National Aeronautics and Space Administration
Langley Research Center

Scientific and Technical Information Program Office

Scientific and Technical Aerospace Reports

STAR

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NASA STI Program ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA Scientific and Technical Information (STI) Program plays a key part in helping NASA maintain this important role.

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- TECHNICAL MEMORANDUM. Scientific and technical findings that are of preliminary or 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.
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- TECHNICAL TRANSLATION. English-language translations of foreign scientific and technical material pertinent to NASA's mission.

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  Hanover, MD 21076-1320

Introduction

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

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

STAR includes citations to Research & Development (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 Scientific and Technical Information (STI) Program was established to support the objectives of NASA's missions and research to advance aeronautics and space science. By sharing information, the NASA STI Program ensures that the U.S. maintains its preeminence in aerospace-related industries and education, minimizes duplication of research, and increases research productivity.

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

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

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

NASA STI Availability Information

NASA Center for AeroSpace Information (CASI)

Through NASA CASI, the NASA STI Program offers many information products and services to the aerospace community and to the public, including access to a selection of full text of the NASA STI. Free registration with the program is available to NASA, U.S. Government agencies and contractors. To register, contact CASI at help@sti.nasa.gov. Others should visit the program at www.sti.nasa.gov. The 'search selected databases' button provides access to the NASA Technical Reports Server (TRS) – 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 or contact help@sti.nasa.gov or telephone the CASI Help Desk at 301-621-0390. Before ordering you may access price code tables for STI documents and videos. When information is not available from CASI, the source of the information is indicated when known.

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National Technical Information Service (NTIS)

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

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The U.S. Congress established the **Federal Depository Library Program** (FDLP) to ensure access by 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 http://www.access.gpo.gov/su_docs.

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

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

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Subject Term Index

Personal Author Index

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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01
AERONAUTICS (GENERAL)

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

20050168080 Federal Aviation Administration, Washington, DC
Federal Aviation Administration National Aviation Research Plan, 2004
Feb. 2004; 230 pp.; In English
Report No.(s): PB2005-105703; No Copyright; Avail: CASI; A11, Hardcopy

;Table of Contents: Executive Summary; FAA R&D Program Overview; Program Information; Appendix A- Research Engineering and Development Advisory Committee; Appendix B: Alphabetical Listing of National Aviation Research Plan Budget Line Items; Appendix C: Numerical Listing of National Aviation Research Plan Projects and Appendix D: Acronyms and Abbreviations.

NTIS
Research; Aeronautics; Aeronautical Engineering

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*.

20050167353 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Free-to-Roll Study of Uncommanded Lateral Motions for the Vented Strake F/ A-18E/F
Bryant, Elaine M.; Apr. 2005; 62 pp.; In English
Report No.(s): AD-A431941; CI04-1030; No Copyright; Avail: CASI; A04, Hardcopy

A free-to-roll study was conducted on the lateral characteristics of a 10% scale model pre-production vented strake F/A-18E/F. This study carried out both static force and moment tests along with free-to-roll tests to determine the correlation to previous studies, assess the lateral motion, and verify free-to-roll as a viable test technique for the determination of uncommanded lateral motion potential. Static force and moment tests established correlation with previous studies. Using a figure of merit, the free-to-roll tests captured the angle of attack range over which the wing drop occurred in flight tests. Based on the equation of motion, the possible contributors to the lateral motion were: the character of the forcing function, the static lateral stability and roll damping. To determine the causal contributions three different angles of attack were analyzed, verifying the importance of free-to-roll as a viable test technique when used in conjunction with static test results.

DTIC
Fighter Aircraft; Jet Aircraft; Roll; Strakes

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*.

20050166400 General Accounting Office, Washington, DC

National Airspace System: Experts' Views on Improving the U.S. Air Traffic Control Modernization Program

Apr. 2005; 50 pp.; In English

Report No.(s): PB2005-104958; GAO-05-333SP; No Copyright; Avail: CASI; A03, Hardcopy

In 1981, the Federal Aviation Administration (FAA) began a program to modernize the national airspace system and a primary component, the air traffic control (ATC) system. The ATC component of this program, which is designed to replace aging equipment and accommodate predicted growth in air traffic, has had difficulty for more than two decades in meeting cost, schedule, and performance targets. The performance-based Air Traffic Organization (ATO) was created in February 2004 to improve the management of the modernization effort. On October 7, 2004, GAO hosted a panel to discuss attempts to address the ATC modernization program's persistent problems. Participants discussed the factors that they believed have affected FAA's ability to acquire new ATC systems. Participants also identified steps that FAA's ATO could take in the short term to address these factors, as well as longer term steps that could be taken to improve the modernization program's chances of success and help the ATO achieve its mission.

NTIS

Air Traffic Control; Air Traffic; National Airspace System; Airspace

20050166902 Civil Aerospace Medical Inst., Oklahoma City, OK, USA

Review of the Scientific Basis for the Mandatory Separation of an Air Traffic Control Specialist at Age 56

Broach, D.; April 2005; 33 pp.; In English

Contract(s)/Grant(s): FAA-BHRR523

Report No.(s): DOT/FAA/AM-05/6; No Copyright; Avail: CASI; A03, Hardcopy

Under Public Law 92-297, air traffic control specialists (ATCS or controller) are required to retire at age 56. A review of the literature relevant to the mandatory retirement of controllers was conducted. The scope of the review was limited to studies relevant to the specific rationales proffered in support of mandatory separation of controllers at age 56. The review was not a comprehensive examination of the extensive literature on aging, health, stress, shiftwork, cognitive abilities, or job performance, including errors, as related to the air traffic control specialist (ATCS) occupation. The testimony offered in 1971 before the U.S. Congress did not explicitly describe why age 56 was chosen. The argument for mandatory retirement appears to have been that: A) The mid-50s were the ages in which 'burnout' was likely to occur among controllers as a result of job stress; B) Age 56 would allow a controller to accumulate 25 years or more of credible service if hired at the proposed maximum entry age of 31; C) Age 56 was a young enough age to allow a 'burned-out' controller to pursue an alternative career, if desired.

Author (revised)

Air Traffic Controllers (Personnel); Human Performance; Mental Performance; Retirement; Public Law; Age Factor

20050167062 North Carolina State Univ., Raleigh, NC, USA

Simulating Virtual Terminal Area Weather Data Bases for Use in the Wake Vortex Avoidance System (Wake VAS) Prediction Algorithm

Kaplan, Michael L.; Lin, Yuh-Lang; December 2004; 19 pp.; In English

Contract(s)/Grant(s): NAG1-03043; No Copyright; Avail: CASI; A03, Hardcopy

During the research project, sounding datasets were generated for the region surrounding 9 major airports, including Dallas, TX, Boston, MA, New York, NY, Chicago, IL, St. Louis, MO, Atlanta, GA, Miami, FL, San Francico, CA, and Los Angeles, CA. The numerical simulation of winter and summer environments during which no instrument flight rule impact was occurring at these 9 terminals was performed using the most contemporary version of the Terminal Area PBL Prediction System (TAPPS) model nested from 36 km to 6 km to 1 km horizontal resolution and very detailed vertical resolution in the planetary boundary layer. The soundings from the 1 km model were archived at 30 minute time intervals for a 24 hour period and the vertical dependent variables as well as derived quantities, i.e., 3-dimensional wind components, temperatures, pressures, mixing ratios, turbulence kinetic energy and eddy dissipation rates were then interpolated to 5 m vertical resolution

up to 1000 m elevation above ground level. After partial validation against field experiment datasets for Dallas as well as larger scale and much coarser resolution observations at the other 8 airports, these sounding datasets were sent to NASA for use in the Virtual Air Space and Modeling program. The application of these datasets being to determine representative airport weather environments to diagnose the response of simulated wake vortices to realistic atmospheric environments. These virtual datasets are based on large scale observed atmospheric initial conditions that are dynamically interpolated in space and time. The 1 km nested-grid simulated datasets providing a very coarse and highly smoothed representation of airport environment meteorological conditions. Details concerning the airport surface forcing are virtually absent from these simulated datasets although the observed background atmospheric processes have been compared to the simulated fields and the fields were found to accurately replicate the flows surrounding the airport where coarse verification data were available as well as where airport scale datasets were available.
Author (revised)
Aviation Meteorology; Flight Conditions; Data Bases; Data Simulation

20050167209 University of Southern California, Marina del Rey, CA USA
CAMERA: Coordination and Management Environments for Responsive Agents
Neches, Robert; Szekely, Pedro; Feb. 2005; 52 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-99-1-0524; DARPA ORDER-J133/H361; Proj-H361
Report No.(s): AD-A431430; AFRL-IF-RS-TR-2005-50; No Copyright; Avail: Defense Technical Information Center (DTIC)

The CAMERA project produced the SNAP (Schedules Negotiated by Agent-based Planners) flight scheduling software in experimental use by Harrier squadrons of Marine Air Group 13, stationed in Yuma, AZ; it was also fielded aboard the USS Bonhomme Richard, the USS Belleau Wood, the USS Pelleliu and the USS Essex that conducted operations in Iraq, Japan and Afghanistan. The CAMERA project also produced an open hybrid solver architecture that allows off-the-shelf solvers to be combined to solve a problem. Finally, it produced a family of market-inspired negotiation algorithms called MARBLES.
DTIC
Cameras; Computer Programs; Coordination; Flight; Planning; Schedules; Scheduling; Snap

20050167222 WaveBand Corp., Irvine, CA USA
A Report of Test Results of the 94 GHz Bird Detection Radar (BIRDAR) (trademark) at DFW Airport
Herricks, Edwin E.; Fisher, Jonathan R.; Markow, Joshua S.; Antonik, Paul; Mar. 2005; 65 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-02-2-0119; Proj-4770
Report No.(s): AD-A431551; AFRL-SN-RS-TR-2005-55; No Copyright; Avail: Defense Technical Information Center (DTIC)

A 94 GHz radar was developed under the Dual Use Science and Technology (DUST) program sponsored by the Federal Aviation Agency and the U.S. Air Force, AFRL/SNRT. The radar was developed by WaveBand Corporation. The University of Illinois Center of Excellence in Airport Technology (CEAT) provided support for the testing and evaluation of the 94 GHz radar designated BIRDAR' by the WaveBand Corporation. The radar system was tested at several locations in California, and a major testing campaign was conducted at the Dallas/Forth Worth International Airport (DFW), September 17-15, 2004. This report provides a report of radar testing conducted at DFW and the postcampaign analysis of test results conducted by CEAT and the U.S. Air Force.
DTIC
Airports; Bird-Aircraft Collisions; Detection; Radar; Radar Detection

20050167260 Naval Health Research Center, San Diego, CA USA
Marine Corps CASEVAC: Determining Medical Supply Requirements for Long-Range Casualty Evacuation Aircraft
Hill, Martin; Galaraneau, Michael; Konoske, Paula; Pang, Gerry; Aug. 2003; 41 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431656; NAVHLTHRSCHC-03-20; No Copyright; Avail: Defense Technical Information Center (DTIC)

Providing casualty evacuation (CASEVAC) in the modern high-maneuver combat environment presents special problems. Small mobile units operating at increased distances from rear areas or sea-based platforms likely will not have the support of a Level 1B treatment facility such as a battalion aid station. With combat elements positioned far forward of their support units, ground evacuation may be impractical. Even evacuation by air may take more than the 'Golden Hour' by which time trauma experts agree severely injured patients must receive some form of advanced lifesaving intervention. Needed is a specially

equipped aeromedical asset manned by corpsman with appropriate skill levels to provide the necessary critical care interventions to stabilize severely wounded, injured or ill Marines for a period of transit that could last hours. The objective of this study was to determine what level of medical skills and what kind of medical equipment would be required for such a CASEVAC asset.
DTIC
Air Transportation; Casualties; Evacuating (Transportation); Medical Services; Supplying

20050167266 Air Force Research Lab., Kirkland AFB, NM USA
TechSat 21: Formation Design, Control, and Simulation
Burns, Rich; McLaughlin, Craig; Leitner, Jesse; Martin, Maurice; Jan. 2000; 8 pp.; In English
Report No.(s): AD-A431668; No Copyright; Avail: Defense Technical Information Center (DTIC)
The satellite cluster approach to space missions requires science and technology advances in several key areas. Among these challenges is understanding the dynamics of satellites in close proximity to each other so that a formation can be intelligently designed, controlled, and simulated. An overview of on-going research in this area under the TechSat 21 program along with preliminary findings is provided. Included in this overview is the recent progress made in the design of formations including designs for circular formations, projected circular formations, and J?sub2! invariant formations. Strategies for formation control are presented as well as the baseline design for the TechSat 21 propulsion system. Fuel expenditure is estimated for various formations using different control strategies. The TechSat 21 mission requires relative position knowledge between satellites to the millimeter level while the radar is transmitting and receiving; concepts for meeting this requirement are also presented. In order to facilitate mission planning and gain confidence in mission success, the Air Force Research Laboratory (AFRL) is building an end to end simulation testbed for the TechSat 21 mission. An overview of the testbed design and functionality is provided. Focus is centered on the dynamics and control module of the testbed. The dynamics and control module utilized high fidelity orbit propagation as the basis of the simulation of the formation dynamics. Through this simulation control algorithms, relative navigation techniques, and the effects of errors in initial conditions and control forces are investigated.
DTIC
Artificial Satellites; Control Simulation; Space Missions

20050167274 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
The KC-135 With a Multi-Point Refueling System: Increased Capability With Unkown Costs
Dittus, James E.; Jun. 2003; 75 pp.; In English
Report No.(s): AD-A431694; AFIT/GMO/ENS/03E-02; No Copyright; Avail: Defense Technical Information Center (DTIC)
Now that the MPRS is fully operational and augmenting the KC-135 as planned, it is possible to quantify the value provided by the added capability of the system and compare it with the costs to make decisions about the future of the system. This research draws on technical manuals, operational testing, and expert opinion to determine appropriate planning factors to use for tactical refueling planning with MPRS capability. A sample set of refueling requests that are generated in the creation of an air tasking order (ATO) is evaluated. The refueling satisfied by KC-135Rs without MPRS capability is compared to the same requirements fulfilled by KC-135Rs equipped with MPRS to provide an evaluation of the system's value. The MPRS provides increased capability for the KC-135 fleet. In a tactical employment refueling scenario, the MPRS increases efficiency of the theater-wide refueling mission 10-18%. This value range is contingent upon the assumptions of system reliability, desired mission success, and the type of tactical environment in which the system is employed. This system adds significant value in redundancy and mission capability without costing more than the savings achieved.
DTIC
C-135 Aircraft; Costs; Refueling; Tanker Aircraft

20050167277 Brown Univ., Providence, RI USA
High Order Accuracy Methods for the Simulations of Reactive Flows
Gottlieb, David; Dec. 2004; 32 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0113
Report No.(s): AD-A431697; AFRL-TR-05-0137; No Copyright; Avail: CASI; A03, Hardcopy
Under this grant we have attempted to simulate supersonic reactive flows with high order accuracy methods. The scientific reason for using high order methods is that simulations of supersonic reactive flows require long time integration and the

resolution of fine scales of the flow. It is well known that high order accuracy methods are mandatory in satisfying those requirements.
DTIC
Mathematical Models; Reactivity; Simulation

20050167727 Air Mobility Warfare Center, Fort Dix, NJ USA
A Model to Determine the Proper SAM/VIP Air Fleet
Van Noord, Jonathan R.; Jun. 2002; 52 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431492; AFIT/GMO/ENS/02E-14; No Copyright; Avail: Defense Technical Information Center (DTIC)

The VIP/SAM fleet at Andrews AFB supports the air transportation of the President and other Washington D.C. dignitaries. Over the last 20 years, the fleet of aircraft have changed in type and numbers. Currently, the fleet cannot support all the requests for airlift it receives. This GRP looks at the aircraft currently assigned to the VIP/SAM fleet and the historical data of missions they fly. With this information and future aircraft possibilities, a model was constructed for the White House Military Office to use to determine the appropriate types and numbers of aircraft given the number of missions scheduled.
DTIC
Air Transportation; Commercial Aircraft

20050168083 Federal Aviation Administration, Washington, DC
Forecasts of IFR Aircraft Handled by FAA Air Route Traffic Control Centers, FY 2004-2015
May 2004; 38 pp.; In English
Report No.(s): PB2005-105691; No Copyright; Avail: CASI; A03, Hardcopy

This report provides forecasts of Instrument Flight Rule (IFR) aircraft handled by individual Federal Aviation Administration (FAA) Air Route Traffic Control Centers (ARTCC). These forecasts are based on the national forecasts reported in FAA Aerospace Forecasts Fiscal Years 2004-2015 (FAA-APO-04-1, March 2004). Final forecasts for the 22 individual centers are based upon the national forecast as well as input from regional staff. These forecasts serve as a base for the FAA planning and budget process in determining future requirements for facilities, equipment, and manpower. A summary of projected IFR aircraft handled for individual centers is presented in Table 1 on page 2.
NTIS
Air Traffic Control; Instrument Flight Rules; Forecasting

