrosion Behavior of Alloy 22 in 5 M CaCl2 at 120 C – 20

Reboredo, F.
Feasibility of Single Molecule DNA Sequencing Using Surface-Enhanced Raman Scattering – 140

Redi, J. K.
Methods for Providing Prioritized Communications Using a Carrier Sense Multiple Access Protocol – 42

Systems and Methods for Automatically Placing Nodes in an Ad Hoc Network – 45

Reeves, James
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 162

Reitz, R. D.
Engine Valve Actuation for Combustion Enhancement – 63

Remington, B.
Graded-density Reservoirs for Accessing High Pressure Low Temperature Material States – 18

Remo, John
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

Rengarajan, Sembiam
The Glacier and Land Ice Surface Topography Interferometer (GLISTIN): A Novel Ka-band Digitally Beamformed Interferometer – 66

Reno, John L.
Operation of Terahertz Quantum-cascade Lasers at 164 K in Pulsed Mode and at 117 K in Continuous-wave Mode – 142

Reschke, M. F.
A Brief Historical Review of Vestibular and Sensorimotor Research Associated with Space Flight – 81

Reynolds, Glenn A.
Co-axial Joint Technology Applied to Antenna Backup Structures – 11

Reynolds, J.
Apparatus and Method for Routing a Transmission Line through a Downhole Tool – 48

Reysa, Richard P.
International Space Station (ISS) Environmental Control and Life Support (ECLS) System Overview of Events: February 2006 - 2007 – 82

Richards, R.
Seismic Retrofitting Manual for Highway Structures. Part 2: Retaining Structures, Slopes, Tunnels,Culverts and Roadways (December 2006) – 66

Richardson, J. G.
Structure for Identifying, Locating and Quantifying Physical Phenomena – 65

Richardson, J. T.
Intelligent Email Services – 153

Rideng, A.
Reisevaner pa Fly 2005. (Norwegian Air Travel Survey, 2005.) – 3

Rignot, Eric
The Glacier and Land Ice Surface Topography Interferometer (GLISTIN): A Novel Ka-band Digitally Beamformed Interferometer – 66

Ring, Z.
Nitride-Based Transistors with a Protective Layer and a Low-Damage Recess and Methods of Fabrication Thereof – 148

Rivas, Rosa M.
Test Results of Total Ionizing Dose Conducted at the Jet Propulsion Laboratory – 56

Rivellini, Tommaso
The Challenges of Landing on Mars – 169

Roatsch, T.
Cassini Observes the Active South Pole of Enceladus – 160

Roberts, L.
User Definable Hierarchy for Database Management – 152

Roberts, Michael S.
Assessment of Silver Based Disinfection Technology for CEV and Future US Spacecraft – 85

Robinson, Judith L.
Assuring Crew Health Protection – 81

Robles, S. J.
Visualization and Processing of Multidimensional Data Using Prefiltering and Sorting Criteria – 96

Rochelle, G. T.
CO2 Capture by Absorption with Potassium Carbonate Fourth Quarterly Report 2006. Quarterly Progress Report. Reporting Period: October 1, 2006 through December 31, 2006 – 72

Rochford, R. A.
Method and Apparatus for Reworking a Microwave Module – 53

Rodriquez, H. M.
Optical Studies of Space Debris at GEO: Survey and Follow-up with Two Telescopes – 10

Rogez, Francois
The Glacier and Land Ice Surface Topography Interferometer (GLISTIN): A Novel Ka-band Digitally Beamformed Interferometer – 66

Rohr, A.
Toxicological Evaluation of Realistic Emissions of Source Aerosols (Teresa): Application to Power Plant-Derived PM2.5 – 69

Rol, Evert
Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae – 162

Rollis, K.
Spray Shadowing for Stress Relief and Mechanical Locking in Thick Protective Coatings – 39

Rommerein, D. N.
Simple Approach for Obtaining High Resolution, High Sensitivity 1H NMR Metabolite Spectra of Biofluids with Limited Mass Supply – 20

Rosenzweig, J. B.
Results from the UCLA/FNPL Underdense Plasma Lens Experiment – 107

Rowe, A.
Design, Fabrication, and Test of an SRF Cryomodule Prototype at Fermilab – 125

Royall, Paul
Developing the Parachute System for NASA's Orion: An Overview at Inception – 14

Ruby, W. S.
Growth of In-Situ Thin Films by Reactive Evaporation – 148

Rushing, Johnny
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

Russell, James M.
Neutral Atmospheric Influences of the Solar Proton Events in October-November 2003 – 173

Russell, Ryan P.
A Dynamical Systems Approach to the Design of the Science Orbit Around Europa – 88

Rutland, C. J.
Engine Valve Actuation for Combustion Enhancement – 63

Ryan, D. T.
Quench Monitoring and Control System and Method of Operating Same – 147

Rykalin, V.
Extruded Scintillator for the Calorimetry Applications – 130

Sadowy, Gregory
The Glacier and Land Ice Surface Topography Interferometer (GLISTIN): A Novel Ka-band Digitally Beamformed Interferometer – 66

Saebjoernsen, A.
Support for Whole-Program Analysis and the Verification of the One-Definition Rule in C++ – 92

Saewert, A. L.
Analog Signal Pre-Processing for the Fermilab Main Injectore BPM Upgrade – 138