20050168086 NASA Ames Research Center, Moffett Field, CA, USA
Prototype Training Materials for Acceptance Criteria of Maintenance ASAP Events Occurring within Social Context
Taylor, J. C.; Aug. 31, 2004; 42 pp.
Report No.(s): PB2005-105702; No Copyright; Avail: CASI; A03, Hardcopy

The aviation maintenance community is at a crossroads with respect to implementing the Aviation Safety Action Program (ASAP). While there is considerable interest, several key issues have emerged that cast doubt on how to assure a successful implementation, including buy-in from all levels of the company and training for key participants. There are two objectives for the present report. The first is to provide an examination of limits (or more properly, examples) of the degree of acceptability of more problematic events for risk-based decisions within the current ASAP guidelines. The second objective is to apply these limits of community standards to a set of further refined ASAP training scenarios.
NTIS
Maintenance Training; Aircraft Safety; Social Factors; Personnel Management

20050168088 Federal Aviation Administration, Washington, DC, USA
FAA Long-Range Aviation Forecasts, Fiscal Years 2010, 2015 and 2020, June 1998
Jun. 1998; 20 pp.; In English
Report No.(s): PB2005-105701; FAA-APO-98-9; No Copyright; Avail: CASI; A03, Hardcopy

The Federal Aviation Administration (FAA) issues its annual 12-year forecast in the spring of each year which is utilized for both manpower and facility planning as well as policy analysis. The latest 12-year forecast (FAA-APO-98-1, FAA Aviation Forecasts: Fiscal Years 1998-2009, March 1998) provides projections of aviation activity and FAA workload measures through the year 2009. Periodically, a need arises for projections of aviation demand and activity beyond the published horizon. This document was developed to meet these needs, and contains projections for aircraft fleet and hours, air carrier and

regional/commuter passenger enplanements, pilots, and FAA workload measures for the years 2010, 2015 and 2020.
NTIS
Air Transportation; Aeronautics; Forecasting

20050168108 Federal Aviation Administration, Washington, DC
Federal Aviation Administration Portfolio of Goals, Fiscal Year 2005
Feb. 02, 2005; 46 pp.; In English
Report No.(s): PB2005-105708; No Copyright; Avail: CASI; A03, Hardcopy
;Table of Contents: Goals; Safety; Greater Capacity; International Leadership and Organizational Excellence.
NTIS
Aerospace Safety; Accident Prevention; Air Transportation

20050168109 General Accounting Office, Washington, DC
Aviation Security: Screener Training and Performance Measurement Strengthened, but More Work Remains
May 2005; 70 pp.; In English
Report No.(s): PB2005-106267; GAO-05-457; No Copyright; Avail: CASI; A04, Hardcopy
The screening of airport passengers and their checked baggage is a critical component in securing our nation's commercial aviation system. Since May 2003, GAO has issued six products related to screener training and performance. This report updates the information presented in the prior products and incorporates results from GAO's survey of 155 Federal Security Directors--the ranking Transportation Security Administration (TSA) authority responsible for the leadership and coordination of TSA security activities at the nation's commercial airports. Specifically, this report addresses (1) actions TSA has taken to enhance training for passenger and checked baggage screeners and screening supervisors, (2) how TSA ensures that screeners complete required training, and (3) actions TSA has taken to measure and enhance screener performance in detecting threat objects.
NTIS
Aerospace Safety; Security; Commercial Aircraft

20050168112 General Accounting Office, Washington, DC
Aviation Fees: Review of Air Carriers' Year 2000 Passenger and Property Screening Costs
Apr. 2005; 36 pp.; In English
Report No.(s): PB2005-106245; GAO-05-558; No Copyright; Avail: CASI; A03, Hardcopy
The Aviation and Transportation Security Act (ATSA) authorized the Transportation Security Administration (TSA) to impose an Aviation Security Infrastructure Fee (ASIF) on air carriers to help pay for the costs of aviation security services. To impose the ASIF, TSA issued an Interim Final Rule (IFR) and required air carriers to report their passenger and property screening costs incurred in 2000 on an attachment to the IFR referred to as Appendix A. The 2000 screening costs reported by air carriers were going to be used to establish the ASIF. Based on industry estimates of $1 billion, TSA had estimated that the costs incurred by air carriers in 2000 were $750 million, but the amounts reported by air carriers totaled $319 million, significantly less than expected. To provide the Congress with an independent assessment, the Department of Homeland Security Appropriations Act, 2005 required GAO to review the amount of passenger and property screening costs incurred by air carriers in 2000.
NTIS
Air Transportation; Airport Security; Costs

20050168115 General Accounting Office, Washington, DC
Aviation Security: Secure Flight Development and Testing Under Way, but Risks Should Be Managed as System Is Further Developed
Mar. 2005; 90 pp.; In English
Report No.(s): PB2005-106241; GAO-05-356; No Copyright; Avail: CASI; A05, Hardcopy
Among its efforts to strengthen aviation security, the Transportation Security Administration (TSA) is developing a new passenger prescreening system-known as Secure Flight. As required by Congress, TSA is planning to assume, through Secure Flight, the prescreening function currently performed by the air carriers. This report assesses the (1) status of Secure Flight's development and implementation, (2) factors that could influence the effectiveness of Secure Flight, (3) processes used to oversee and manage the Secure Flight program, and (4) efforts taken to minimize the impacts on passengers and protect

passenger rights. In conducting this assessment, we addressed the 10 specific areas of congressional interest related to Secure Flight outlined in Public Law 108-334.
NTIS
Air Transportation; Security; Passengers

20050168126 Federal Aviation Administration, Washington, DC
Terminal Area Forecast Summary
Mar. 2004; 52 pp.; In English
Report No.(s): PB2005-105722; No Copyright; Avail: CASI; A04, Hardcopy

This publication provides aviation data users with summary historical statistics on passenger demand and aviation activity at U.S. airports, in particular, at the 31 large hub airports with one percent or more of total enplanements. It also contains forecasts for all airports in the National Plan of Integrated Airport Systems (NPIAS) which were prepared and reviewed prior to the terrorist attacks of September 11 and therefore, do not reflect the impact of these events. Thus, the utility of this document to aviation planners is only as to what has happened in the past and as a benchmark to measure the impact of the September 11 incidents on future activity.
NTIS
Air Transportation; Civil Aviation; Airports

20050168127 Federal Aviation Administration, Washington, DC
Terminal Area Forecast Summary, Fiscal Years 2002-2020
Apr. 2003; 48 pp.; In English
Report No.(s): PB2005-105721; FAA-APO-03-2; No Copyright; Avail: CASI; A03, Hardcopy

This publication provides aviation data users with summary historical statistics on passenger demand and aviation activity at U.S. airports, in particular, at the 31 large hub airports with one percent or more of total enplanements. It also contains forecasts for all airports in the National Plan of Integrated Airport Systems (NPIAS) which were prepared and reviewed prior to the terrorist attacks of September 11 and therefore, do not reflect the impact of these events. Thus, the utility of this document to aviation planners is only as to what has happened in the past and as a benchmark to measure the impact of the September 11 incidents on future activity.
NTIS
Air Traffic; Air Transportation; Civil Aviation; Airports

20050168130 Federal Aviation Administration, Washington, DC
Interim Guidance for UAT Avionics Operating with Safe Flight 21 ADS-B, TIS-B and FIS-B Ground Infrastructure
Mar. 26, 2004; 38 pp.; In English
Report No.(s): PB2005-105719; RTCA-053-04/SC186-221; No Copyright; Avail: CASI; A03, Hardcopy

The Federal Aviation Administration's (FAA) Capstone and Safe Flight 21 Programs are in the early stages of implementing a broadcast services ground network that will deliver to the cockpit real-time access to weather, traffic and advisory aeronautical information. Aeronautical digital communications, or data link, will provide high-speed exchange of textual and graphical information between aircraft and ground-based systems. Dedicated or multifunction avionics displays will be used to present this information to the flight crew. This implementation has begun in the Yukon Kuskokwim Delta area of Alaska under the Capstone program. Additionally, during 2004, sites are being established between Florida and New Jersey as part of the East Coast initiative as part of the Safe Flight 21 program. Subsequently, approval is being sought for a national deployment of ground infrastructure. This document is intended to address the needs of early Capstone and Safe Flight 21 implementations. This guidance may be superceded by subsequent guidance, e.g., FAA TSOs, Advisory Circulars, RTCA, and ICAO standards.
NTIS
Avionics; Communication Networks; Display Devices; Flight Crews; Data Links

20050169420 European Space Agency, Paris, France
Space Applications in Europe
Collette, Rene C.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1247; In English; See also 20050169243; Copyright; Avail: Other Sources

A review of European programmes and plans in the fields of Broadcast, Mobile, Multimedia and Broadband Satellite

Communications as well as Navigation, Data Relay, Meteorology and Earth Resources. In particular, in the area of telecommunications, the present developments leading to advanced multimedia and broadband systems will be described, as well as the deployment as of 2000 of the advanced Technology and Data Relay Satellite, ARTEMIS, undertaken in cooperation with Canada. The contribution of Europe to the present worldwide space navigation infrastructure, GNSS-I, will be highlighted as well as the preparation of the future evolution, GNSS-2. With respect to Earth Observation, the new generation of Geostationary meteorological satellites as well as the major Envisat LEO System endeavour will be detailed, together with the new polar observation system, a cooperation undertaken with the Eumetsat organization.
Derived from text
Broadcasting; Multimedia; Satellite Communication; Navigation; Data Links; Earth Resources; Telecommunication; Technology Utilization

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*.

20050167899 Physics and Electronics Lab. TNO, The Hague, Netherlands
Modeling and Simulation of Integrated Navigation Systems
Banning, Reinder; February 2005; 105 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 015.32804
Report No.(s): FEL-04-A156; TD-2004-0199; Copyright; Avail: Other Sources

This report deals with navigation systems integrating inertial navigation systems and GPS based navigation systems. Two filtering approaches are studied, the so-called loosely coupled and tightly coupled navigation systems both based on Kalman filters. The filters are implemented in a simulation model and simulations have been done to measure the performance. The models will be used in future studies on the performance of the navigation systems used in guided weapon systems.
Author
Inertial Navigation; Missile Control; Systems Simulation; Global Positioning System; 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 Structural Mechanics*. For land transportation vehicles see *85 Technology Utilization and Surface Transportation*.

20050166903 NASA Dryden Flight Research Center, Edwards, CA, USA
A Generic Inner-Loop Control Law Structure for Six-Degree-of-Freedom Conceptual Aircraft Design
Cox, Timothy H.; Cotting, M. Christopher; April 04, 2005; 31 pp.; In English; 43rd AIAA Aerospace Sciences Meeting, 10-13 Jan. 2005, Reno, NV, USA
Contract(s)/Grant(s): WU 794-70-00-SE-79
Report No.(s): NASA/TM-2005-212865; H-2587; No Copyright; Avail: CASI; A03, Hardcopy

A generic control system framework for both real-time and batch six-degree-of-freedom simulations is presented. This framework uses a simplified dynamic inversion technique to allow for stabilization and control of any type of aircraft at the pilot interface level. The simulation, designed primarily for the real-time simulation environment, also can be run in a batch mode through a simple guidance interface. Direct vehicle-state acceleration feedback is required with the simplified dynamic inversion technique. The estimation of surface effectiveness within real-time simulation timing constraints also is required. The generic framework provides easily modifiable control variables, allowing flexibility in the variables that the pilot commands. A direct control allocation scheme is used to command aircraft effectors. Primary uses for this system include conceptual and preliminary design of aircraft, when vehicle models are rapidly changing and knowledge of vehicle six-degree-of-freedom performance is required. A simulated airbreathing hypersonic vehicle and simulated high-performance fighter aircraft are used to demonstrate the flexibility and utility of the control system.
Author
Aircraft Design; Degrees of Freedom; Control Systems Design; Algorithms

20050167068 NASA Glenn Research Center, Cleveland, OH, USA

Particle Size Distributions Measured in B757 Engine Plume During EXCAVATE

Sanders, Terry; Penko, Paul; Culler, Steve; Rivera, Monica; [2005]; 18 pp.; In English

Contract(s)/Grant(s): NCC3-1055; No Copyright; Avail: CASI; A03, Hardcopy

A ground-based test, the Experiment to Characterize Aircraft Volatile Aerosols and Trace Species Emissions (EXCAVATE), was conducted at NASA Langley Research Center, January 26 - 27, 2002, with a Boeing 757 aircraft. The aircraft was anchored on a tarmac and two probes were positioned downstream of the right-side engine, a Rolls Royce RB211-585. One probe was designed and fabricated by Arnold Engineering Development Center (AEDC) and had a 45.6 mm (1.794 in.) ID. A second probe, constructed of 6.4 mm (0.25 in.) stainless-steel tubing at NASA Langley Research Center, had a 6 mm (0.22 in.) ID. The engine was run on JP-5 with three different sulfur concentrations, 810 ppm, 1050 ppm, 1820 ppm; and was operated over a range of power settings from idle to near-full power. Particulate size-distributions and concentrations were measured at four downstream axial locations: 1 m and 10 m with the AEDC particulate probe, and 25 m and 35 m with the Langley probe. Fuel with various sulfur contents was tested to address the long-standing question of the role of sulfur in the formation of volatile species. Several experimental and modeling studies have shown a correlation between fuel sulfur-content and particulate-emissions. The object of EXCAVATE was to further study the effect of sulfur content on particulate number concentration and size-distribution as a function of location in the engine plume and engine operating conditions.

Derived from text

Aerosols; Boeing 757 Aircraft; Particle Size Distribution; Plumes; Exhaust Emission; Trace Elements; Volatility

20050167100 General Accounting Office, Washington, DC, USA

Tactical Aircraft: F/A-22 and JSF Acquisition Plans and Implications for Tactical Aircraft Modernization

Sullivan, Michael; [2005]; 27 pp.; In English

Report No.(s): GAO-05-519T; No Copyright; Avail: CASI; A03, Hardcopy

The F/A-22 has been in development for 19 years, and cost increases and delays have created affordability concerns that reduced the number of aircraft planned for acquisition. A changing world environment and threats over this time frame have compelled the Air Force to plan for large investments in new capabilities to keep the F/A-22 viable. Termination of F/A-22 procurement after fiscal year 2008 has also placed modernization plans in doubt. The original business case elements needs and resources -set at the outset of the program are no longer valid, and a new business case is needed to justify future investments for aircraft quantities and modernization efforts. The F/A-22's acquisition approach was not knowledge-based or evolutionary. It attempted to develop revolutionary capability in a single step, causing significant technology and design uncertainties and, eventually, significant cost overruns and schedule delays. Lessons from the F/A-22 program can be applied to the JSF program to improve on its outcomes. While relatively early in its acquisition program, the JSF program has experienced design and weight problems that, if not solved, will affect aircraft performance. These problems have led to increased development and procurement costs and schedule delays so far. In addition, the program s customers are still not sure how many aircraft they will need. The combination of cost overruns and quantity reductions has already diluted DOD s buying power and made the original JSF business case unexecutable. Given continuing program uncertainties, DOD could use more time right now to gain knowledge before it commits to a new business case for its substantial remaining investments. The JSF s current acquisition strategy does not embrace evolutionary, knowledge-based techniques intended to reduce risks. Key decisions, like the planned 2007 production decision, are expected to occur before critical knowledge is captured. Time taken now to gain knowledge will avoid placing sizable investments in production capabilities at risk to expensive changes. Taken together, the current status and continuing risk in these two programs have broader implications to the DOD tactical fixed-wing aircraft modernization program, raising questions as to whether its overarching goals are now achievable. Decreases in quantities alone about 30 percent since original plans raise questions about how well the aircraft will complement our tactical air forces in the future.

Author

Aircraft Configurations; F-22 Aircraft; Data Acquisition; Augmentation

20050167210 North Carolina State Univ., Raleigh, NC USA

Membrane-Mediated Extraction and Biodegradation of Volatile Organic Compounds From Air

Peretti, Stephen W.; Shepherd, Robert D.; Clayton, Russell K.; Proffitt, David E.; Jan. 2005; 186 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F08637-98-C-6002; Proj-3904

Report No.(s): AD-A431460; EPA-600/R-05/035; AFRL-ML-TY-TR-2002-4506; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report describes feasibility tests of a two-step strategy for air pollution control applicable to exhaust air contaminated with volatile organic compounds (VOCs) from painting aircraft. In the first step of the two-step strategy, the VOC-contaminated exhaust air passes over coated, polypropylene, hollow-fiber membranes while an involatile liquid (silicone oil, mineral oil, decanol, octanol) is pumped counter-current through the filters. The organic liquid captures the VOCs, and their concentration in the circulating liquid increases whenever exhaust air circulates. In the second step, the circulating organic loop passes through a second set of hollow-fiber membranes that support a culture of microorganisms, which remove and metabolize the VOCs, on their exterior surfaces. The concentration of VOCs in the circulating loop oscillates as the painting process starts and stops because VOC capture by the liquid is a fast process whereas removal and metabolization by microorganisms is a slow process. Despite constraints caused by limited availability of commercial membrane packages, adequate rates of removal and transport into and out of circulating octanol were shown to be adequate to support the proposed technology. Biodegradation was also qualitatively validated, although each of the organisms used in these tests selectively metabolized specific classes of solvents; however, other cultures or sequential treatment stages are expected to provide satisfactory removal. Scale-up revealed material incompatibility of the membranes and adhesives with octanol. Silicone oils and vegetable oils were briefly tested as the circulating organic liquid at the end of the project. Pressure drop also remains as an engineering challenge unless ventilation exhaust rates are decreased.
DTIC
Air Pollution; Biodegradation; Extraction; Maintenance; Membranes; Paints; Volatile Organic Compounds

20050167211 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Genetic Algorithm for UAV Routing Integrated with a Parallel Swarm Simulation
Russell, Matthew A.; Mar. 2005; 240 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431476; AFIT/GCS/ENG/05-16; No Copyright; Avail: Defense Technical Information Center (DTIC)
This research investigation addresses the problem of routing and simulating swarms of UAVs. Sorties are modeled as instantiations of the NP-Complete Vehicle Routing Problem, and this work uses genetic algorithms (GAs) to provide a fast and robust algorithm for a priori and dynamic routing applications. Swarms of UAVs are modeled based on extensions of Reynolds' swarm research and are simulated on a Beowulf cluster as a parallel computing application using the Synchronous Environment for Emulation and Discrete Event Simulation (SPEEDES). In a test suite, standard measures such as benchmark problems, best published results, and parallel metrics are used as performance measures. The GA consistently provides efficient and effective results for a variety of VRP benchmarks. Analysis of the solution quality over time verifies that the GA exponentially improves solution quality and is robust to changing search landscapes - making it an ideal tool for employment in UAV routing applications. Parallel computing metrics calculated from the results of a PDES show that consistent speedup (almost linear in many cases) can be obtained using SPEEDES as the communication library for this UAV routing application. Results from the routing application and parallel simulation are synthesized to produce a more advanced model for routing UAVs.
DTIC
Drone Vehicles; Genetic Algorithms; Pilotless Aircraft; Simulation; Synchronism

20050167220 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Issues Related to Alternatives to Current Procedures in the Unscheduled Maintenance of Air Force Aircraft
Wuchenich, Daniel M.; Jun. 2001; 106 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431543; AFIT/GMO/ENS/01E-16; No Copyright; Avail: Defense Technical Information Center (DTIC)
The purpose of this paper is to identify issues related to alternative procedures in the unscheduled maintenance of Air Force aircraft. Specifically, the procedures investigated are those used by the 352d Special Operations Group (SOG) in sourcing expendable aircraft parts for which estimated delivery dates are unacceptable. The SOG's experience has been that direct sourcing from private contractors has resulted in superior delivery response times. Further, they believe that their experience with expendables could be extended into the management of reparables. Since adopting these procedures formally would require changes in Air Force policies, these procedures need to be evaluated from a broader level. The intent of this paper is to identify the issues related to such an analysis. Because the subject of this research topic has not yet been thoroughly or formally investigated, the sources of information were primarily expert opinions, combined with an analysis of related theses, reports, and journal articles. The major finding of this research has been that while the relationship between spares levels and readiness is fairly direct, the relationship between cost and readiness is not. A third dimension of the problem is proposed. Further research into the issues surrounding the cost-readiness tradeoff is recommended.
DTIC
Aircraft Maintenance; Alternatives; Maintenance

20050167224 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

An Analysis into the Effectiveness of Aircraft Maintenance Under the Combat Wing Structure

Barthol, Derrick R.; Mar. 2005; 175 pp.; In English; Original contains color illustrations

Report No.(s): AD-A431553; AFIT/GLM/ENS/05-02; No Copyright; Avail: Defense Technical Information Center (DTIC)

Organizational structure builds the foundation from which organizations operate. To gain full potential of structural efficiencies in the current operating environment, public and private firms are continually modifying their organizational structure. The U.S. Air Force is no different and underwent its most recent reorganization in the fall of 2002 replacing the post-Gulf War format of the previous decade. Air Force leadership needs to understand how well the current structure is performing at achieving its intended objectives. This research investigates the effectiveness of the recent change to Air Force organizational structure on aircraft maintenance performance through an analysis of aircraft maintenance metrics. To observe effects both within and across the Air Force, four years of data were analyzed from three F-16 units and three KC-135 units representing two of the significant Air Force Major Commands. The analytical methods used for this research include testing assumptions of normality and variance of sample data, homogeneity of variance and comparison of means, weighted factoring, and trend analysis using linear regression to determine the overall effectiveness of the combat wing structure. Results of this analysis allowed the researcher to postulate an answer to the overall research question. This answer and other associated findings can assist Air Force leaders in understanding how to enhance operational performance.

DTIC

Combat; Maintenance; System Effectiveness; Wings

20050167263 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

After the KC-135, What Next? Exploring the Future Capabilities and Acquisition of Our Next Generation Tanker

White, Jeffrey M.; Jun. 2002; 68 pp.; In English; Original contains color illustrations

Report No.(s): AD-A431661; AFIT/GMO/ENS/02E-15; No Copyright; Avail: Defense Technical Information Center (DTIC)

This research paper covers several aspects of the current and future tanker acquisition. Not only does it research capabilities related tanker acquisition but it also explores the proper capabilities required of future tanker assets. The research progresses from a historical perspective to the current available options for the next generation tanker. From there data is used to show possible capabilities and missions appropriate for aerial refueling assets. Topics discussed are dual role tanker/airlift possibilities, spiral development of 'SMART' tanker capabilities, and possible associated tanker platform missions. Final recommendations are given for future tanker platform acquisition and capabilities it should have for tomorrow's wartime scenario's.

DTIC

C-135 Aircraft; Tanker Aircraft

20050167314 Army War Coll., Carlisle Barracks, PA USA

Employment of the C-17 in Airdrop and Airland Operations in Closing the Force

Hershman, M. S.; Mar. 2005; 29 pp.; In English

Report No.(s): AD-A431814; No Copyright; Avail: Defense Technical Information Center (DTIC)

The USA relies on the doctrine of rapid global mobility in support of national objectives in projecting power across strategic distances. On March 26, 2003, fifteen C-17As made history when they airdropped equipment and personnel on Bashur Airfield in Iraq with a follow on airland flow for the next four nights. There has been discussion beginning in the early 20th century on the utility of employing airdrop during combat operations. The purpose of this paper is four fold: first a review of the national strategy of the USA in the concept of rapid global mobility along with a review of air mobility operations; second a review of the capabilities of the C-17 employed during Operation Enduring Freedom and Operation Iraqi Freedom; third to review advantages and disadvantages of airland or airdrop operations based on the airdrop of the 173rd Airborne Brigade in Northern Iraq and the follow on airland flow; fourth recommendations for future operations based on OIF operations.

DTIC

Air Drop Operations; Airdrops; Military Operations; Transport Aircraft

20050167440 Air Force Flight Test Center, Edwards AFB, CA USA

Unmanned Air Vehicles: A New Age in Human Factors Evaluations

Spravka, John J.; Moisio, Deborah A.; Payton, Mary G.; Jan. 2003; 18 pp.; In English

Report No.(s): AD-A432105; AFFTC-PA-05069; XC-412/TW; No Copyright; Avail: CASI; A03, Hardcopy

No abstract available

Age Factor; Drone Vehicles; Human Factors Engineering

20050167470 Naval Air Warfare Center, China Lake, CA USA

Aircraft Carrier Flight and Hangar Deck Fire Protection: History and Current Status

Darwin, Robert L.; Bowman, Howard L.; Hunstad, Mary; Leach, William B.; Williams, Frederick W.; Jan. 2005; 101 pp.; In English; Original contains color illustrations

Report No.(s): AD-A432176; NAWCWD-TP-8516; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report covers the history and current status of fire protection on aircraft carrier flight decks and hangar decks. Fire protection on aircraft carriers is a joint responsibility of the Naval Sea Systems Command and the Naval Air Systems Command. The report begins with a quick orientation covering some of the significant physical characteristics of aircraft carriers that are relevant to fire protection. The fire hazardous nature of carrier operations is discussed specifically, with focus on some of the concerns relative to air launched ordnance. Next, a review of firefighting systems, including the firefighting agents currently in use, as well as the current tactics for fighting fires on the flight deck and the hangar deck, is provided. We review the history of carrier fires and emphasize some of the lessons learned, including the research and development programs that resulted from those fires. Some recent program initiatives under NAVAIR project W1819 are covered. Finally, the report covers a list of some current shortcomings and future concerns.

DTIC

Air Launching; Aircraft Carriers; Fire Prevention; Fires; Hangars; Ordnance

20050167880 NASA Langley Research Center, Hampton, VA, USA

Resonant Wingbeat Tuning Circuit using Strain-Rate Feedback for Ornithoptic Micro Aerial Vehicles

Raney, David L., Inventor; January 11, 2005; 9 pp.; In English

Patent Info.: Filed 14 Oct. 2003; US-Patent-6,840,476; US-Patent-Appl-SN-693848; US-Patent-Appl-SN-422181; NASA-Case-LAR-16539-1; No Copyright; Avail: CASI; A02, Hardcopy

A resonant wingbeat tuning circuit automatically tunes the frequency of an actuating input to the resonant frequency of a flexible wing structure. Through the use of feedback control, the circuit produces the maximum flapping amplitude of a mechanical ornithoptic system, tracking the resonant frequency of the vibratory flapping apparatus as it vanes in response to change in flight condition, ambient pressure, or incurred wing damage.

Official Gazette of the U.S. Patent and Trademark Office

Circuits; Tuning; Strain Rate; Flexible Wings; Resonant Frequencies; Feedback Control; Research Vehicles

20050169159 NASA Lewis Research Center, Cleveland, OH, USA

Cascade Optimization Strategy Maximizes Thrust for High-Speed Civil Transport Propulsion System Concept

[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The design of a High-Speed Civil Transport (HSCT) air-breathing propulsion system for multimission, variable-cycle operations was successfully optimized through a soft coupling of the engine performance analyzer NASA Engine Performance Program (NEPP) to a multidisciplinary optimization tool COMETBOARDS that was developed at the NASA Lewis Research Center. The design optimization of this engine was cast as a nonlinear optimization problem, with engine thrust as the merit function and the bypass ratios, r-values of fans, fuel flow, and other factors as important active design variables. Constraints were specified on factors including the maximum speed of the compressors, the positive surge margins for the compressors with specified safety factors, the discharge temperature, the pressure ratios, and the mixer extreme Mach number. Solving the problem by using the most reliable optimization algorithm available in COMETBOARDS would provide feasible optimum results only for a portion of the aircraft flight regime because of the large number of mission points (defined by altitudes, Mach numbers, flow rates, and other factors), diverse constraint types, and overall poor conditioning of the design space. Only the cascade optimization strategy of COMETBOARDS, which was devised especially for difficult multidisciplinary applications, could successfully solve a number of engine design problems for their flight regimes. Furthermore, the cascade strategy converged to the same global optimum solution even when it was initiated from different design points. Multiple optimizers in a specified sequence, pseudorandom damping, and reduction of the design space distortion via a global scaling scheme are some of the key features of the cascade strategy. HSCT engine concept, optimized solution for HSCT engine concept. A COMETBOARDS solution for an HSCT engine (Mach-2.4 mixed-flow turbofan) along with its configuration is shown. The optimum thrust is normalized with respect to NEPP results. COMETBOARDS added value in the design optimization of the HSCT engine.

Author

Civil Aviation; Thrust; Design Optimization; Engine Design; Propulsion System Configurations; Cascade Flow; Supersonic Transports

20050169193 NASA Lewis Research Center, Cleveland, OH, USA

1025:1 Area Ratio Nozzle Evaluated at High Combustion Chamber Pressure

[1995]; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

A recently completed experimental test program obtained performance data on an optimally contoured nozzle with an exit-to-throat area ratio of 1025:1 and on a truncated version of this nozzle with an area ratio of 440:1. The nozzles were tested with gaseous hydrogen and liquid oxygen propellants at combustion chamber pressures of 12.4 to 16.5 mPa (1800 to 2400 psia). Testing was conducted in the altitude test capsule at the NASA Lewis Research Center's Rocket Engine Test Facility (RETF), and results were compared with analytical performance predictions. This testing builds on previous work with this nozzle at Lewis, where testing was completed at nominal chamber pressure of 350 psia. High-area-ratio nozzles have long been sought as a means to increase the performance of spacebased rocket engines. However, as the area ratio increases, the physical size and weight of the nozzle also increase. As a result, engine and vehicle designers must make tradeoffs between nozzle size and performance enhancement. Until this test program, very little experimental data existed on the performance of the high-area-ratio nozzles used in rocket engine designs. The computer codes being used by rocket engine designers rely on data extrapolated from tests of low-area-ratio nozzles, and these extrapolations do not always provide the accuracy needed for a reliable design assessment. Therefore, we conducted this high-area-ratio nozzle testing program to provide performance data for use in rocket engine design and analysis computer codes. The nozzle had a nominal 2.54-cm- (1-in.-) diameter throat, an exit diameter of 81.3-cm (32.0-in.) at an exit-to-throat area ratio of 1025, and a length of 128.6 cm (50.6 in.). Testing was conducted in an altitude test capsule to simulate the static pressure at altitude by vacuum pumping. Data such as propellant mass flow, oxidizer-to-fuel mixture, and thrust were measured. These measurements were then used to calculate performance factors such as the thrust coefficient, the characteristic exhaust velocity efficiency, and the vacuum specific impulse. In addition, the nozzle temperature was measured to calculate the amount of heat transferred from the combustion gases to the nozzle.

Author

Combustion Chambers; Rocket Engine Design; Aspect Ratio; High Pressure; Nozzle Design; Test Stands

20050169198 NASA Lewis Research Center, Cleveland, OH, USA, Allison Engine Co., Indianapolis, IN, USA

Affect of Brush Seals on Wave Rotor Performance Assessed

[1995]]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The NASA Lewis Research Center's experimental and theoretical research shows that wave rotor topping can significantly enhance gas turbine engine performance levels. Engine-specific fuel consumption and specific power are potentially enhanced by 15 and 20 percent, respectively, in small (e.g., 400 to 700 hp) and intermediate (e.g., 3000 to 5000 hp) turboshaft engines. Furthermore, there is potential for a 3- to 6-percent specific fuel consumption enhancement in large (e.g., 80,000 to 100,000 lbf) turbofan engines. This wave-rotor-enhanced engine performance is accomplished within current material-limited temperature constraints. The completed first phase of experimental testing involved a three-port wave rotor cycle in which medium total pressure inlet air was divided into two outlet streams, one of higher total pressure and one of lower total pressure. The experiment successfully provided the data needed to characterize viscous, partial admission, and leakage loss mechanisms. Statistical analysis indicated that wave rotor product efficiency decreases linearly with the rotor to end-wall gap, the square of the friction factor, and the square of the passage of nondimensional opening time. Brush seals were installed to further minimize rotor passage-to-cavity leakage. The graph shows the effect of brush seals on wave rotor product efficiency. For the second-phase experiment, which involves a four-port wave rotor cycle in which heat is added to the Brayton cycle in an external burner, a one-dimensional design/analysis code is used in conjunction with a wave rotor performance optimization scheme and a two-dimensional Navier-Stokes code. The purpose of the four-port experiment is to demonstrate and validate the numerically predicted four-port pressure ratio versus temperature ratio at pressures and temperatures lower than those that would be encountered in a future wave rotor/demonstrator engine test. Lewis and the Allison Engine Company are collaborating to investigate wave rotor integration in an existing turboshaft engine. Recent theoretical efforts include simulating wave rotor dynamics (e.g., startup and load-change transient analysis), modifying the one-dimensional wave rotor code to simulate combustion internal to the wave rotor, and developing an analytical wave rotor design/analysis tool based on macroscopic balances for parametric wave rotor/engine analysis.

Author (revised)

Brush Seals; Wave Rotors; Gas Turbine Engines; Rotor Dynamics

20050169204 NASA Lewis Research Center, Cleveland, OH, USA, Lockheed Corp., USA, Advanced Research Projects Agency, USA

Advanced Short Takeoff and Vertical Landing (ASTOVL) Concepts Tested

[1995]; 1 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

In this cooperative program between NASA, Lockheed Corporation, and the Advanced Research and Projects Agency (ARPA), an advanced short takeoff and vertical landing (ASTOVL) model was tested in the 9- by 15-Foot Low-Speed Wind Tunnel at the NASA Lewis Research Center. The 10-percent scaled model was tested over a range of headwind velocities from 25 to 120 kn. This inlet/forebody test was a key part of an important Department of Defense program investigation enabling technologies for future high-performance ASTOVL aircraft. The Lockheed concept is focused on a shaft-coupled lift fan system centered around Pratt & Whitney's F119 power plant. As envisioned, a conventional takeoff and landing version (CTOL) would replace the U.S. Air Force's F-16's. The ASTOVL version would eventually replace Marine and, possibly, British Harrier aircraft. The ASTOVL and CTOL versions are scheduled to begin their manufacturing development phases in 2000. The purpose of this test was to acquire data pertinent to the inlet-forebody model. The test was very successful. Both steady-state and dynamic data were obtained. This small-scale testing, which is directed at reducing risks, may greatly reduce the risks on a full-scale aircraft.
Author
V/STOL Aircraft; Wind Tunnel Tests; Scale Models; Low Speed Wind Tunnels

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*.