Sagen, J.
Advanced Vehicle Technologies for Efficient Powertrain Performance – 154

Sager, John C.
Assessment of Silver Based Disinfection Technology for CEV and Future US Spacecraft – 85

Saiidi, M. S.
Impact of Aspect Ratio on Two-Column Bent Seismic Performance – 65

Static and Dynamic Performance of RC Bridge Bents with Architectural-Flared Columns – 64

Saito, A.
Dayside Global Ionospheric Response to the Major Interplanetary Events of October 29-30, 2003 ''Halloween Storms'' – 73

Sajaev, V.
Linear Lattic Modeling of the Recycler Ring at FERMILAB – 109

Measurement and Correction of linear Optics an Coupling at Tevatron Complex – 113

Salmi, A.
Methods and Devices for High-Throughput Dielectrophoretic Concentration – 125

Samokhin, A.
Low Current Plasmatron Fuel Converter Having Enlarged Volume Discharges – 62

Samuels, W. D.
Methods of Making Monolayers – 24

Samulyak, R. V.
Beam-Induced Damage to the Tevatron Components and What has been Done About it – 136

Sanders, D. H.
Static and Dynamic Performance of RC Bridge Bents with Architectural-Flared Columns – 64

Sanders, D.
Impact of Aspect Ratio on Two-Column Bent Seismic Performance – 65

Sanders, M. P.
W and Z Production at the Tevatron – 112

Sarrao, J.
Basic Research Needs for Superconductivity. Report of the Basic Energy Sciences Workshop on Superconductivity, May 8-11, 2006 – 104

Satyanarayana, Arunkumar
The Effect of Delamination on Damage Path and Failure Load Prediction for Notched Composite Laminates – 27

Scaglione, S.
Method and Systems for Cooperative Transmission in Multi-Hop Ad-Hoc Networks – 45

Schellenberg, Stephen A.
The Cretaceous/Paleogene Transition on the East Tasman Plateau, Southwestern Pacific – 168

Schellhase, Amy
ISS Asset Tracking Using SAW RFID Technology – 55

Scherer, A.
Microfabricated Elastomeric Valve and Pump Systems – 40

Scherzinger, W. M.
Laser Based Micro Forming and Assembly – 146

Schildbach, M. A.
Measurement and Prediction of Water Outgassing from TR55 Silicone by the Isoconversional Technique – 17

Schlecht, Erich
Reliability of Cascaded THz Frequency Chains with Planar GaAs Circuits – 46

Schloerb, F. Peter
On The Effect of Electron Collisions in the Excitation of Cometary HCN – 172

Schmerge, J. F.
In-Situ Cleaning of Metal Photo-Cathodes in rf Guns – 121

Schmidt, Mariek E.
Linking Home Plate and Algonquin Class Rocks through Microtextural Analysis: Evidence for Hydrovolcanism in the Inner Basin of Columbia Hills, Gusev Crater – 66

Schmidt, R.
Beam Diagnostics, Collimation, Injection/Extraction, Targetry. Accidents and Commissioning: Working Group C&G Summary Report – 124

Schnaidt, D. V.
Data Monitoring and Recovery – 8

Schokker, A. J.
Development of a Standard Accelerated Corrosion Test for Acceptance of Post-Tensioning Grouts in Florida – 29

Schowalter, L. J.
Powder Metallurgy Crucible for Alluminum Nitride Crystal Growth – 35

Schreiler, J. B.
Data Monitoring and Recovery – 8

Schuler, D. L.
Polarimetric Analysis of Scatterometer Data for Ocean Surface Wind Measurement – 73

Schulte, D.
Benchmarking, Crosschecking DFS in the ILC Main Linac – 137

Scott, John H.
An Overview of Space Power Systems for NASA Missions – 14

Sears, J. A.
Simple Approach for Obtaining High Resolution, High Sensitivity 1H NMR Metabolite Spectra of Biofluids with Limited Mass Supply – 20

Segalman, D. J.
Finite Element Calculations Illustrating a Method of Model Reduction for the Dynamics of Structures with Localized Nonlinearities – 94

Sehic, Asim
Co-axial Joint Technology Applied to Antenna Backup Structures – 11

Seitzer, P.
Optical Studies of Space Debris at GEO: Survey and Follow-up with Two Telescopes – 10

Selemitos, Peter J.
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 162

Serabyn, Eugene
Measuring Extended Structure in Stars Using the Keck Interferometer Nuller – 158

Sergent, A. M.
Phase Matched Parametric Light Generation in Monolithically Integrated Intersubband Optical Devices – 144

Seryi, A. A.
ILC Beam Delivery WG Summary: Optics, Collimation and Background – 110

Seshadri, Banavara R.
Three Dimensional Constraint Effects on the Estimated (Delta)CTOD during the Numerical Simulation of Different Fatigue Threshold Testing Techniques – 28

Sexton, A.
CO2 Capture by Absorption with Potassium Carbonate Fourth Quarterly Report 2006. Quarterly Progress Report. Reporting Period: October 1, 2006 through December 31, 2006 – 72

Seyfried, W. E.
Novel Approach to Experimental Studies of Mineral Dissolution Kinetics. Annual Technical Progress Report. Period September 1, 2005 through August 31, 2006 – 29