20050169163 NASA Lewis Research Center, Cleveland, OH, USA
Code to Optimize Load Sharing of Split-Torque Transmissions Applied to the Comanche Helicopter
[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Most helicopters now in service have a transmission with a planetary design. Studies have shown that some helicopters would be lighter and more reliable if they had a transmission with a split-torque design instead. However, a split-torque design has never been used by a U.S. helicopter manufacturer because there has been no proven method to ensure equal sharing of the load among the multiple load paths. The Sikorsky/Boeing team has chosen to use a split-torque transmission for the U.S. Army's Comanche helicopter, and Sikorsky Aircraft is designing and manufacturing the transmission. To help reduce the technical risk of fielding this helicopter, NASA and the Army have done the research jointly in cooperation with Sikorsky Aircraft. A theory was developed that equal load sharing could be achieved by proper configuration of the geartrain, and a computer code was completed in-house at the NASA Lewis Research Center to calculate this optimal configuration.
Author
Sikorsky Aircraft; Military Helicopters; Transmissions (Machine Elements); Optimization

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*.

20050166904 NASA Dryden Flight Research Center, Edwards, CA, USA
A Generic Guidance and Control Structure for Six-Degree-of-Freedom Conceptual Aircraft Design
Cotting, M. Christopher; Cox, Timothy H.; April 27, 2005; 26 pp.; In English; 43rd AIAA Aerospace Sciences Meeting, 10-13 Jan. 2005, Reno, NV, USA
Contract(s)/Grant(s): WU 794-70-00-SE-79
Report No.(s): NASA/TM-2005-212866; H-2596; AIAA Paper 2005-0032; No Copyright; Avail: CASI; A03, Hardcopy

A control system framework is presented for both real-time and batch six-degree-of-freedom simulation. This framework allows stabilization and control with multiple command options, from body rate control to waypoint guidance. Also, pilot commands can be used to operate the simulation in a pilot-in-the-loop environment. This control system framework is created by using direct vehicle state feedback with nonlinear dynamic inversion. A direct control allocation scheme is used to command aircraft effectors. Online B-matrix estimation is used in the control allocation algorithm for maximum algorithm flexibility. Primary uses for this framework include conceptual design and early preliminary design of aircraft, where vehicle models change rapidly and a knowledge of vehicle six-degree-of-freedom performance is required. A simulated airbreathing

hypersonic vehicle and a simulated high performance fighter are controlled to demonstrate the flexibility and utility of the control system.
Author
Aircraft Control; Flight Simulation; Control Systems Design; Aircraft Design

09
RESEARCH AND SUPPORT FACILITIES (AIR)

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

20050169150 NASA Lewis Research Center, Cleveland, OH, USA
Aircraft Ice Accretion Due to Large-Droplet Icing Clouds
[1995]; 1 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Studies of aircraft icing due to clouds consisting of individual droplets 10 times larger than those normally found in icing conditions are being carried out by members of the NASA Lewis Research Center's Icing Technology Branch. When encountered by an aircraft in freezing conditions, clouds consisting of large water droplets have a significantly different effect than those with normal droplets. A large-water-droplet cloud has been suggested as the cause of a commuter airplane accident in the late fall of 1994. As a result, studies of what happens to aircraft flying in these rare, but potentially very hazardous, conditions have been reemphasized.
Author
Aircraft Icing; Research Facilities; Aircraft Safety; Clouds (Meteorology)

20050169187 NASA Lewis Research Center, Cleveland, OH, USA
Concept Designed and Developed for Distortion- Tolerant, High-Stability Engine Control
[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Engine Control Future aircraft turbine engines, both commercial and military, must be able to successfully accommodate expected increased levels of steady-state and dynamic engine-face distortion. Advanced tactical aircraft are likely to use thrust vectoring to enhance their maneuverability. As a result, the engines will see more extreme aircraft angles-of-attack and sideslip levels than are currently encountered with present-day aircraft. Also, the mixed-compression inlets needed for the High Speed Civil Transport will likely encounter disturbances similar to those seen by tactical aircraft, in addition to planar pulse, inlet buzz, and high distortion levels at low flight speed and off-design operation. The current approach of incorporating a sufficient component design stall margin to tolerate these increased levels of distortion would significantly reduce performance. The objective of the High Stability Engine Control (HISTEC) program is to design, develop, and flight demonstrate an advanced, high-stability, integrated engine-control system that uses measurement-based, real-time estimates of distortion to enhance engine stability. The resulting distortion-tolerant control reduces the required design stall margin, with a corresponding increase in performance and decrease in fuel burn. The HISTEC concept has been designed and developed, and the software implementing the concept has successfully accommodated time-varying distortion. The NASA Lewis Research Center is currently overseeing the development and validation of the hardware and software necessary to flight test the HISTEC concept. HISTEC is a contracted effort with Pratt & Whitney of West Palm Beach, Florida. The HISTEC approach includes two major systems: A Distortion Estimation System (DES) and Stability Management Control (SMC). DES is an aircraft-mounted, high-speed processor that estimates the amount and type of distortion present and its effect on the engine. It uses high-response pressure measurements at the engine face to calculate indicators of the type and extent of distortion in real time. From these indicators, DES determines the effects of distortion on the propulsion systems and the corresponding engine match point necessary to accommodate it. DES output consists of fan and compressor pressure ratio trim commands that are passed to the SMC. In addition, DES uses maneuver information, consisting of angle-of-attack and sideslip from the flight control, to anticipate high inlet distortion conditions. The SMC, which is contained in the engine-mounted, Improved Digital Electronic Engine Control (IDEEC), includes advanced control laws to directly control the fan and compressor transient operating line (pressure ratio). These advanced control laws, with a multivariable design, have the potential for higher bandwidth and the resulting more precise control of engine match. The ability to measure and assess the distortion effects in real time coupled with a high-response controller improves engine stability at high levels of distortion. The software algorithms implementing DES have been designed, developed, and demonstrated, and integration testing of the DES and SMC software has been completed. The results show that the HISTEC system will be able to sense inlet distortion, determine the

effect on engine stability, and accommodate distortion by maintaining an adequate margin for engine surge. The Pratt &Whitney Comprehensive Engine Diagnostic Unit was chosen as the DES processor. An instrumented inlet case for sensing distortion was designed and fabricated. HISTEC is scheduled for flight test on the ACTIVE F-15 aircraft at the NASA Dryden Flight Research Center in Edwards, California, in late 1996.
Author
Control Theory; Distortion; Engine Control; Stability; Turbine Engines; Fabrication

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*.

20050166895 NASA, Washington, DC, USA
Game Plan
Morring, Frank, Jr.; Aviation Week and Space Technology; April 25, 2005; ISSN 0005-2175; Volume 162, No. 17, pp. 50-51; In English; Copyright; Avail: Other Sources

Industry proposals for the Crew Exploration Vehicle that NASA plans as a replacement for the space shuttle are due next week, but the agency's new chief says it might be necessary to slow the CEV procurement at first to speed it up later. After a quick trip to Kennedy Space Center for briefings on getting the space shuttle back in operation, Michael D. Griffin sat down with his growing staff last week to begin work on modifying the CEV procurement. 'We are going to rethink our entire program in that area,' he said during an inaugural press conference Apr. 18. The proposals due May 2 are being prepared in response to NASA's call for a 'risk-reduction flight effort' in 2008 that would lead to delivery of a human-rated CEV in 2014. But Griffin was co-leader on an independent study in 2004 that recommended a way to get the CEV flying astronauts in 2010, the year President Bush has set as a deadline for retiring the space shuttle fleet. In that study, produced for The Planetary Society, Griffin and his team called for development of a 13-15-ton 'Block 1' CEV limited to low Earth orbit (LEO) that would be launched atop a single space shuttle solid rocket motor (SRM), with a new cryogenic upper stage based on existing rocket engine technology, Under this approach, NASA would develop a 'Block 2' CEV later for human exploration beyond LEO. Author (revised)
Government Procurement; Launch Vehicles; Manned Space Flight; Project Management; Management Planning; Replacing; Procurement Management; Space Shuttles

20050166941 Massachusetts Inst. of Tech., Cambridge, MA, USA
The MIT-Hawaii-IRTF Joint Campaign for NEO Spectral Reconnaissance
Binzel, R. P.; Rivkin, A. S.; Thomas, C. A.; DeMeo, F. E.; Tokunaga, A.; Bus, S. J.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 1 pp.; In English; See also 20050166923
Contract(s)/Grant(s): NSF 0205863; NCC5-538; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We describe a new joint observing program for routine measurement of near-Earth object (NEO) spectra being conducted by MIT, the University of Hawaii, and the NASA Infrared Telescope Facility (IRTF) on Mauna Kea, Hawaii. All spectroscopic observations obtained in this campaign are being made publicly available in near-real time.
Author
Near Earth Objects; Spectral Reconnaissance

20050166992 Search for Extraterrestrial Intelligence Inst., Mountain View, CA, USA
Solfataric Alteration in Hawaii as a Mechanism for Formation of the Sulfates Observed on Mars by OMEGA and the MER Instruments
Bishop, J. L.; Schiffman, P.; Lane, M. D.; Dyar, M. D.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Solfataric alteration may have played a role in sulfate mineralization on Mars. Fumaroles in the Kilauea caldera, HI, have created a solfataric bank on the south wall of the crater where Keanakakoi ash was deposited. A combination of jarosite and

gypsum in a silica/clay matrix is observed here. Similar processes may have occurred on Mars if hydrothermal processes existed. This would be an explanation for the formation of sulfate minerals and hydrated phases on Mars that does not require long-term aqueous processes.
Author
Sulfates; Silicon Dioxide; Volcanoes; Ashes

20050167281 Air Force Research Lab., Hanscom AFB, MA USA
Monopole-Quadrupole Model of Spacecraft Charging in Sunlight
Tautz, M.; Lai, S. T.; Jan. 2005; 7 pp.; In English
Contract(s)/Grant(s): Proj-5021
Report No.(s): AD-A431710; AFRL-VS-HA-TR-2005-1003; No Copyright; Avail: CASI; A02, Hardcopy

Geophysics research spacecraft are often covered partially with thin layers of dielectrics such as kapton or thermal blanket materials. Analytical modeling of the charging of a dielectric spacecraft in sunlight needs to go beyond the monopole potential and include a dipole term. If the capacitances of the dielectric 1ayers are sufficiently large and the spacecraft spin rate is sufficiently fast the potentials may be determined on the basis of spin averaged spectra of electron and ion fluxes. In such a condition the potential distribution resembles that of monopole-quadrupole system. We formulate the monopole-quadrupole case and compare it to the monopole-dipole model.
DTIC
Dielectrics; Monopoles; Quadrupoles; Spacecraft Charging; Sunlight

20050167725 National Defense Univ., Washington, DC USA
Back to the Future: Space Power Theory and A.T. Mahan
France, Martin E.; Jan. 2000; 15 pp.; In English
Report No.(s): AD-A432172; No Copyright; Avail: Defense Technical Information Center (DTIC)

More than four decades since our first steps into space, no definitive work on space power theory, comparable to the writings of Clausewitz, Mahan, or Mitchell (among others in their respective fields), is recognized by military theorists. This lack is magnified by the billions of dollars already invested in military, civil and commercial space systems and a global population increasingly dependent upon space. Though most preliminary space power writing in the USA centered on space as a logical extension of air power theory (if for no reason than the organizational location of most space forces within the U.S. Air Force), such treatment is akin to early Army characterizations of aircraft as a tool of the artillery or signal corps, restricted to supporting ground operations. While space is certainly a unique operational setting that has yet to be fully exploited, it shares many characteristics with the sea as an arena for commerce, transport, observation and conflict. In fact, because of the distances involved, the importance of constantly safeguarding the free flow of global commerce in both peace and war, and the more or less permanent basing of key civil and military assets in orbit, space power, missions and responsibilities have many analogs to those of the sea. Therefore, one would do well to consider the earlier work of sea power theorists, specifically A.T. Mahan, when attempting to develop a theory of space power and to develop strategies for space control.
DTIC
Warfare; Ground Operational Support System; Artillery

20050168134 Federal Aviation Administration, Washington, DC, USA
Special Report: FAA's Annual Commercial Space Transportation Forecast Conference (3rd)
2000; 10 pp.; In English; FAA's Annual Commercial Space Transportation Forecast Conference (3rd), February 8 - 9, 2000. 2nd Quarter 2000, Arlington, Virginia, USA
Report No.(s): PB2005-105716; No Copyright; Avail: CASI; A02, Hardcopy

The Third Annual Federal Aviation Administration (FAA) Commercial Space Transportation Forecast Conference took place in Arlington, Virginia at the Sheraton National Hotel. The year 2000 conference featured seven panels and several special presentations by top-level government and industry guests, including the Honorable Rodney E. Slater, Secretary, U.S. Department of Transportation, Dr. Neal Lane, Assistant to the President for Science and Technology and Director of the Office of Science and Technology Policy (OSTP), and Representative Dana Rohrabacher, Chairman, Subcommittee on Space and Aeronautics, House Committee on Science. commercial launch and commercial spaceport industries for the past year. She also

expressed confidence that commercial launch operations would be stronger and more successful for 2000 and beyond.
NTIS
Policies; Conferences; Forecasting; Spacecraft Launching

20050168142 Federal Aviation Administration, Washington, DC, USA
Special Report: Licensing of Commercial Launch Sites, 1st Quarter 2000
2000; 10 pp.; In English
Report No.(s): PB2005-105715; No Copyright; Avail: CASI; A02, Hardcopy

The Commercial Space Launch Act of 1984 as recodified at 49 U.S.C. Subtitle IX-- Commercial Space Transportation, ch. 701, Commercial Space Launch Activities, 49 U.S.C. Section 70101- authorizes the Secretary of Transportation to license launches or the operation of launch sites carried out by U.S. citizens or within the USA. The Department of Transportation (DOT) has delegated this authority to the Federal Aviation Administration (FAA). In order to enable the development and use of private launch sites, the FAA proposed amending its commercial space transportation licensing regulations to include licensing and safety requirements for the operation of launch sites. A Notice of Proposed Rulemaking (NPRM) has been developed and published in the Federal Register on June 25, 1999.
NTIS
Licensing; Regulations; Launching

20050169227 American Inst. of Aeronautics and Astronautics, Reston, VA, USA
A Building-Block Approach to Space
Hancock, Thomas M.; Aerospace America; May 2005; ISSN 0740-722X; Volume 43, No. 5, pp. 33-35; In English; Original contains color illustrations; Copyright; Avail: Other Sources

The vehicles of the Apollo era provided a good, quick solution for getting people to and from the Moon. However, both the CMS (Apollo Command and Service Module) and Lunar Module (LM) were closed spacecraft architectures that could not accommodate growth. The space shuttle, too, has a closed architecture. Since 1981 it has been doing just what it was designed to do: bring payloads from Earth to LEO and back. More than this it simply cannot do. Both Apollo and the space shuttle were unique spacecraft, designed for different goals one for getting quickly to the Moon, the other for building a space station. This limited what could be done and set the U.S. on a very constrained path to exploration. To get the shuttle program approved, NASA was forced to abandon Apollo. In following this limited path, NASA effectively took itself out of the human space exploration business. One way to get the space agency back into the exploration business would be to provide a new class of spacecraft, including support capabilities. With an open architecture that builds on a solid foundation, such a system would be able to grow and fly with reduced risk and cost. That new spacecraft will be built under Project Constellation and called the Crew Exploration Vehicle (CEV).
Author (revised)
Manned Space Flight; Space Exploration; Spacecraft Design

14
GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

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

20050166430 Aviation Week and Space Technology, New York, NY, USA
Artificial Gravity
Scott, William B.; Aviation Week and Space technology; April 25, 2005; ISSN 0005-2175; Volume 162, No. 17, pp. 62-64; In English; Copyright; Avail: Other Sources

When the first manned mission to Mars is launched, its crew could be accompanied by a short-radius centrifuge designed to create artificial gravity. Astronauts would 'spin' a few hours a day on the machine to avoid bone and muscle loss, reduced cardiovascular performance and other physiological functions attributable to prolonged weightlessness.
Author
Human Centrifuges; Artificial Gravity; Bioastronautics; Aerospace Medicine

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*.

20050166896 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Time Critical
Covault, Craig; Aviation Week and Space Technology; April 25, 2005; ISSN 0005-2175; Volume 162, No. 17, pp. 49-50; In English; Copyright; Avail: Other Sources

NASA's decision to slip launch of the space shuttle return-to-flight mission to no earlier than May 22 will provide engineers more time to complete final, rigorous assessments before the orbiter Discovery's final Flight Readiness Review (FRR). That FRR is now planned for May 10-11. It will be used by NASA and contractor managers to reaffirm the readiness of all program elements to support the new target to return the U.S. space program to manned launch operations. It will also enable them to better raise any final issues that could slip the target again, if necessary, to complete more work and documentation.
Author
Spacecraft Launching; Space Shuttles; Launch Dates; Schedules; Preflight Operations; Prelaunch Tests

20050167064 Old Dominion Univ., Norfolk, VA, USA
Development of the Architectural Simulation Model for Future Launch Systems and its Application to an Existing Launch Fleet
Rabadi, Ghaith; May 03, 2005; 24 pp.; In English
Contract(s)/Grant(s): NAG1-03078; ODU Proj. 140453; No Copyright; Avail: CASI; A03, Hardcopy

A significant portion of lifecycle costs for launch vehicles are generated during the operations phase. Research indicates that operations costs can account for a large percentage of the total life-cycle costs of reusable space transportation systems. These costs are largely determined by decisions made early during conceptual design. Therefore, operational considerations are an important part of vehicle design and concept analysis process that needs to be modeled and studied early in the design phase. However, this is a difficult and challenging task due to uncertainties of operations definitions, the dynamic and combinatorial nature of the processes, and lack of analytical models and the scarcity of historical data during the conceptual design phase. Ultimately, NASA would like to know the best mix of launch vehicle concepts that would meet the missions launch dates at the minimum cost. To answer this question, we first need to develop a model to estimate the total cost, including the operational cost, to accomplish this set of missions. In this project, we have developed and implemented a discrete-event simulation model using ARENA (a simulation modeling environment) to determine this cost assessment. Discrete-event simulation is widely used in modeling complex systems, including transportation systems, due to its flexibility, and ability to capture the dynamics of the system. The simulation model accepts manifest inputs including the set of missions that need to be accomplished over a period of time, the clients (e.g., NASA or DoD) who wish to transport the payload to space, the payload weights, and their destinations (e.g., International Space Station, LEO, or GEO). A user of the simulation model can define an architecture of reusable or expendable launch vehicles to achieve these missions. Launch vehicles may belong to different families where each family may have it own set of resources, processing times, and cost factors. The goal is to capture the required resource levels of the major launch elements and their required facilities. The model s output can show whether or not a certain architecture of vehicles can meet the launch dates, and if not, how much the delay cost would be. It will also produce aggregate figures of missions cost based on element procurement cost, processing cost, cargo integration cost, delay cost, and mission support cost. One of the most useful features of this model is that it is stochastic where it accepts statistical distributions to represent the processing times mimicking the stochastic nature of real systems.
Author
Computerized Simulation; Mathematical Models; Systems Engineering; Spacecraft Configurations; Reusable Launch Vehicles; Space Transportation System

20050167240 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Fast All-Season Soil STrength (FASST)
Frankenstein, Susan; Koenig, George G.; Sep. 2004; 107 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431603; ERDC/CRREL-SR-04-1; No Copyright; Avail: Defense Technical Information Center (DTIC)

The ability to predict the state of the ground is essential to manned and unmanned vehicle mobility and personnel movement, as well as determining sensor performance for both military and civilian activities. As part of the Army's

Battlespace Terrain Reasoning and Awareness research program, the 1-D dynamic state of the ground model FASST (Fast All-season Soil STrength) was developed. It calculates the ground's moisture content, ice content, temperature, and freeze/thaw profiles, as well as soil strength and surface ice and snow accumulation/depletion. The fundamental operations of FASST are the calculation of an energy and water budget that quantifies both the flow of heat and moisture within the soil and also the exchange of heat and moisture at all interfaces (ground/air or ground/snow; snow/air) using both meteorological and terrain data. FASST is designed to accommodate a range of users, from those who have intricate knowledge of their site to those who know only the site location. It allows for 22 different terrain materials, including asphalt, concrete, bedrock, permanent snow, and the USCS soil types. At a minimum, the only weather information required is air temperature.
DTIC

Moisture Content; Soil Mechanics; Soils; Transportation

20050167282 Jackson and Tull, Inc., Albuquerque, NM USA

On-Orbit Experiments and Applications of Shape Memory Alloy Mechanisms

Peffera, Andrew; Fosnessb, Eugene; Carpenter, Bernie; Denoyerb, Keith; Jan. 2000; 9 pp.; In English

Report No.(s): AD-A431711; No Copyright; Avail: Defense Technical Information Center (DTIC)

Spacecraft require a variety of mechanisms to accomplish mission-related functions such as deployment, articulation, and positioning. Current off-the-shelf devices such as pyrotechnic separation nuts, paraffin actuators, and other electro-mechanical devices may not be able to meet future satellite requirements, such as low shock and vibration, and zero contamination. The Air Force Research Laboratory (AFRL), with corporate and government partners, has developed Shape Memory Alloy (SMA) spacecraft release mechanisms and hinges as alternatives. In order to meet future goals, the SMA devices have been designed to reduce shock and vibration, reduce parts, and eliminate pyrotechnics. This paper will focus on descriptions and results of on-orbit SMA mechanism experiments and applications. AFRL has flown SMA release devices as part ofthe Shape Memory Alloy Release Device (SMARD) experiment on MightySat I. The SMARD experiment, that compared the shock and release times of two SMA devices with those of current off-the-shelf devices, was conducted in May 1999 with extremely successful results. In addition, four AFRL funded SMA release mechanisms successfully deployed the Air Force Academy FalconSat spacecraft from the Orbital Sub-Orbital Program Space Launch Vehicle (OSP-I) in January 00. AFRL has also conducted an on-orbit experiment with SMA hinges. The hinges were flown as part of the Lightweight Flexible Solar Array (LFSA) program, that was a joint AFRL/DARPA/NASA/Lockheed Martin program to develop innovative solar array technologies. Six SMA hinges were launched as part of the LFSA experiment on the Space Shuttle Columbia (STS-93) in July 1999 with successful results.
DTIC

Artificial Satellites; Electromechanical Devices; Shape Memory Alloys

20050167318 Army War Coll., Carlisle Barracks, PA USA

USA National Space Security Policy and the Strategic Issues for DOD Space Control

Perdomo, Maurice; Mar. 2005; 31 pp.; In English

Report No.(s): AD-A431824; No Copyright; Avail: Defense Technical Information Center (DTIC)

The USA has been the world leader in space for decades and is second to none in the development of space technology and its uses for industrial, civil, military, and intelligence operations. However, the rest of the world is increasing its reliance on space applications such as navigation, communications, weather prediction, agriculture, and urban planning. The list of how space technology contributes to the world economy grows almost daily. Space globalization is racing faster than U.S. National Security Strategy can keep up. The U.S. Strategy calls for the military to develop capabilities to protect U.S. assets in outer space. This is to ensure the use of space assets during time of conflict. Potential adversaries understand the vulnerabilities. America must deny the enemy use of space if called upon to do so and ensure its ability to operate freely. Space Control actions will increasingly encounter strategic issues as adversaries use third party space assets to enhance their military and intelligence operations. What are the implications for military and national security planners when third party space assets and services are interwoven into an adversary's capabilities? Will current U.S. space policy meet the needs of the nation in an era of space globalization? To answer these questions this paper will review the national and military policies on space. It will also summarize the effects of space globalization, to include the world's increasing reliance on civilian space assets. Finally, a strategic analysis of space control policies and doctrine will determine if there is a sound space strategy in the face of globalization and if not, suggest recommendations for possible action.
DTIC

Aerospace Engineering; Security; Space Law; United States

20050167325 Air Force Research Lab., Kirkland AFB, NM USA

Commanding and Controlling Satellite Clusters (IEEE Intelligent Systems, November/December 2000)

Zetocha, Paul; Self, Lance; Wainwright, Ross; Burns, Rich; Brito, Margarita; Surka, Derek; Jan. 2000; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A431874; No Copyright; Avail: Defense Technical Information Center (DTIC)

Many organizations, including the National Aeronautics and Space Administration and the U.S. Department of Defense, want to use constellations or fleets of autonomous spacecraft working together to accomplish complex mission objectives. The Air Force Research Laboratory's Space Vehicles Directorate is now developing architectures for commanding and controlling a cluster of cooperating satellites through autonomous software development for the TechSat 21 program. Many space missions require large, monolithic satellites. This often results in costly, complex, failure-prone vehicles whose physical size constraints limit their performance characteristics. Recently, various organizations have begun to explore how distributed clusters of cooperating satellites can replace their larger monolithic counterparts to reduce overall costs, enhance mission performance, and increase system fault tolerance. Large clusters of satellites flying in formation must have some level of onboard autonomy to fly within specified tolerance levels; avoid collisions; address fault detection, isolation, and resolution (FDIR); share knowledge; and plan and schedule activities. Commanding and controlling a large cluster of satellites can be very burdensome for ground operators as well. This article describes the authors' efforts to address these issues through the technology development for TechSat 21 program.

DTIC

Artificial Intelligence; Automatic Control; Autonomy; Command and Control; Computer Programming; Computer Programs; Satellite Constellations; Software Engineering

20050167327 Air Force Research Lab., Hanscom AFB, MA USA

CRRES Electric Field Power Spectra and Radial Diffusion Coefficients

Brautigam, D. H.; Ginet, G. P.; Albert, J. M.; Wygant, J. R.; Rowland, D. E.; Ling, A.; Bass, J.; Feb. 2005; 16 pp.; In English

Contract(s)/Grant(s): Proj-5021

Report No.(s): AD-A431876; AFRL-VS-HA-TR-2005-1035; No Copyright; Avail: CASI; A03, Hardcopy

Combined Release and Radiation Effects Satellite (CRRES) Electric Field Instrument (EFI) data are used to determine the electric field power spectral density as a function of L and Kp over the frequency range 0.2 to 15.9 mHz. The power at each frequency is fit to the function P(L,Kp) = aLb exp(cKp). Assuming a purely electrostatic field and making several other assumptions regarding the azimuthal dependence of the field fluctuations, a Kp-dependent radial diffusion coefficient is computed from the power spectra. The model average for high activity (Kp=6) is between 1 to 2 orders of magnitude larger than that for low activity (Kp=1), dependent upon L and first invariant.

DTIC

Artificial Satellites; Crres (Satellite); Diffusion Coefficient; Electric Fields; Power Spectra; Radiation Belts; Radiation Effects

20050167449 Army Space and Missile Defense Battle Lab., Colorado Springs, CO USA

Net-Centric C2 in Near and Far Space

Schmitt, C. L.; Groves, S. R.; Tomasino, T.; Dec. 2004; 4 pp.; In English

Report No.(s): AD-A432118; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Virtual Mission Operations Center (VMOC) was an Office of the Secretary of Defense Rapid Acquisition Incentive Net Centricity (RAI-NC) Initiative executed as a collaborative experiment between the Air Force Space Battlelab, Army Space and Missile Defense Command Battle Lab (SMDBL), and NASA's Glenn Research Center (GRC). During June 2004, the VMOC team hosted an operational demonstration at Vandenberg AFB, CA, under advocacy from the 14th AF commander. The on-orbit space asset is owned by Surrey University, England, and is part of the Disaster Monitoring Constellation (UK-DMC1), operated by Surrey Space Technology Ltd.

DTIC

Command and Control; Communication Networks; Internets

20050167472 Air Force Research Lab., Hanscom AFB, MA USA

CRRES Electric Field Power Spectra and Radial Diffusion Coefficients

Brautigam, D. H.; Ginet, G. P.; Albert, J. M.; Wygant, J. R.; Rowland, D. E.; Ling, A.; Bass, J.; Mar. 2005; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-5021

Report No.(s): AD-A432188; AFRL-VS-HA-TR-2005-1035; No Copyright; Avail: Defense Technical Information Center (DTIC)

Combined Release and Radiation Effects Satellite (CRRES) Electric Field Instrument (EFI) data are used to determine the electric field power spectral density as a function of L and Kp over the frequency range 0.2 to 15.9 mHz. The power at each frequency is fit to the function P(L,Kp)=aLb exp(cKp). Assuming a purely electrostatic field and making several other assumptions regarding the azimuthal dependence of the field fluctuations, a Kp-dependent radial diffusion coefficient is computed from the power spectra. The model average for high activity (Kp=6) are between 1 to 2 orders of magnitude larger than that for low activity (Kp=1), dependent upon L and first invariant.
DTIC
Artificial Satellites; Crres (Satellite); Diffusion Coefficient; Electric Fields; Fast Fourier Transformations; Power Spectra; Radiation Belts; Radiation Effects

20050167708 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Stochastic Capability Models for Degrading Satellite Constellations
Gulyas, Cole W.; Mar. 2005; 131 pp.; In English
Report No.(s): AD-A431518; AFIT/GOR/ENS/05-07; No Copyright; Avail: Defense Technical Information Center (DTIC)
This thesis proposes and analyzes a new measure of functional capability for satellite constellations that incorporates the instantaneous availability and mission effectiveness of individual satellites. The capability measure yields a continuous score between zero and one accounting for the degree to which the constellation meets operational requirements. The measure is computed from an average of satellite capabilities, composed of the product of the satellite's instantaneous availability and value score. Instantaneous availability is acquired by modeling the satellite degradation status as either a time-homogenous, continuous-time Markov chain (CTMC) if it possesses functions with exponential lifetime distributions, or as a time-homogenous, semi-Markov process (SMP) if the function lifetime distributions are not exponential. The satellite value score represents the individual satellite's contribution to the overall constellation mission and is obtained using multi-attribute value theory. For illustrative purposes, analytical results were compared with those obtained via the Monte Carlo method and were found to be indistinguishable with substantially less computational effort.
DTIC
Degradation; Satellite Constellations; Stochastic Processes

20050168102 RTI International, Research Triangle Park, NC, USA, Ferrell and Associates Consulting, Inc., Vienna , VA, USA
Reusable Launch Vehicles Operations and Maintenance Top-Down Analysis
Middendorf, T.; May, E. L.; Ferrell, U.; Ferrell, T.; Dec. 20, 2002; 230 pp.; In English
Report No.(s): PB2005-105399; No Copyright; Avail: CASI; A11, Hardcopy
The purpose of this report and the corresponding effort is to identify those Operations and Maintenance requirements that should be universally applied to Reusable Launch Vehicle maintainers and operators to ensure public safety and to allow for technological development and global competitiveness.
NTIS
Reusable Launch Vehicles; Maintenance

20050168122 Research Triangle Inst., Cocoa Beach, FL, USA
30th Space Wing/Vandenberg Air Force Base Final Launch Site Safety Assessment, June 8, 2002
Jun. 08, 2002; 118 pp.; In English
Report No.(s): PB2005-105726; No Copyright; Avail: CASI; A06, Hardcopy
Partial Contents: Western Range General Range Capabilities (General Information, Range description, Capability); Western Range Safety Program (Introduction, Safety organization and responsibilties Base Safety, Mission Flight Control, Systems Safety, Flight Analysis, Western Range Safety Policy, Public Exposure, Control Systems, Clearance Zones, Safety Approvals, Wing Commander Approvals); The Western Range Safety Program (Missile System Ground Safety, Missile System Pre-launch Safety Package, Noncompliance with the Requirements of EWR 127-1, Mission Flight Control Officer, System Safety Training, Flight Safety Project Officer, Other Training, Commercial Launch Operator Responsibilities and Requirements); Bibliography.
NTIS
Safety Management; Systems Analysis; Flight Safety

20050168124 Federal Aviation Administration, Washington, DC, USA
Guide to Reusable Launch Vehicle Safety Validation and Verification Planning, Version 1.0
Sep. 2003; 30 pp.; In English
Report No.(s): PB2005-105724; No Copyright; Avail: CASI; A03, Hardcopy

The Federal Aviation Administration (FAA), Associate Administrator for Commercial Space Transportation (AST) regulates the emerging Reusable Launch Vehicle (RLV) industry. Such regulatory efforts are used only to the extent necessary to ensure that industry activities do not jeopardize public health and safety, safety of property, U.S. national security or foreign policy interests, or international obligations of the U.S. The FAA is committed to ensuring safety as well as promoting the RLV industry through an efficient regulatory process. Corresponding to the FAA/ASTs regulatory authority, this guide discusses the validation and verification process within the context of safety requirements. This guide provides an acceptable method of safety validation and verification planning. Sample formats illustrating implementation of the validation and verification process are provided. In demonstrating compliance with the RLV regulations, an applicant may use the validation and verification process described in this guide or an equivalent process. In any event, obtaining AST approval of the selected process is required.

NTIS

Aerospace Industry; Reusable Launch Vehicles; Space Transportation System

20050168133 Federal Aviation Administration, Washington, DC, USA
Suborbital Reusable Launch Vehicles and Emerging Markets
Feb. 2005; 48 pp.; In English
Report No.(s): PB2005-105718; No Copyright; Avail: CASI; A03, Hardcopy

Suborbital launch activity has long been overlooked by the commercial market, which for many years focused exclusively on launching satellites. Suborbital launch operations remained primarily in the government sector, supporting missile tests and scientific work, and even there activity declined significantly after the end of the Cold War. Recently, however, there has been a resurgence of interest in commercial suborbital spaceflight, stimulated by the emergence of new markets, notably space tourism, and new vehicles developed by entrepreneurs. With the successful claiming of the Ansari X Prize, high public interest in space travel, and new vehicles under construction, entrepreneurial ventures are pushing a new industry forward at a rapid pace. The Suborbital Reusable Launch Vehicles (SRLV) and Emerging Markets report provides the first comprehensive assessment by the Federal Aviation Administration's Office of Commercial Space Transportation (FAA/AST) of the commercial suborbital reusable launch industry in the USA. This document reviews three key areas in this commercial suborbital renaissance: new markets for suborbital spaceflight, companies that are developing vehicles to serve those markets, and spaceports from which these vehicles can operate. This report also discusses the recent developments in commercial suborbital spaceflight and the history of suborbital rocketry.