Shaklan, Stuart B.
The Sensitivity of Shaped Pupil Coronagraphs to Optical Aberrations – 143

Shambayati, Shervin
Deep Space Ka-band Link Management and the MRO Demonstration: Long-term Weather Statistics Versus Forecasting – 77

Shaneyfelt, W. L.
Investigating Surety Methodologies for Cognitive Systems – 81

Shao, Michael
Search for Terrestrial Planets with ESA Planet Quest – 155

Shaunak, S.
Glycodendrimers having Biological Activity – 38

Sheppard, D. M.
Design Hurricane Storm Surge Pilot Study – 77

Sheppard, J. C.
Start-to-end Beam Optics Development and Multi-Particle Tracking for the ILC Undulator-based Positron Source – 108

Sheppard, S. T.
Nitride-Based Transistors with a Protective Layer and a Low-Damage Recess and Methods of Fabrication Thereof – 148

Shi, Z.
Curved Track Segment Finding Using Tiny Triplet Finder (TTF) – 121

Shih, C. C.
Method and Means for Generating High Order Hermite Functions for Simulation of Electromagnetic Wave Devices – 95

Shiltsev, V.
Electron Beam Generation in Tevatron Electron Lenses – 132

Shitltsev, V. D.
Channeling Collimation Studies at the Fermilab Tevatron – 111

Sickels, S.
System and Method for Multi-Perspective Collaborative Modeling – 43

Sidick, Erkin
Broadband Performance of TPF's High-contrast Imaging Testbed: Modeling and Simulations – 142

Siegel, Peter
Reliability of Cascaded THz Frequency Chains with Planar GaAs Circuits – 46

Simard, Marc
The Glacier and Land Ice Surface Topography Interferometer (GLISTIN): A Novel Ka-band Digitally Beamformed Interferometer – 66

Simmons, B. A.
Methods and Devices for High-Throughput Dielectrophoretic Concentration – 125

Simmons, K. L.
Methods of Making Monolayers – 24

Simpson, M. L.
Apparatus for Controlled Alignment of Catalytically Grown Nanostructures – 49

Singer, D. M.
Biogenic UO-2- Characterization and Surface Reactivity – 31

Singer, J. P.
Human Factors Guidelines for Intelligent Transportation Systems at the Highway-Rail Intersection: Technical Report – 85

Singh, A. K.
ProUCL Version 4.0, Technical Guide – 93

ProUCL Version 4.0, User Guide – 93

Singh, A.
ProUCL Version 4.0, Technical Guide – 93

ProUCL Version 4.0, User Guide – 93

Singh, R.
Minimizing Degradation of SiC Bipolar Semiconductor Devices – 54

Sinhg, D. N.
Noninvasive Characterization of a Flowing Multiphase Fluid Using Ultrasonic Interferometry – 56

Sinnhuber, Miriam
Neutral Atmospheric Influences of the Solar Proton Events in October-November 2003 – 173

Sjoeqvist, L.
Numerical Simulation of a Flashlamp Pumped Nd:YAG Laser (Numerisk Simulering av en Blixlampspumpad Nd:YAG Laser) – 146

Skands, P. Z.
SUSY-QCD Coupling Relation – 118

Skoug, R.
Dayside Global Ionospheric Response to the Major Interplanetary Events of October 29-30, 2003 "Halloween Storms" – 73

Slack, G. A.
Powder Metallurgy Crucible for Alluminum Nitride Crystal Growth – 35

Slinn, D.
Design Hurricane Storm Surge Pilot Study – 77

Slobin, Stephen
Deep Space Ka-band Link Management and the MRO Demonstration: Long-term Weather Statistics Versus Forecasting – 77

Smart, Marshall C.
An Update of the Ground Testing of the Li-ion Batteries in Support of JPL's 2003 Mars Exploration Rover Mission – 166

Smialek, James L.
Oxidation Kinetics of a NiPtTi High Temperature Shape Memory Alloy – 34

Smith, D. E.
Search for the Rare Decay KL-\gpiO piO gamma – 129

Smith, Frederick
Testing of an Amine-Based Pressure-Swing System for Carbon Dioxide and Humidity Control – 84

Smith, J. C.
Benchmarking, Crosschecking DFS in the ILC Main Linac – 137

Smith, M. E.
Mixing Utility Liquid Viscometric Apparatus – 57

Smith, M.
System and Method for Identifying, Reporting, and Evaluating Presence of Substance – 95

Smith, P. W.
Systems and Methods for Immobilization – 54

Smith, R. P.
Nitride-Based Transistors with a Protective Layer and a Low-Damage Recess and Methods of Fabrication Thereof – 148

Smith, Randall K.
The Chandra X-ray Observatory: An Astronomical Facility Available to the World – 158

Smith, R.
Graded-density Reservoirs for Accessing High Pressure Low Temperature Material States – 18

Smith, Stephen W.
Three Dimensional Constraint Effects on the Estimated (Delta)CTOD during the Numerical Simulation of Different Fatigue Threshold Testing Techniques – 28

Smyth, William H.
Gas Dynamics and Kinetics in the Cometary Coma: Theory and Observations – 170

So, F.
Polymer and Small Molecule Based Hybrid Light Source – 53

Sobanjo, J. O.
Decision Support for Bridge Programming and Budgeting – 89

Soboyejo, W. O.
Methods of Fabricating Devices by Transfer of Organic Material – 49

Soeldner-Rembold, S.
Standard Model Higgs Searches and Perspectives at the Tevatron – 129

Solberg, J. M.
Adaptive Mesh Refinement Algorithms for Parallel Unstructured Finite Element Codes – 96

Solem, Jody A.
Maintenance Procedure Display: Head Mounted Display (HMD) Evaluations – 82

Solyak, N.
Electron Beam Generation in Tevatron Electron Lenses – 132

Somers, J. T.
A Brief Historical Review of Vestibular and Sensorimotor Research Associated with Space Flight – 81

Souers, C.
Kinetic Modeling of Slow Energy Release in Non-Ideal Carbon Rich Explosives – 17

Southward, S. C.
Magnetostrictive Wavelet Method for Measuring Pulse Propagation Time – 132

Soyars, W. M.
Critical Speed Measurements in the Tevatron Cold Compressors – 122

Soyars, W.
Design, Fabrication, and Test of an SRF Cryomodule Prototype at Fermilab – 125

Spangler, Cindy
Propellant Analysis and Distillation Unit Design – 16

Speidrich, J. W.
Relative Humidity Sensor Enclosed with Formed Heating Element – 52

Spencer, E.
Wire Bond Vibration of Forward Pixel Tracking Detector of CMS – 130

Spencer, Michael
The Aquarius Scatterometer: An Active System for Measuring Surface Roughness for Sea-Surface Brightness Temperature Correction – 74

Spitale, J.
Cassini Observes the Active South Pole of Enceladus – 160

Squillacioti, P.
CKM physics at CDF – 120

Measurement of the Branching Fraction Ratio B--\g D K/B--\gD pi with the CDF II Detector – 123

Squyres, S.
Cassini Observes the Active South Pole of Enceladus – 160

Srinivasen, Margaret
Societal Benefits of Ocean Altimetry Data – 80

Stahl, H. P.
Observations of Lightning on Earth from the Lunar Surface – 165

Stahl, H. Philip
Ares V an Enabling Capability for Future Space Astrophysics Missions – 9

Stansbery, Gene
Orbital Debris Studies at NASA – 156

Steckle, W. P.
Mixing Utility Liquid Viscometric Apparatus – 57

Steffen, J. H.
Developments in Planet Detection using Transit Timing Variations – 161

Steinberg, A. D.
Immunostimulatory Nucleic Acid Molecules – 30

Stewart, Christine E.
EVA Hazards due to TPS Inspection and Repair – 8

Steyskal, M.
Laser Based Micro Forming and Assembly – 146

Stickley, Catherine E.
The Cretaceous/Paleogene Transition on the East Tasman Plateau, Southwestern Pacific – 168

Still, D. A.
Beam-Induced Damage to the Tevatron Components and What has been Done About it – 136

Stockli, M. P.
Ion Source Choices An H Source for the High Intensity Neutrino Source – 119

Storlie, C. B.
Sampling-Based Computational Strategy for the Representation of Epistemic Uncertainty in Model Predictions with evidence Theory – 94

Stoughton, C.
Running the Sloan Digital Sky Survey Data Archive – 160

Strologas, J.
Search for Chargino-Neutralino Production at the Collider Detector at Fermilab – 122

Strom, Richard
Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae – 162

Stuart, M. L.
Long-Term Corrosion Behavior of Alloy 22 in 5 M CaCl2 at 120 C – 20

Sumakeris, J. J.
Minimizing Degradation of SiC Bipolar Semiconductor Devices – 54

Sun, Y. E.
Photoinjector Production of a Flat Beam with Transverse Emittance Ratio of 100 – 111

Sunada, Eric T.
Thermal Design and Flight Experience of the Mars Exploration Rover Spacecraft Computer-Controlled, Propulsion Line Heaters – 61

Suntzeff, Nicholas B.
SN 1987A after 18 Years: Mid-Infrared GEMINI and SPITZER Observations of the Remnant – 159

Surampudi, S.
An Update of the Ground Testing of the Li-ion Batteries in Support of JPL's 2003 Mars Exploration Rover Mission – 166

Sutapati, S.
Modeling Urban Surface Transportation Network Dependability and Security – 43

Suter, L.
Hard X-ray Imaging for Measuring Laser Absorption Spatial Profiles on the National Ignition Facility – 145

Sutherlin, Steven
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

Swan, S. K.
Searches for D0 - Anti-D0 Mixing, Rare Charm and Tau Decays – 109

Sweterlitsch, Jeffrey
Testing of an Amine-Based Pressure-Swing System for Carbon Dioxide and Humidity Control – 84

Syverson, Paul
A Formal Language for Cryptographic Protocol Requirements – 98

Szalay, A.
Designing an Multi-petabyte Database for LSST – 164

Taffard, A.
Measurement of the W Boson and Top-Quark Masses at CDF – 150

Takagi, A.
Induction Barrier RF and Applications in Main Injector – 110

Takahashi, Tadayuki
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 162

Talley, C. E.
Feasibility of Single Molecule DNA Sequencing Using Surface-Enhanced Raman Scattering – 140

Tang, Z.
Efficiency and Lifetime of Carbon Foils – 32

Tanna, H.
Scalable and Dynamic Quality of Service Control – 45

Tanner, Angelle M.
Search for Terrestrial Planets with ESA Planet Quest – 155

Tayal, S. S.
Accurate Calculation of Oscillator Strengths for CI II Lines Using Non-orthogonal Wavefunctions – 164