NTIS

Reusable Launch Vehicles; Spacecraft Launching

16
SPACE TRANSPORTATION AND SAFETY

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

20050166382 American Inst. of Aeronautics and Astronautics, Reston, VA, USA
Return to Flight - and a Tenuous Future
Jones, Thomas D.; Aerospace; April 2005; ISSN 0740-722X; Volume 43, No. 4, pp. 24-26; In English; Original contains color illustrations; Copyright; Avail: Other Sources

Eleven years ago I strapped into a space shuttle for the first time. The only rookie on the six-person crew of STS-59, I was also the only one aboard Endeavour who didn't know what to expect when the engines lit. Simulations and centrifuge rides had taken me to the limits of what training can do. There was no way to find out except to experience a shuttle liftoff. When Discovery's solid rocket boosters ignite next month to return the space shuttle fleet to orbit, Eileen Collins, Charlie Camarda, Jim Kelly, Wendy Lawrence, Soichi Noguchi, Steve Robinson, and Andy Thomas will have experienced many of the same emotions: anticipation, apprehension, certainly determination. Their safe return to Earth on STS-114 will mean that

one challenge - the return to flight - has ended. But the mission will mark only the first step toward restoring the health of the nation's human spaceflight program.
Author (revised)
Space Shuttles; Spacecrews; Aerospace Safety; Space Transportation System Flights

20050167074 NASA Johnson Space Center, Houston, TX, USA
Multi-Tasking: First Shuttle Mission Since Columbia Combines Test Flight, Catch-Up ISS Supply and Maintenance
Morring, Frank, Jr.; Aviation Week and Space Technology; April 25, 2005; ISSN 0005-2175; Volume 162, No. 17, pp. 65-66; In English; Copyright; Avail: Other Sources

NASA's space shuttle fleet is nearing its return to flight with a complex mission on board Discovery that will combine tests of new hardware and procedures adopted in the wake of Columbia's loss with urgent repairs and resupply for the International Space Station. A seven-member astronaut crew has trained throughout most of the two-year hiatus in shuttle operations for the 13-day mission, shooting for a three-week launch window that opens May 15. The window, and much else about the STS-114 mission, is constrained by NASA's need to ensure it has fixed the ascent/debris problem that doomed Columbia and its crew as they attempted to reenter the atmosphere on Feb. 1, 2003. The window was selected so Discovery's ascent can be photographed in daylight with 107 different ground- and aircraft-based cameras to monitor the redesigned external tank for debris shedding. Fixed cameras and the shuttle crew will also photograph the tank in space after it has been jettisoned.
Author (revised)
Space Shuttles; Space Transportation System Flights; Safety Factors; Aerospace Safety; Flight Safety; Space Maintenance; Orbital Servicing

20050167715 General Accounting Office, Washington, DC, USA
Testimony Before the Committee on Science, Subcommittee on Space and Aeronautics, House of Representatives, Space Transportation: Progress of the X-33 Reusable Launch Vehicle Program
Li, Allen; [September 29, 1999]; 14 pp.; In English
Report No.(s): GAO/T-NSIAD-99-243; No Copyright; Avail: CASI; A03, Hardcopy

Because of problems in developing technologies for the X-33, the program will not meet some of its original cost, schedule, and performance objectives. Costs have increased, the test vehicle s first flight was delayed by 16 months, and some performance objectives-such as a speed reduction from Mach 15 to Mach 13.8-were reduced. When the cooperative agreement was established in July 1996, Lockheed Martin and industry partners contributions totaled $211.6 million; NASA's contribution was fixed at $912.4 million. We estimate that between July 1996 and March 1999, contractors total contributions increased by $75 million, to $286.6 million in response to problems encountered during development. Estimated government costs for NASA civil service personnel working on the program also increased, from $95.2 million to $113.1 million. These costs for NASA personnel are not included in the agency s agreement contribution; they are paid out of another budget account. Because the agreement permits NASA employees to work side by side with Lockheed Martin employees to perform various technical tasks, NASA's oversight of the program is based on real-time and detailed insights from its personnel. With information from its employees, NASA's X-33 program office monitors and verifies the program's progress and pays the contractor when it meets milestones. Several issues will need to be addressed before NASA can decide whether to use VentureStar reusable launch vehicles to support the International Space Station. First, the results of the X-33 Program must provide sufficient information for NASA to determine that risks have been adequately reduced and that continuation of activities leading to the agency s use of VentureStar is warranted. Second, even though VentureStar reusable launch vehicles are intended to be commercially owned and operated, government financial incentives may be needed to initiate such a venture. Third, the amount NASA would have to pay in additional development and production costs to enable VentureStar to carry people would need to be determined. Fourth, the need for and effect of additional flights would need to be considered. Because VentureStar would not carry as much cargo as the space shuttle, more frequent dockings are likely. This could reduce the amount of stable time available for some science operations. The design and management of the X-33 Program agreement reflect the intent of the National Space Transportation Policy. However, the extent that the program will achieve a cost reduction envisioned by that policy is unclear at this time. In our August 1999 report, we recommended that NASA establish performance targets and a clear linkage between the X-33 Program and the agency s objective of reducing the cost of access to space. NASA concurred with our recommendation and stated that it would develop performance targets for the X-33 Program that (1) establish a clear path leading from the X-33 flight-test vehicle to an operational reusable launch vehicle and

(2) show progress toward meeting the agency's objective of significantly reducing launch costs.
Derived from text
Space Transportation; X-33 Reusable Launch Vehicle; NASA Space Programs; International Space Station

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*.

20050167102 General Accounting Office, Washington, DC, USA
Military Space Operations: Common Problems and Their Effects on Satellite and Related Acquisitions
[2003]; 40 pp.; In English
Report No.(s): GAO-03-825R; No Copyright; Avail: CASI; A03, Hardcopy

The majority of satellite programs cost more than expected and took longer to develop and launch than planned. In reviewing our past reports, we found that these results were commonly tied to the following problems. (1) Requirements for what the satellite needed to do and how well it must perform were not adequately defined at the beginning of a program or were changed significantly once the program had already begun. (2) Investment practices were weak. For example, potentially more cost-effective approaches were not examined and cost estimates were optimistic. (3) Acquisition strategies were poorly executed. For example, competition was reduced for the sake of schedule or DOD did not adequately oversee contractors. (4) Technologies were not mature enough to be included in product development. Several factors contributed to these problems. First, DOD often took a schedule driven instead of a knowledge-driven approach to the acquisition process. As a result, activities essential to containing costs, maximizing competition among contractors and testing technologies were compressed or not done. Second, there is a diverse array of organizations with competing interests involved in overall satellite development from the individual military services, to testing organizations, contractors, civilian agencies, and in some cases international partners. This created challenges in making tough tradeoff decisions, particularly since, for many years, there was no high-level official within the Office of the Secretary of Defense dedicated to developing and enforcing an overall investment strategy for space. Third, space acquisition programs have historically attempted to satisfy all requirements in a single step, regardless of the design challenge or the maturity of technologies to achieve the full capability. This approach made it difficult to match requirements to available resources (in terms of time, money, and technology). Other factors also created challenges for the satellite acquisition programs we reviewed. These include a shrinking industrial base, a declining space workforce, difficulties associated with testing satellites in a realistic environment, as well as challenges associated with launching satellites. DOD has studied problems affecting its satellite acquisitions and is undertaking efforts to address these problems. We plan to evaluate these efforts in a subsequent review. Therefore, we are not making recommendations in this report.
Derived from text
Military Technology; Satellite Communication

20050167168 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
NASA's New Millennium ST6 Project
Chmielewski, A. B.; Nelson, R. M.; Stevens, C. M.; Chien, S. A.; Davies, A. G.; Shwerwood, R. L.; Wyman, W.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 1 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

NASA s New Millennium Program validates advanced technologies in space and thus lowers the risk for the first mission user. The New Millennium ST6 project has developed two advanced, experimental technologies for use on future missions. These technologies are: 1) the Autonomous Sciencecraft Experiment (ASE), a demonstration of autonomous, science-driven spacecraft command and control; and 2) the Inertial Stellar Compass (ISC). These technologies will improve a spacecraft's ability (with ASE) to make intelligent decisions on what information to gather and send back to the ground; and (with ISC) determine its own attitude and adjust its pointing.
Author
Automatic Control; Autonomous Navigation; Compasses

20050169156 NASA Lewis Research Center, Cleveland, OH, USA
B-ISBN Onboard Processing Fast Packet Switch Developed
[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Future satellite communications applications will require a packet-switched onboard satellite processing system to route packets at very high speeds from uplink beams to different downlink beams. The rapid emergence of point-to-multipoint services, and the important role of satellites in a national and global information infrastructure, makes the multicast function essential to a fast packet switch (FPS). NASA Lewis Research Center's Digital System Technology Branch has been studying possible architectures for high-speed onboard-processing satellite systems. As part of this research, COMSAT Laboratories developed a broadband integrated services digital network (B-ISDN) fast packet switch for Lewis that was delivered on December 1994. The fast packet switch consists of eight inputs and eight outputs that can receive and transmit data, respectively, at a rate of 155 Mbps. The switch features multiple priorities (three) and multiple-size (three) satellite virtual cells that are similar to ATM cells in length (52 bytes). In addition, the fast packet switch features a congestion-control algorithm that allows users to set different thresholds for individual destination ports, thus throttling back the traffic from the transmitting port.

Author

Onboard Data Processing; Satellite Communication; Packet Switching; Airborne/Spaceborne Computers

18
SPACECRAFT DESIGN, TESTING AND PERFORMANCE

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

20050167063 Georgia Inst. of Tech., Atlanta, GA, USA

Enhancing the Design Process for Complex Space Systems through Early Integration of Risk and Variable-Fidelity Modeling

Mavris, Dimitri; Osburg, Jan; March 31, 2005; 80 pp.; In English

Contract(s)/Grant(s): NCC1-02043; GTRC-03-01/2552-GT; Copyright; Avail: CASI; A05, Hardcopy

An important enabler of the new national Vision for Space Exploration is the ability to rapidly and efficiently develop optimized concepts for the manifold future space missions that this effort calls for. The design of such complex systems requires a tight integration of all the engineering disciplines involved, in an environment that fosters interaction and collaboration. The research performed under this grant explored areas where the space systems design process can be enhanced: by integrating risk models into the early stages of the design process, and by including rapid-turnaround variable-fidelity tools for key disciplines. Enabling early assessment of mission risk will allow designers to perform trades between risk and design performance during the initial design space exploration. Entry into planetary atmospheres will require an increased emphasis of the critical disciplines of aero- and thermodynamics. This necessitates the pulling forward of EDL disciplinary expertise into the early stage of the design process. Radiation can have a large potential impact on overall mission designs, in particular for the planned nuclear-powered robotic missions under Project Prometheus and for long-duration manned missions to the Moon, Mars and beyond under Project Constellation. This requires that radiation and associated risk and hazards be assessed and mitigated at the earliest stages of the design process. Hence, RPS is another discipline needed to enhance the engineering competencies of conceptual design teams. Researchers collaborated closely with NASA experts in those disciplines, and in overall space systems design, at Langley Research Center and at the Jet Propulsion Laboratory. This report documents the results of this initial effort.

Author

Aerospace Systems; Complex Systems; Space Missions; Mathematical Models; Systems Integration; Spacecraft Design; Aerothermodynamics

20050167188 North Carolina State Univ., Raleigh, NC, USA

CFD Modeling of NASA's ARES Platform

Coltrane, J. J.; Arena, A. S.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This project's aim is to model NASA's platform for aerial exploration of Mars, A.R.E.S., or Aerial Regional-scale Environmental Survey. This Mars Scout Mission candidate lost the initially bidding for the Scout Mission to fly in 2007 to the lander Phoenix. Computational Fluid Dynamic (CFD) modeling of ARES allows the platform to be flown in a simulated

Martian atmosphere. This atmosphere has an air density one-hundredth of Earth s, temperatures averaging -60 degrees Celsius and a composition 95% carbon dioxide [1]. The atmospheric as well as geologic data that could be revealed by an aerial platform has kept this interesting Scout candidate in the running. This platform could also discover and investigate areas with higher methane concentrations and conduct crustal magnetism measurements [7]. In order to perform an aerodynamic study on this candidate, a model had to built using a grid generator. FELISA (Finite Element Langley Imperial Swansea Ames) is a grid generator developed at the previously listed institutions and is part of the STARS package that Oklahoma State University uses to model aeroelasticity for NASA Dryden. Three input files must be constructed for the FELISA grid generator to run, these are the surfaces, boundary conditions and background files. FELISA's grid output from these three files and a controls input file allow the fluid solver Euler3d to simulate a variety of atmospheres, free stream speeds, and directions of air flow over an aircraft.
Derived from text
Flying Platforms; Dynamic Models; Mars Atmosphere; Aeroelasticity; Computational Fluid Dynamics

20050169153 NASA Lewis Research Center, Cleveland, OH, USA
Aperture Shield Materials Characterized and Selected for Solar Dynamic Space Power System
[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The aperture shield in a solar dynamic space power system is necessary to prevent thermal damage to the heat receiver should the concentrated solar radiation be accidentally or intentionally focused outside of the heat receiver aperture opening and onto the aperture shield itself. Characterization of the optical and thermal properties of candidate aperture shield materials was needed to support the joint U.S./Russian solar dynamic space power effort for Mir. The specific objective of testing performed at the NASA Lewis Research Center was to identify a high-temperature material with a low specular reflectance, a low solar absorptance, and a high spectral emittance so that during an off-pointing event, the amount of solar energy reflecting off the aperture shield would be small, the ratio of solar absorptance to spectral emittance would provide the lowest possible equilibrium temperature, and the integrity of the aperture shield would remain intact.
Author
Spacecraft Construction Materials; Spacecraft Shielding; Solar Radiation Shielding; Heat Shielding; Spacecraft Power Supplies; Mir Space Station; Materials Selection

20050169211 General Accounting Office, Washington, DC, USA
Space Station: Status of Efforts to Determine Commercial Potential
30 Jun. 1999; 20 pp.; In English
Report No.(s): GAO/NSIAD-99-153R; B-282682; No Copyright; Avail: CASI; A03, Hardcopy

In 1998, Congress declared that a priority goal of constructing the International Space Station was the economic development of Earths orbital space and directed the National Aeronautics and Space Administration (NASA) to assess the station's commercial potential. NASA is doing so as part of its commercial development plan for the space station. As requested, we are providing information on whether space-station-related commercial activities could generate revenue capable of reducing the station's annual cost of operations, which NASA estimates will average $1.3 billion, or $13 billion over a 10-year mission life after the space station is fully assembled in 2004. We are also providing information on funding issues associated with the proposed x-ray crystallography facility for the space station because it may have some potential commercial use. One intended purpose of this facility would be to support the design of new drugs, which may be of possible interest to pharmaceutical companies. Uncertainty over funding of the facility brings to the forefront the issue of who should pay to develop station-based commercial facilities.
Derived from text
International Space Station; Economic Development; NASA Space Programs; Space Commercialization

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*.

20050166938 NASA Johnson Space Center, Houston, TX, USA

Cleanroom Robotics: Appropriate Technology for a Sample Receiving Facility?

Bell, M. S.; Allen, C. C.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

NASA is currently pursuing a vigorous program that will collect samples from a variety of solar system environments. The Mars Exploration Program is expected to launch spacecraft that are designed to collect samples of martian soil, rocks, and atmosphere and return them to Earth, perhaps as early as 2016. International treaty obligations mandate that NASA conduct such a program in a manner that avoids cross-contamination both Earth and Mars. Because of this requirement, Mars sample curation will require a high degree biosafety, combined with extremely low levels inorganic, organic, and biological contamination.

Derived from text

Mars Exploration; Mars Surface; Mars Surface Samples; Robotics; Rocks

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*.

20050167326 Air Force Research Lab., Hanscom AFB, MA USA

Computational Modeling of Ion Beam-Neutralizer Interactions in Two and Three Dimensions

Wheelock, Adrian; Cooke, David L.; Gatsonis, Nikolaos A.; Jul. 2004; 10 pp.; In English

Contract(s)/Grant(s): Proj-1010

Report No.(s): AD-A431875; AFRL-VS-HA-TR-2004-1080; AIAA-2004-4121; No Copyright; Avail: CASI; A02, Hardcopy

The fact that ion beams readily neutralize given a source of electrons is well known, but the physics behind that process is not. As electric propulsion devices move into the micro and macro regions with colloids, FEEPs, and large arrays of thrusters, the interactions between the neutralizer and the thruster are under examination. Simulations using 2D and 3D Particle-in-Cell (PIC) codes are presented, detailing starting and steady state interactions between an ion beam and an electron beam. It is shown that the starting conditions require detailed current coupling to propagate normally. Steady state simulations show robust behavior regardless of ion or electron currents. Further investigation of steady state reveals no mechanism for imparting ion beam bulk velocity to electrons.