Accurate Cross Sections for Excitation of Resonance Transitions in Atomic Oxygen – 171

Collisions of Electrons with Atomic Oxygen: Current Status – 141

Electron Collisional Excitation Rates for OI USING the B-Spline R-Matrix Approach – 163

Electron Impact Excitation of Forbidden and Allowed Transitions in O(II) – 131

Low-Energy Elastic Electron Scattering by Atomic Oxygen – 141

New Accurate Oscillator Strengths and Electron Excitation Collision Strengths for N1 – 163

Taylor, Anthony P.
Developing the Parachute System for NASA's Orion: An Overview at Inception – 14

Taylor, Robert W.
Panel Resource Management (PRM) Implementation and Effects within Safety Review Panel Settings and Dynamics – 4

Temelkuran, B.
Fiber Waveguides and Methods of Making the Same – 52

Terashima, Yuichi
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 162

Terechkine, I.
Designing Focusing Solenoids for Superconducting RF Accelerators – 114

Thang, J.
Megapixel Multi-band QWIP Focal Plane Arrays – 58

Theilacker, J. C.
Cryogenics for the Supercondcuting Module Test Facility – 136

Surge Recovery Techniques for the Tevatron Cold Compressors – 139

Thomas, M.
Optical System for Generating Three-Dimensional Images – 144

Thomas, P. C.
Cassini Observes the Active South Pole of Enceladus – 160

Thomas, P. D.
Decision Support for Bridge Programming and Budgeting – 89

Thomas, Scott
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

Thompson, M. C.
Results from the UCLA/FNPL Underdense Plasma Lens Experiment – 107

Thorsen, T. A.
Microfabricated Elastomeric Valve and Pump Systems – 40

Tidrow, M.
Megapixel Multi-band QWIP Focal Plane Arrays – 58

Tillman, R\g F.
Bias Selectable Dual Band AlGaN Ultraviolet Detectors – 53

Tingey, D. T.
Summary of NHEERL Ecological Research on Global Climate Change – 79

Tiunov, M.
Electron Beam Generation in Tevatron Electron Lenses – 132

Tomizawa, M.
Beam Diagnostics, Collimation, Injection/Extraction, Targetry. Accidents and Commissioning: Working Group C&G Summary Report – 124

Tompkins, J.
Designing Focusing Solenoids for Superconducting RF Accelerators – 114

Toxel, G. D.
Packet-Based and Pseudo-Packet Based Cryptographic Communications System and Method – 91

Trauger, John T.
Broadband Performance of TPF's High-contrast Imaging Testbed: Modeling and Simulations – 142

Travish, G.
Results from the UCLA/FNPL Underdense Plasma Lens Experiment – 107

Trocellier, P.
Durability of Silicate Glasses: An Historical Approach – 39

Tsai, J. C.
Wavelength-Selective 1XN2 Switches with Two Dimensional Input Output Fiber Arrays – 47

Tsalatsanis, S.
Efficacy of Utility Database Management – 89

Tsurutani, B. T.
Dayside Global Ionospheric Response to the Major Interplanetary Events of October 29-30, 2003 "Halloween Storms" – 73

Tsurzuki, G.
Systems and Methods for Tuning Filters – 51

Turtle, E.
Cassini Observes the Active South Pole of Enceladus – 160

Tyliszczak, T.
Study of Interactions Between Microbes and Minerals by Scanning Transmission X-Ray Microscopy (STXM) – 34

Tyrrell, B.
Method for Photolithography Using Multiple Illuminations and a Single Fine Feature Mask – 48

Ubertini, P.
A Possible Magnetar Nature for IGR J16358-4726 – 157

Uchida, S.
High Efficiency Organic Photovoltaic Cells Employing Hybridized Mixed Planar Heterojunctions – 50

Unger, J.
Scalable and Dynamic Quality of Service Control – 45

Unger, M. A.
Microfabricated Elastomeric Valve and Pump Systems – 40

Uozumi, S.
B Masses and Lifetimes at the Tevatron – 117

Vaidyanathan, K. R.
Water Soluble Tooling Materials for Composite Structures – 6

Valishev, A.
Linear Lattic Modeling of the Recycler Ring at FERMILAB – 109

Measurement and Correction of linear Optics an Coupling at Tevatron Complex – 113

van der Geest, P. J.
Study of Normal Operational Landing Performance on Subsonic, Civil, Narrow-Body Jet Aircraft During Instrument Landing System Approaches – 2

van Es, G. W. H.
Study of Normal Operational Landing Performance on Subsonic, Civil, Narrow-Body Jet Aircraft During Instrument Landing System Approaches – 2

Van Hook, A.
System and Method for Identifying, Reporting, and Evaluating Presence of Substance – 95

Vanderbei, Robert J.
The Sensitivity of Shaped Pupil Coronagraphs to Optical Aberrations – 143

VanDerHorst, Alexander J.
Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae – 162

Vasbinder, M. J.
Oxidations of Organic and Inorganic Substrates by Superoxo-, Hydroperoxo-, and Oxo-Compounds of the Transition Metals – 32

Vassilevski, P. S.
Parallel H-1-Based Auxiliary Space AMG Solver for H(curl) Problems – 88

Vay, J. L.
Electron Production and Collective Field Generation in Intense Particle Beams – 140

Veverka, J.
Cassini Observes the Active South Pole of Enceladus – 160

Vicko, A.
Phase Matched Parametric Light Generation in Monolithically Integrated Intersubband Optical Devices – 144

Viisco, S.
Solid State Electrochemical Composite – 29

Vimmerstedt, L.
Technical Assistance Project for the Minnesota Pollution Control Agency – 68

Vitello, P.
Kinetic Modeling of Slow Energy Release in Non-Ideal Carbon Rich Explosives – 17

Volk, J. T.
Hydro Static Water Level Systems at Fermilab – 57

Roll Measurement of Tevatron Dipoles and Quadrupoles – 133

Voutier, E.
Nucleon Structure and Generalized Parton Distributions – 109

Vuduc, R.
Support for Whole-Program Analysis and the Verification of the One-Definition Rule in C++ – 92

Wachter, S.
A Possible Magnetar Nature for IGR J16358-4726 – 157

Waggoner, A. S.
Cyanine Dyes as Labeling Reagents for Detection of Biological and Other Materials by Luminescence Methods – 23

Wagner, R.
Cassini Observes the Active South Pole of Enceladus – 160

Wagstaff, B. R.
Protection of Alodine Coatings from Thermal Aging by Removable Polymer Coatings – 39

Wagstaff, Kiri
Clustering with Missing Values: No Imputation Required – 100

Wake, M.
Magnetization Anomaly of Nb3Al Strands and Instability of Nb3Al Rutherford Cables – 148

Walish, J.
Water Soluble Tooling Materials for Composite Structures – 6

Walter, R.
A Possible Magnetar Nature for IGR J16358-4726 – 157

Walton, Otis R.
Adhesion of Lunar Dust – 172

Wang, A.
Variable Structure Diagnostics Approach Achieving Optimized Low-Frequency Data Sampling for EMA Motoring Systems – 7

Wang, J.
Proceedings of a Workshop on Hydrological Modeling of Freshwater Discharge from Alaska's Arctic Coast – 78

Wang, M.
Curved Track Segment Finding Using Tiny Triplet Finder (TTF) – 121

FPGA Curved Track Fitter with Very Low Resource Usage – 128

Ward, John
Reliability of Cascaded THz Frequency Chains with Planar GaAs Circuits – 46

Watson, Michael D.
Radiation-Hardened Electronics for the Space Environment – 15

Weaver, H.
Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System – 171

Weber, E. R.
Hafnium Nitride Buffer Layers for Growth of GaN on Silicon – 48

Weil, S. A.
Design and Implementation of Ceph: A Scalable Distributed File System – 87

Weinberg, M. S.
Dual Microwave Cavity Accelerometer – 54

Weisenstein, Debra K.
Neutral Atmospheric Influences of the Solar Proton Events in October-November 2003 – 173

Welton, R. F.
Ion Source Choices An H Source for the High Intensity Neutrino Source – 119

Wemhoff, A. P.
Thermal Modeling Tool for a Spherical Capsule in a Sputtering Chamber – 140

Wendt, M.
Analog Signal Pre-Processing for the Fermilab Main Injectore BPM Upgrade – 138

Wenski, E. G.
System and Method for Identifying, Reporting, and Evaluating Presence of Substance – 95

Werner, Michael
Execution of the Spitzer In-orbit Checkout and Science Verification Plan – 158

West, R.
Cassini Observes the Active South Pole of Enceladus – 160

Wheeler, D. L.
Biomimetic Organic/Inorganic Composite Processes for Their Production and Methods of Use, PAT-APPL-11-433-725 – 23

Biomimetic Organic/Inorganic Composites, Processes for Their Production, and Methods of Use, PAT-APPL-11- – 21

Whelley, Patrick
Autonomous Detection of Dust Devils and Clouds on Mars – 154

Whinnery, L. L.
Protection of Alodine Coatings from Thermal Aging by Removable Polymer Coatings – 39

Whitcanack, L. D.
An Update of the Ground Testing of the Li-ion Batteries in Support of JPL's 2003 Mars Exploration Rover Mission – 166

Whitlock, Dave
Orbital Debris Studies at NASA – 156

Whitmore, Milrian
Maintenance Procedure Display: Head Mounted Display (HMD) Evaluations – 82

Wicke, D.
Top Pair Production III: Testing the Standard Model in Top Quark Decays – 130

Wiedeman, Michael D.
Test Results of Total Ionizing Dose Conducted at the Jet Propulsion Laboratory – 56

Wiener, D. J.
Final Report for the Network Authentication Investigation and Pilot – 87

Wildman, D.
Induction Barrier RF and Applications in Main Injector – 110

Willemsen, B. A.
Systems and Methods for Tuning Filters – 51

Williams, Benjamin S.
Operation of Terahertz Quantum-cascade Lasers at 164 K in Pulsed Mode and at 117 K in Continuous-wave Mode – 142

Williams, David E.
Characteristics of Post-Sorbent and High Temperature Catalytic Oxidizer Beds After Long-Term On-Orbit Use – 83

International Space Station Environmental Control and Life Support System: Verification for the Pressurized Mating Adapters – 83