DTIC

Beam Interactions; Ion Beams; Neutralizers

20050167342 Air Force Research Lab., Hanscom AFB, MA USA

Ion Beam Neutralization Processes for Electric Micropropulsion Applications

Wheelock, Adrian; Cooke, David L.; Gatsonis, Nikolaos A.; Jul. 2003; 12 pp.; In English

Contract(s)/Grant(s): Proj-1010

Report No.(s): AD-A431922; AFRL-VS-HA-TR-2004-1076; AIAA-2003-5148; No Copyright; Avail: CASI; A03, Hardcopy

While it is common knowledge that ion beams are easily neutralized using a variety of means, the precise process of neutralization remains unknown. With the increasing popularity of electric propulsion, and in particular micropropulsion systems, this question is of significant importance. Additionally, it has a bearing on thruster design, space instrument calibration, electrodynamic tethers, and ionospheric research. A review of the present state of knowledge on this topic is presented as well as results from ion beam simulations using 2D and 3D Particle-in-Cell codes. The grid generation methodology, adaptation, charged-particle transport, and field solver methodologies of the 3D code are reviewed. The simulations show electrons moving to neutralize the ion beam from background and neutralizer sources. The simulations show

the dependence of neutralization on beam energy and the electron/ion velocity ratio. The results are compared favorably with previous computations and experimental observations.
DTIC
Beam Neutralization; Electric Propulsion; Ion Beams; Low Thrust Propulsion; Microthrust; Spacecraft Propulsion

20050169151 NASA Lewis Research Center, Cleveland, OH, USA
Analysis of Shadowing Effects on Spacecraft Power Systems
[1995]; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

As part of an ongoing effort within the NASA Lewis Research Center's Power Systems Project Office to assist in the design and characterization of future space-based power systems, analyses have been performed to assess the effects of shadowing on the capabilities of various power systems on the International Space Station and the Russian MIR.
Author
Spacecraft Power Supplies; International Space Station; Mir Space Station; Self Shadowing; Solar Arrays

20050169152 NASA Lewis Research Center, Cleveland, OH, USA
Analysis of Solar Receiver Flux Distributions for US/Russian Solar Dynamic System Demonstration on the MIR Space Station
[1995]; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Analyses have been performed at the NASA Lewis Research Center's Power Systems Project Office to support the design and development of the joint U.S./Russian Solar Dynamic Flight Demonstration Project. The optical analysis of the concentrator and solar flux predictions on target receiver surfaces have an important influence on receiver design and control of the Brayton engine.
Author
Mir Space Station; Solar Collectors; Solar Flux Density; Distribution (Property)

20050169202 NASA Lewis Research Center, Cleveland, OH, USA
2-kW Solar Dynamic Space Power System Tested in Lewis' Thermal Vacuum Facility
[1995]; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Working together, a NASA/industry team successfully operated and tested a complete solar dynamic space power system in a large thermal vacuum facility with a simulated sun. This NASA Lewis Research Center facility, known as Tank 6 in building 301, accurately simulates the temperatures, high vacuum, and solar flux encountered in low-Earth orbit. The solar dynamic space power system shown in the photo in the Lewis facility, includes the solar concentrator and the solar receiver with thermal energy storage integrated with the power conversion unit. Initial testing in December 1994 resulted in the world's first operation of an integrated solar dynamic system in a relevant environment.
Author
Spacecraft Power Supplies; Ground Tests; Space Environment Simulation; Solar Simulation; Solar Generators

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*.

20050165784 National Inst. of Information and Communications Technology, Japan
Fabrication and Characterization of Nanometer-size Structures Consisting of Organic Molecules
Suzuki, Hitoshi; Terui, Toshifumi; Tanaka, Shukichi; Miki, Hideki; Kamikado, Toshiya; Yokoyama, Takashi; Okuno, Yoshishige; Yokoyama, Shiyoshi; Mashiko, Shinro; Review of the National Institute of Information and Communications Technology, Volume 50, Nos. 3/4; September/December 2004, pp. 103-111; In Japanese; See also 20050165771; Copyright; Avail: Other Sources

Overlayer structures consisting of organic molecules deposited on clean metal surfaces were observed by using scanning tunneling microscope (STM), which has sub-nanometer spatial resolution. Structural isomers of the molecules, whose difference is the binding sites of substituents, can be clearly distinguished from STM images. Introducing the substituent having attractive force, to the molecules causes specific overlayer structure by self-assembly manner controlled by the

substituent. We succeeded to observe a single molecular image on a metal surface with noncontact atomic force microscope (NCAFM) that can be applicable to nonconductive sample. These techniques forming the structures and obtaining highly resolved molecular images are fundamental and essential techniques to develop future information/communication devices with molecules.
Author
Fabrication; Chemical Bonds; Molecules; Self Assembly; Spatial Resolution; Electron Microscopes

20050166930 Open Univ., Milton Keynes, UK
Lithium and Carbon Isotopic Fractionations Between the Alteration Assemblages of Nakhla and Lafayette
Bridges, J. C.; Pearson, V. K.; Baker, L.; Verchovsky, A. B.; Wright, I. P.; James, R. H.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The nakhlites experienced a fluid alteration event on Mars leading to the rapid crystallization at low temperature (e.g. 25-150 C) of siderite, clay and other salts in fractures within olivine and interstitial sites [1-2]. In order to help constrain the origin and evolution of the brine we present new Li-isotopic, C and Thermal Gas Analysis data for Nakhla and Lafayette samples.
Author
Crystallization; Lithium Isotopes; Carbon; Fractionation; Nakhlites; Thermal Analysis

20050166947 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Processing and Synthesis of Pre-Biotic Chemicals in Hypervelocity Impacts
Brickerhoff, W. B.; Managadze, G. G.; Chumikov, A. E.; Managadze, N. G.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Hypervelocity impacts (HVIs) may have played a significant role in establishing the initial organic inventory for pre-biotic chemistry on the Earth and other planetary bodies. In addition to the delivery of organic compounds intact to planetary surfaces, generally at velocities below approx.20 km/s, HVIs also enable synthesis of new molecules. The cooling post-impact plasma plumes of HVIs in the interstellar medium (ISM), the protosolar nebula (PSN), and the early solar system comprise pervasive conditions for organic synthesis. Such plasma synthesis (PS) can operate over many length scales (from nm-scale dust to planets) and energy scales (from molecular rearrangement to atomization and recondensation). HVI experiments with the flexibility to probe the highest velocities and distinguish synthetic routes are a high priority to understand the relevance of PS to exobiology. We describe here recent studies of PS at small spatial scales and extremely high velocities with pulsed laser ablation (PLA). PLA can simulate the extreme plasma conditions generated in impacts of dust particles at speeds of up to 100 km/s or more. When applied to carbonaceous solids, new and pre-biotically relevant molecular species are formed with high efficiency [1,2].
Derived from text
Atmospheric Chemistry; Biochemistry; Synthesis (Chemistry); Organic Compounds; Molecular Gases

20050167265 Massachusetts Inst. of Tech., Cambridge, MA USA
Ecology, Diversity and Comparative Genomics of Oceanic Cyanobacterial Viruses
Sullivan, Matthew B.; Jun. 2004; 201 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): OCE-9820035; DE-FG02-02ER63445
Report No.(s): AD-A431667; MIT/WHOI-2004-09; No Copyright; Avail: Defense Technical Information Center (DTIC)

The marine cyanobacteria Prochiorococcus and Synechococcus are numerically dominant primary producers in the oceans. Each genera consists of multiple physiologically and genetically distinct groups (termed 'ecotypes' in Prochiorococcus). Cyanobacterial viruses (cyanophages) that infect Synechococcus are abundant (to 104.106 phage ml.I) in the oceans and calculations suggest that they play a small but significant role in host mortality. Cyanophages are also thought to shape their host populations through regulation of sub-populations and through transfer of genes.
DTIC
Ecology; Viruses

20050167278 Army War Coll., Carlisle Barracks, PA USA

The Department of Defense Commitment to the Destruction and Remediation of Non-Stockpile Chemical Materiel: Can Present Policy and Approaches Effectively Meet the Challenges to Eliminate the Threat to the Public?

Fletcher, James P.; Mar. 2005; 27 pp.; In English

Report No.(s): AD-A431701; No Copyright; Avail: Defense Technical Information Center (DTIC)

The intent of this project is to examine the current approach for the destruction of Recovered Chemical Warfare Material. Current projections are that 42 states are impacted by the possible presence of RCWM. Projections to remove and destroy RCWM range from $8.9 billion to more than $20 billion. RCWM exists on both present and former defense sites. Many of the sites are no longer under DOD control and the presence of RCWM presents a threat to the public. Presently no organization has the responsibility to coordinate, budget and plan for a comprehensive approach for RCWM. This paper addresses the issues related to RCWM removal and destruction and recommends an DOD approach to develop a comprehensive solution. DTIC

Defense Program; Destruction; Hazardous Materials; Policies; Stockpiling

20050167376 Naval Air Warfare Center, Patuxent River, MD USA

An Investigation of Spalling Behavior of High Velocity Oxygen Fuel (HVOF) Coatings on the 4340 Steel and HyTuf

Lee, Eui W.; Frazier, William E.; Leap, Michael; Taylor, Bob; Sanders, Henry; Feb. 2005; 42 pp.; In English; Original contains color illustrations

Report No.(s): AD-A431979; NAWCADPAX/TR-2005/38; No Copyright; Avail: Defense Technical Information Center (DTIC)

The application of high velocity oxygen fuel (HVOF) coatings has gained increasing acceptance in the aerospace Industry. It has the potential to replace hard chromium coatings in a number of applications. This work was focused on ascertaining the limitations of HVOF coatings applied to ultra high strength steels and components experiencing high loading stresses. A group of tubular axial fatigue specimens with 2.3 in. diameter and 5.0 in. long gage section were coated with a WC-Co composite coating (Suizer Metco Diamalloy 2005) via the HVOF process. HVOF coating thickness was varied from -0.006 in. to -0.012 in. and substrate material used was 4340 steel to HyTuf. The fatigue specimens were subjected to 20 cycle test segments starting at 150 ksi or 160 ksi for stress ratios of-I and 4).33, respectively. Stepped stress testing was continued in 10 ksi increments until coating failure was observed in the form of cracking and/or spalling. Coating failure was observed to be a function of coating thickness. As coating thickness increased, coating failure occurred at progressively lower stress levels. DTIC

Coatings; High Strength; Hvof Thermal Spraying; Spalling; Sprayed Coatings; Steels; Stress Analysis

20050167784 American Museum of Natural History, New York, NY, USA

First Results of a Physicochemical Survey of CV3 Calcium-Aluminum-rich Inclusions: The Refractory Trace Elements Sr, Y, Zr, Nb, Ba, Hf, Ta

Friedrich, J. M.; Jochum, K. P.; Ebel, D. S.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ca, Al-rich inclusions (CAIs) offer glimpses into the earliest chemical and physical processes during solar system formation. We have begun a study of the trace element distribution(s) within CV3 CAIs and their constituent minerals to help constrain the chemical environment(s) of their formation and evolution. We have physically, mineralogically, and chemically characterized 20 individual CAIs in thick sections of 3 different CV3 chondrites using 3D tomography, qualitative x-ray mapping, quantitative electron microprobe and laser ablation inductively coupled plasma mass spectrometry (LA-ICPMS) techniques. The combination of these techniques on individual CAIs will expand our knowledge of the physical and chemical formation conditions of these enigmatic objects.

Derived from text

Calcium; Aluminum; Trace Elements; Chemical Reactions; Tomography; Chondrites; Inductively Coupled Plasma Mass Spectrometry; Laser Ablation; X Rays

20050168153 Building and Construction Research TNO, Rijswijk, Netherlands, Netherlands School for Advanced Studies in Construction, Delft, Netherlands

HERON, Volume 48, No. 3, 2003. Special Issue

2003; 72 pp.; In English

Report No.(s): PB2005-102998; No Copyright; Avail: CASI; A04, Hardcopy

Contents include the following: Editorial; Decay of Rhenish Tuff in Dutch Monuments: Part 1; Decay of Rhenish Tuff in Dutch Monuments: Part 2; Black Weathering of Sandstone; Laser Cleaning of Rakowicze Sandstone; Weathering of White Flemish Stone; Properties of Portland Limestone and Durability; and Effects of Styolites on the Durability of Building Stones: Two Case Studies.
NTIS
Construction Materials; Research and Development; Minerals

20050168162 Edison Welding Inst., Columbus, OH, USA, Pacific Gas and Electric Co., San Ramon, CA, USA
Internal Repair of Pipelines Review and Evaluation of Internal Pipeline Repair Trials Report. Report for September 20, 2003-June 30, 2004
Gordon, R.; Bruce, B.; Harris, I.; Harwig, D.; Ritter, G.; Sep. 2004; 112 pp.; In English
Report No.(s): DE2004-834163; No Copyright; Avail: Department of Energy Information Bridge

The two broad categories of fiber-reinforced composite liner repair and deposited weld metal repair technologies were reviewed and evaluated for potential application for internal repair of gas transmission pipelines. Both are used to some extent for other applications and could be further developed for internal, local, structural repair of gas transmission pipelines. Evaluation trials were conducted on pipe sections with simulated corrosion damage repaired with glass fiber-reinforced composite liners, carbon fiber-reinforced composite liners, and weld deposition. Additional un-repaired pipe sections were evaluated in the virgin condition and with simulated damage. Hydrostatic failure pressures for pipe sections repaired with glass fiber-reinforced composite liner were only marginally greater than that of pipe sections without liners, indicating that this type of liner is generally ineffective at restoring the pressure containing capabilities of pipelines. Failure pressure for pipe repaired with carbon fiber-reinforced composite liner was greater than that of the un-repaired pipe section with damage, indicating that this type of liner is effective at restoring the pressure containing capability of pipe. Pipe repaired with weld deposition failed at pressures lower than that of un-repaired pipe in both the virgin and damaged conditions, indicating that this repair technology is less effective at restoring the pressure containing capability of pipe than a carbon fiber-reinforced liner repair. Physical testing indicates that carbon fiber-reinforced liner repair is the most promising technology evaluated to-date. Development of a comprehensive test plan for this process is recommended for use in the next phase of this project.
NTIS
Epoxy Matrix Composites; Pipelines; Failure; Corrosion

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COMPOSITE MATERIALS

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

20050167279 Army Tank-Automotive Research and Development Command, Warren, MI USA
Army Composite Bridging Applications Supporting the Future Combat System and Future Force
Hornbeck, Brian; Mar. 2004; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431702; REPT-14028; No Copyright; Avail: Defense Technical Information Center (DTIC)

This brief presents U.S. Army composite bridging research and technology, which is intended to support the Future Force. It provides a review of the current state of mobile military bridging followed by an overview of the Future Force requirements. The current fleet has short comings as the Army is transforming the Future Force. Current composite technology efforts to address the requirements of the Future Force are the Composite Army Bridge (CAB) and the Modular Composite (MCB). The CAB is a technology demonstrator, which successfully demonstrated the ability of a reinforced plastic structure to withstand the aggressive crossings of military vehicles (i.e. M1, HET w/M1). The MCB successfully demonstrated that a composite joint could be designed, which can support the required design loads for a 25m span. Concepts are presented, which will address the requirements of the Future Force.
DTIC
Combat; Composite Materials

20050167299 Nebraska Univ., Lincoln, NE USA
Fatigue Fracture Analysis and Development of Fundamentals of Predictive NDE of Adhesive Composite Joints
Dzenis, Y. A.; Jan. 2005; 35 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0124
Report No.(s): AD-A431776; AFRL-SR-AR-TR-05-0133; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this research was a systematic fatigue fracture analysis and development of fundamentals of predictive nondestructive evaluation of adhesive composite joints for aerospace structural applications. Fatigue fracture of joints was studied using fracture mechanics methods. A mixed mode fracture model was developed and validated. Feasibility of prediction of fatigue life of joints was demonstrated. Several methods of nondestructive evaluation of cracks in joints were significantly enhanced based on wave propagation modeling. Ultrasonic through thickness and longitudinal (acousto-ultrasonic) methods were explored and sensor configurations were optimized based on modeling. The accuracy of crack location evaluation was enhanced by modal analysis. A pioneering method of nondestructive evaluation of loading mode mixity at the crack tip was developed based on the pattern recognition acoustic emission (AE) analysis. The method was validated experimentally and confirmed by modeling. The feasibility of real-time monitoring of adhesive joints using built-in sensors was demonstrated. A new method and specimen for experimental evaluation of transverse fracture resistance of an isotropic composites was developed. The results provide better understanding of fatigue behavior of adhesive composite joints. The demonstrated combined modeling-based QNDE and advanced fracture mechanics approach for life prediction constitutes a fundamental basis for the next generation Smart NDE (SNDE) systems with mechanics- based predictive capabilities. The research was performed in close collaboration with AFRL/MLBC.