International Space Station (ISS) Environmental Control and Life Support (ECLS) System Overview of Events: February 2006 - 2007 – 82

Williams, Graham L.
The Cretaceous/Paleogene Transition on the East Tasman Plateau, Southwestern Pacific – 168

Williams, James H.
Oxygen Concentration Flammability Threshold Tests for the Constellation Program – 10

Williams, J.
Chassis Dynamometer Testing of Aqueous Ethanol in a Transit Van – 153

Williams, Kevin W.
An Assessment of Pilot Control Interfaces for Unmanned Aircraft – 7

Williams, W. F.
Adhesive Anchors for Retrofit/Repair of Bridge Rails: Summary Report – 22

Repair/Retrofit Anchorage Designs for Bridge Rails – 22

Wilson, C. A.
A Possible Magnetar Nature for IGR J16358-4726 – 157

Wilson, D.
Cassini Observes the Active South Pole of Enceladus – 160

Wilson, M. G.
Search for D0-anti-D0 Mixing with the BaBar Experiment – 137

Wilson, Robert K.
Execution of the Spitzer In-orbit Checkout and Science Verification Plan – 158

Wilson, William J.
Compact, Lightweight Dual- Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 41

Compact, Lightweight Dual-Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 67

Windsat Validation Using Seawinds, Windrad and POLSCAT Measurements – 76

Wind, R. A.
Simple Approach for Obtaining High Resolution, High Sensitivity 1H NMR Metabolite Spectra of Biofluids with Limited Mass Supply – 20

Winters, W. S.
Final Report for the ASC Gas-Powder Two-Phase Flow Modeling Project AD2006-09 – 57

Wisdom, Jack
Dynamics of the Lunar Spin Axis – 170

Evidence for a Past High-Eccentricity Lunar Orbit – 170

Motion of the Mantle in the Translational Modes of the Earth and Mercury – 170

Simplectic Correctors for Canonical Heliocentric N-Body Maps – 160

Wisdom, J.
Cassini Observes the Active South Pole of Enceladus – 160

Wizke, E. L.
Final Report for the Network Authentication Investigation and Pilot – 87

Wolf, S.
Reduced Reference Video Calibration Algorithms – 90

Wolk, S. J.
Chandra Observations of Comet 2P/Encke 2003: First Detection of a Collisionally Thin, Fast Solar Wind Charge Exchange System – 171

Wolski, R.
Evaluating the Performance Impact of Xen on MPI and Process Execution for HPC Systems – 88

Woodcock, Gordon
Near Earth Object (NEO) Mitigation Options Using Exploration Technologies – 9

Woodell, Glen
Enhanced Images for Checked and Carry-on Baggage and Cargo Screening – 59

Woodell, Glenn A.
Automated On-board Terrain Analysis for Precision Landings – 15

DSP Implementation of the Multiscale Retinex Image Enhancement Algorithm – 59

Image Enhancement, Image Quality, and Noise – 60

Impact of Multiscale Retinex Computation on Performance of Segmentation Algorithms – 58

Real-time Enhancement, Registration, and Fusion for an Enhanced Vision System – 60

Woodell, Glenn
Advanced Image Processing of Aerial Imagery – 60

Woodells, Glenn A.
The Automatic Assessment and Reduction of Noise Using Edge Pattern Analysis in Nonlinear Image Enhancement – 59

Woodley, M. D.
Start-to-end Beam Optics Development and Multi-Particle Tracking for the ILC Undulator-based Positron Source – 108

Woods, P.
A Possible Magnetar Nature for IGR J16358-4726 – 157

Woolford, Barbara
Space Human Factors Engineering Gap Analysis Project Final Report – 86

Woosley, Stan E.
Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae – 162

Wortham, M. B.
ISS Debris Avoidance Maneuver Threshold Analysis – 14

Wright, T.
B-Tagging at CDF and DO Lesson for LHC – 102

Wu, J.
Curved Track Segment Finding Using Tiny Triplet Finder (TTF) – 121

FPGA Curved Track Fitter with Very Low Resource Usage – 128

Wu, Liangjin
Growth and Properties of Lattice Matched GaAsSbN Epilayer on GaAs for Solar Cell Applications – 131

Influence of Growth Parameters and Annealing on Properties of MBE Grown GaAsSbN SQWs – 149

Wu, M. C.
Wavelength-Selective 1XN2 Switches with Two Dimensional Input Output Fiber Arrays – 47

Wu, Sien-Chong
Real-time Sub-cm Differential Orbit Determination of two Low-Earth Orbiters with GPS Bias Fixing – 12

Wuers, Ralph A. M. J.
Prompt and Afterglow Emission Properties of Gamma-Ray Bursts with Spectroscopically Identified Supernovae – 162

Xia, Y.
Flavone Acetic Acid Analogs and Methods of Use Thereof – 30

Xiao, M.
Linear Lattic Modeling of the Recycler Ring at FERMILAB – 109

Xiao, T. D.
Coatings, Coated Articles and Methods of Manufacture Thereof, PAT-APPL-11-418-626 – 21

Coatings, Coated Articles and Methods of Manufacture Thereof, PAT-APPL-11-418-871 – 21

Xiao, Y.
Evaluation of the Dynamic Complex Modulus Test and Indirect Diametral Test for Implementing the AASHTO 2002 Design Guide for Pavement Structures in Florida – 3

Xiaoli, Ding
Policy Document on Earth Observation for Urban Planning and Management: State of the Art and Recommendations for Application of Earth Observation in Urban Planning – 67

Xu, D. P.
Intersubband Mid-Infrared Electroluminescent Semiconductor Devices – 126

Xu, L.
Integrated Photoelectrochemical Cell and System Having a Liquid Electrolyte – 67

Xue, J.
High Efficiency Organic Photovoltaic Cells Employing Hybridized Mixed Planar Heterojunctions – 50

Yacoob, S.
Radiation Damage to Scintillator in the D0 Luminosity Monitor – 128

Yalcin, A.
Efficacy of Utility Database Management – 89

Yamada, R.
Feasibility Study of Nb3Al Rutherford Cable for High Field Accelerator Magnet Application – 127

Magnetization Anomaly of Nb3Al Strands and Instability of Nb3Al Rutherford Cables – 148

Yan, H.
Siloxane-Polymer Dielectric Compositions and Related Organic Field-Effect Transistors – 52

Yang, Bingen
Development of New Modeling and Analysis Tools for Solar Sails – 16

Yang, M. M.
Visualization and Processing of Multidimensional Data Using Prefiltering and Sorting Criteria – 96

Yang, P.
Thermal Properties of PZT95/5(1.8Nb) and PSZT Ceramics – 38

Yang, X.
Coherent Instabilities at the FNAL Booster – 109

Yang, Z. Y.
Flavone Acetic Acid Analogs and Methods of Use Thereof – 30

Yao, W.
Structure, Ionic Conductivity and Mobile Carrier Density in Fast Ionic Conducting Chalcogenide Glasses – 137

Yaqoob, Tahir
Precision Fe K-Alpha and Fe K-Beta Line Spectroscopy of the Seyfert 1.9 Galaxy NGC 2992 with Suzaku – 162

Yashiki, T.
Comparative Corrosion Behavior of Two Palladium Containing Titanium Alloys – 20

Yen, B. K. H.
Method of Preparing Nanocrystals – 24

Yingst, R. Aileen
Linking Home Plate and Algonquin Class Rocks through Microtextural Analysis: Evidence for Hydrovolcanism in the Inner Basin of Columbia Hills, Gusev Crater – 66

Yoon, M. H.
Siloxane-Polymer Dielectric Compositions and Related Organic Field-Effect Transistors – 52

Youseff, L.
Evaluating the Performance Impact of Xen on MPI and Process Execution for HPC Systems – 88

Yuan, F.
Unique Description for Single Transverse Spin Asymmetries in DIS and Hadronic Collisions – 105

Yueh, S. H.
Polarimetric Analysis of Scatterometer Data for Ocean Surface Wind Measurement – 73

Yueh, Simon H.
Compact, Lightweight Dual- Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 41

Microwave Remote Sensing Modeling of Ocean Surface Salinity and Winds Using an Empirical Sea Surface Spectrum – 74

Windsat Validation Using Seawinds, Windrad and POLSCAT Measurements – 76

Yueh, Simon
Compact, Lightweight Dual-Frequency Microstrip Antenna Feed for Future Soil Moisture and Sea Surface Salinity Missions – 67

Yung, G.
Stabilization of Self-Assembled Monolayers – 26

Yunis, Isam
On the Use of 3dB Qualification Margin for Structural Parts on Expendable Launch Vehicles – 9

Zatsarinny, O.
Electron Collisional Excitation Rates for OI USING the B-Spline R-Matrix Approach – 163

Zatsarinny O.
Low-Energy Elastic Electron Scattering by Atomic Oxygen – 141

Zawadzki, Mark
The Glacier and Land Ice Surface Topography Interferometer (GLISTIN): A Novel Ka-band Digitally Beamformed Interferometer – 66

Zemanian, T. S.
Methods of Making Monolayers – 24

Zhang, Yan
Target Selection and Imaging Requirements for JWST Fine Phasing – 143

Zhang, Z.
Coatings, Coated Articles and Methods of Manufacture Thereof, PAT-APPL-11-418-871 – 21

Zhou, A.
Acoustic Immunosensor for Detecting Neurotransmitter GABA – 141

Zhou, F.
Start-to-end Beam Optics Development and Multi-Particle Tracking for the ILC Undulator-based Positron Source – 108

Zhu, C.
Novel Approach to Experimental Studies of Mineral Dissolution Kinetics. Annual Technical Progress Report. Period September 1, 2005 through August 31, 2006 – 29

Ziang, J.
Variable Structure Diagnostics Approach Achieving Optimized Low-Frequency Data Sampling for EMA Motoring Systems – 7

Zielinski, M.
QCD and Top-Quark Results from the Tevatron – 129

Zlobin, A. V.
Study of 2-in-1 Large-Aperture Nb3Sn IR Quadrupoles for the LHC Luminosity Upgrade – 103

Thermal Analysis of SC Quadrupoles in Accelerator Interaction Regions – 125

Zoilkin, T. V.
Negative Hydrogen Ion Source Research and Beam Parameters for Accelerators – 115

Zuber, Maria T.
Evidence for a Past High-Eccentricity Lunar Orbit – 170

Zurita, J.
A Possible Magnetar Nature for IGR J16358-4726 – 157