DTIC

Adhesive Bonding; Composite Materials; Fracturing; Joints (Junctions); Nondestructive Tests; Predictions

20050167892 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands

Analysing Blast and Fragment Penetration Effects on Composite Helicopter Structures

vantHof, C.; Herlaar, K.; Luyten, J. M.; vanderJagt, M. J.; March 2005; 73 pp.; In English

Contract(s)/Grant(s): B02/Klu/500; TNO Proj. 014.14186

Report No.(s): TD-2005-0013; DV2-2005-A13; Copyright; Avail: Other Sources

Sandwich structures become increasingly important as structural parts in helicopters. This does not only have effect on the way of construction but also on the vulnerability of the helicopter. The last decades the threat of helicopters blast loads and fragment impact more frequently. Moreover the blast load becomes more important because the threat comes closer to the target. At TNO different blast and fiagment response models are available for metal structures. However little is known about the blast and fragment performance of sandwich panels. To be able to determine the damage of these structures due to blast loads and fragment impact it will be necessary to extend the present vulnerability methods for composite structures. A combination of numerical simulations and experiments were performed for both blast loading and fragment impact on composite structures. The numerical results show good agreement with the experiments but must be improved for some applications. The numerical tools make it possible in future to simulate vulnerability of composite structures without the need of large and expensive experiments.

Author

Blast Loads; Fragments; Helicopters; Penetration; Composite Materials; Sandwich Structures

20050168087 NASA Glenn Research Center, Cleveland, OH, USA

Rod-Coil Block Polyimide Copolymers

Meador, Mary Ann B., Inventor; Kinder, James D., Inventor; April 19, 2005; 10 pp.; In English

Patent Info.: Filed 13 May 2002; US-Patent-6,881,820; US-Patent-Appl-SN-147477; NASA-Case-LEW-17299-1; No Copyright; Avail: CASI; A02, Hardcopy

This invention is a series of rod-coil block polyimide copolymers that are easy to fabricate into mechanically resilient films with acceptable ionic or protonic conductivity at a variety of temperatures. The copolymers consist of short-rigid polyimide rod segments alternating with polyether coil segments. The rods and coil segments can be linear, branched or mixtures of linear and branched segments. The highly incompatible rods and coil segments phase separate, providing nanoscale channels for ion conduction. The polyimide segments provide dimensional and mechanical stability and can be functionalized in a number of ways to provide specialized functions for a given application. These rod-coil black polyimide copolymers are particularly useful in the preparation of ion conductive membranes for use in the manufacture of fuel cells and lithium based polymer batteries.

Official Gazette of the U.S. Patent and Trademark Office

Block Copolymers; Fabrication; Polyimides; Rods; Electric Coils

20050168111 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Enschede, Netherlands
Comparison of Waterproof Breathable Membranes for Textiles
Schrijer, G. J. M.; Wessels, D. J.; February 2005; 69 pp.; In Dutch; Original contains black and white illustrations
Contract(s)/Grant(s): A04/KL/169; TNO Proj. 007.64458
Report No.(s): TD-2005-0384; Rept--42/04.012272; Copyright; Avail: Other Sources

Today many different textile laminates are available. The Dutch Defence Organization applies these laminates in their specialized clothing. The laminates consist of one or two textile layers and one waterproof, breathable membrane. Selection of the proper membrane is difficult because of the many properties, specified according to many different test methods. A survey of the important properties of the membranes applied in laminates has been performed. Thus enabling a better evaluation of the many different membranes. Seven interesting commercially available membranes have been specified as completely as possible according to the information as made available by the suppliers. The aim was to compare these membranes. A reliable comparison of the membranes with the specifications supplied appears hardly possible. The conclusion is that only by a testing programme the most suitable membranes can be selected. So some well defined textile laminates may be compared. These laminates should be composed of some membranes of the interest and one or two layers of specified textile cloth to be laminated with each of the membranes.
Author
Laminates; Membranes; Textiles; Waterproofing

20050168241 Nagaoka Univ. of Technology, Nagaoka, Japan
Synthesis of nanosize powders by pulsed wire discharge
Jiang, Weihua; Yatsui, Kiyoshi; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 214-219; In English; See also 20050168165; Copyright; Avail: Other Sources

We have carried out demonstration experiments of nanosize powder synthesis by pulsed wire discharge. The experimental results have showed that the species of the powders produced by wire discharge are not only those of the wires but also many kinds of ceramic compounds of the wire material. In the initial experiments, we have demonstrated powder synthesis of metals (Al, Fe, Cu, Mo, and Pb), metal oxides (Al2O3, TiO2, Fe2O3, NiO, ZrO2, SnO2, and PbO), and metal nitrides (TiN, ZrN, Ta2N). Results of surface area measurements have shown that the average particle sizes of these powders are on the order of several tens of nm.
Author
Powder (Particles); Metal Powder; Metal Oxides

20050169147 NASA Lewis Research Center, Cleveland, OH, USA
Active Piezoelectric Structures for Tip Clearance Management Assessed
[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Managing blade tip clearance in turbomachinery stages is critical to developing advanced subsonic propulsion systems. Active casing structures with embedded piezoelectric actuators appear to be a promising solution. They can control static and dynamic tip clearance, compensate for uneven deflections, and accomplish electromechanical coupling at the material level. In addition, they have a compact design. To assess the feasibility of this concept and assist the development of these novel structures, the NASA Lewis Research Center developed in-house computational capabilities for composite structures with piezoelectric actuators and sensors, and subsequently used them to simulate candidate active casing structures. The simulations indicated the potential of active casings to modify the blade tip clearance enough to improve stage efficiency. They also provided valuable design information, such as preliminary actuator configurations (number and location) and the corresponding voltage patterns required to compensate for uneven casing deformations. An active ovalization of a casing with four discrete piezoceramic actuators attached on the outer surface is shown. The center figure shows the predicted radial displacements along the hoop direction that are induced when electrostatic voltage is applied at the piezoceramic actuators. This work, which has demonstrated the capabilities of in-house computational models to analyze and design active casing structures, is expected to contribute toward the development of advanced subsonic engines.
Author
Piezoelectric Actuators; Propulsion System Configurations; Turbomachinery; Mathematical Models; Blade Tips; Composite Structures

20050169149 NASA Lewis Research Center, Cleveland, OH, USA
Advanced High-Temperature Engine Materials Technology Progresses
[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The objective of the Advanced High Temperature Engine Materials Technology Program (HITEMP) is to generate technology for advanced materials and structural analysis that will increase fuel economy, improve reliability, extend life, and reduce operating costs for 21st century civil propulsion systems. The primary focus is on fan and compressor materials (polymer-matrix composites--PMC's), compressor and turbine materials (superalloys, and metal-matrix and intermetallic-matrix composites--MMC's and IMC's) and turbine materials (ceramic-matrix composites--CMC's). These advanced materials are being developed by in-house researchers and on grants and contracts. NASA considers this program to be a focused materials and structures research effort that builds on our base research programs and supports component-development projects. HITEMP is coordinated with the Advanced Subsonic Technology (AST) Program and the Department of Defense/NASA Integrated High-Performance Turbine Engine Technology (IHPTET) Program. Advanced materials and structures technologies from HITEMP may be used in these future applications. Recent technical accomplishments have not only improved the state-of-the-art but have wideranging applications to industry. A high-temperature thin-film strain gage was developed to measure both dynamic and static strain up to 1100 C (2000 F). The gage's unique feature is that it is minimally intrusive. This technology, which received a 1995 R&D 100 Award, has been transferred to AlliedSignal Engines, General Electric Company, and Ford Motor Company. Analytical models developed at the NASA Lewis Research Center were used to study Textron Specialty Materials' manufacturing process for titanium-matrix composite rings. Implementation of our recommendations on tooling and processing conditions resulted in the production of defect free rings. In the Lincoln Composites/AlliedSignal/Lewis cooperative program, a composite compressor case is being manufactured with a Lewis-developed matrix, VCAP. The compressor case, which will reduce weight by 30 percent and costs by 50 percent, is scheduled to be engine tested in the near future.
Author
Heat Resistant Alloys; Technology Utilization; Composite Materials; Turbine Engines; Civil Aviation

20050169160 NASA Lewis Research Center, Cleveland, OH, USA
Ceramic Composites Used in High-Speed Turbines for Rocket Engines
[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Ceramic matrix composite (CMC) technology offers many benefits for liquid-fueled rocket engines. Analyses show that components made from fiber-reinforced ceramic matrix composites (FRCMC's) offer the opportunity for revolutionary gains in turbomachinery performance. In addition, they offer reduced weight and the potential for longer life and lower operating costs. A NASA-sponsored turbopump development effort, conducted at Rocketdyne with parallel material characterization at the NASA Lewis Research Center, confirmed the potential to use FRCMC's for complex turbomachinery components.
Author
Fiber Composites; Reinforcing Fibers; Carbon Fibers; Turbine Pumps; Carbon-Silicon Carbide Composites; Engine Parts

20050169185 NASA Lewis Research Center, Cleveland, OH, USA
Affordable Fiber-Reinforced Ceramic Composites Win 1995 R and D 100 Award
[1995]; 1 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Affordable fiber-reinforced ceramic matrix composites (AFReCC) with high strength and toughness, good thermal conductivity, thermal shock resistance, and oxidation resistance are needed for high-temperature structural applications. AFReCC materials will have various applications in advanced high-efficiency and high-performance engines: that is, the High Speed Civil Transport (HSCT), space propulsion components, and land-based systems. For example, silicon-carbide-fiber-reinforced silicon carbide matrix composites show promise for meeting the criteria of high strength, thermal conductivity, and toughness required for the HSCT combustor liner. AFReCC received R&D Magazine's prestigious R&D 100 Award in 1995. The fabrication process for these composites has three steps. In the first step, fiber preforms are made and chemical vapor infiltration is used to apply the desired interface coating on the fibers. This step also rigidizes the preform. The second step consists of resin infiltration, which after pyrolysis, yields an interconnected network of porous carbon as the matrix. In the final step of the process, the carbon-containing preform is infiltrated with molten silicon or silicon alloys in a furnace. This converts the carbon to silicon carbide leaving as little as 5 percent residual free silicon or refractory disilicide phase. This process is suitable for any type of small-diameter fiber (e.g., carbon, alumina, or silicon carbide) woven into a two- or three-dimensional architecture. This processing approach leads to dense composites where matrix microstructure and composition can be tailored for optimum properties. It has much lower processing cost (less than 50 percent) in comparison to other approaches to fabricating silicon-carbide-based composites. The photograph shows the various AFReCC components. Thermomechanical and thermochemical characterization of these composites under the hostile environments that will be encountered in engine applications is underway.
Author
Ceramic Matrix Composites; Fabrication; Fiber Composites; Research and Development; Civil Aviation

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INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

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

20050166375 Du Pont de Nemours (E. I.) and Co., Aiken, SC, USA
Hydrogen Generation During the Corrosion of Carbon Steel in Oxalic Acid
Wiersma, B. J.; Aug. 2004; 26 pp.; In English
Report No.(s): DE2004-833395; WSRC-TR-2004-00441; No Copyright; Avail: Department of Energy Information Bridge

This document summarizes a literature review that was performed to gain a more complete understanding of the hydrogen evolution reaction that occurs during the corrosion of carbon steel in oxalic acid. The theory of carbon steel corrosion in oxalic acid was presented as well as the supporting experimental work that was performed. Finally the application of the theory and test results to chemical cleaning at SRS are discussed.
NTIS
Carbon Steels; Corrosion; Hydrogen; Oxalic Acid

20050166385 CH2M/Hill, Inc., Richland, WA, USA
Empirical Rate Equation Model and Rate Calculations of Hydrogen Generation for Hanford Tank Waste
Hu, T. A.; 2004; 130 pp.; In English
Report No.(s): DE2004-833516; HNF-3851-REV-1; No Copyright; Avail: Department of Energy Information Bridge

Empirical rate equations are derived to estimate hydrogen generation based on chemical reactions, radiolysis of water and organic compounds, and corrosion processes. A comparison of the generation rates observed in the field with the rates calculated for twenty-eight tanks shows agreement within a factor of three. Revision 1 incorporates the available new data to update the equations. It also includes the contribution from total alpha to radiolysis.
NTIS
Hydrogen; Mathematical Models; Tanks (Containers); Waste Management

20050166413 Lawrence Livermore National Lab., Livermore, CA
Field Analysis of Propellant Stabilizers and their Daughter Products in any Propellant Formulation by Thin-Layer Chromatography Year End Report 2003
Whipple, R.; Dec. 09, 2003; 14 pp.; In English
Report No.(s): DE2004-15009754; UCRL-TR-201359; No Copyright; Avail: Department of Energy Information Bridge

Lawrence Livermore National Laboratory's Forensic Science Center (FSC) has successfully resolved a variety of concerns related to propellant stabilizer analysis by thin-layer chromatography. The technology is now ready to proceed to validation and the related issues associated with deployment, both CONUS and OCONUS. The goal of this project is to develop a completely self-contained field-portable system to quantitatively analyze propellants for their stabilizer content. Lawrence Livermore National Laboratory's Forensic Science Center (FSC) has taken an established technology, thin-layer chromatography (TLC), and developed new sampling protocols, unique hardware, and specialized chemistries for incorporation into a new field-portable TLC kit.
NTIS
Propellants; Thin Layer Chromatography; Field Tests; Explosives

20050167239 Massachusetts Inst. of Tech., Cambridge, MA USA
The Marine Geochemistry of Iron and Iron Isotopes
Bergquist, Bridget A.; Sep. 2004; 235 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431602; MIT/WHOI-2004-08; No Copyright; Avail: Defense Technical Information Center (DTIC)

This thesis addressed questions about the Fe cycle by measuring detailed profiles and transects of Fe species and also by exploring the use of a new tracer of Fe, Fe isotopic fractionation. Dissolved Fe concentrations (\h0.4 micrometer) reflect atmospheric deposition trends in surface waters, water mass source, age, and transport path. Most of the variation in dissolved Fe is due to variations in colloidal Fe (0.02 to 0.4 micrometer). Trace metal clean plankton tows, river samples, aerosol leachates, and porewater samples were measured for their Fe isotopic composition. A range of 4% (in 56Fe/54Fe) was observed in the isotopic composition of plankton tow samples. Plankton samples from the North Pacific had isotopically lighter Fe than samples from the Atlantic. The overall isotopic range observed in the Amazon River system was 1.5%, with

variability observed for different types of tributaries and isotopically light Fe observed in shelf porewaters. In river water-seawater mixing experiments, the Fe isotopic signal of dissolved Fe of river water was modified by flocculation of isotopically heavy Fe. The range in the Fe isotopic composition of the natural samples including biological and aqueous samples demonstrates that useful is associated with Fe biogeochemistry in the environment.
DTIC
Geochemistry; Iron; Iron Isotopes; Isotopes; Marine Biology; Marine Chemistry

20050167255 Virginia Commonwealth Univ., Richmond, VA USA
Investigation of Semiconductor Nitride Deposition & Characterization on Defect-Void GaN Templates & ZnO Substrates
Morkoc, Hadis; Mar. 2005; 14 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0038
Report No.(s): AD-A431651; TR-528657; No Copyright; Avail: CASI; A03, Hardcopy

A variety of approaches have been taken to enhance GaN quality during epitaxy and lead zirconate titanate (PZT) structures for sensors and data storage. GaN regrown on KOH etched templates with defective material removed has shown improved optical quality and demonstrated lateral growth by MBE. The same also carried out using MOCVD. GaN layers were also grown on closely lattice and stacking matched ZnO substrates. In this vein, we developed a high temperature thermal treatment for ZnO substrate. After 3 hours annealing in the air at 1050 deg C, all the surface damages were removed and straight, parallel terrace features were formed on the surface as judged by AFM images, which can facilitate smooth 2D growth and reduce column formation during the growth of GaN epilayers without the deleterious effects of a damaged substrate surface. Thin films of PZT were grown by sol-gel techniques on sapphire, Pt/Ti/SiO2/Si and Ir/ Ti/SiO2/Si. For electrical characterization, the top electrodes for Au/PZT/Pt and Au/PZT/Ir capacitors were fabricated by photolithography and liftoff process, The polarization hysteresis and fatigue characteristics were measured by using a ferroelectric tester.
DTIC
Characterization; Defects; Deposition; Gallium Nitrides; Lead Zirconate Titanates; Nitrides; Oxides; Semiconductors (Materials); Substrates; Templates; Voids

20050167271 Textile Research Inst., Princeton, NJ USA
Molecular Modeling of Nafion Permselective Membranes
Vishnyakov, Aleksey M.; Neimark, Alexander V.; Mar. 2005; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-1-0545
Report No.(s): AD-A431689; ARO2005F; ARO-41966.4-CH; No Copyright; Avail: Defense Technical Information Center (DTIC)

Specific goals: a) development of the versatile simulation tool to study morphology and transport in swollen polyelectrolyte membranes (PEM) of Nafion type at mesoscale (\g20nm); b) understanding of the mechanisms of sorption and transport of chemical agents in swollen PEM. We developed molecular models for Nafion and nerve agent simulant DMMP and explored microphase segregation and mechanisms of DMMP sorption and transport in hydrated membranes with K+ counterion. It was shown that in dry membranes DMMP partly dissolves in the polymer. However, in the excess of water, DMMP neither mixes with aqueous subphase nor dissolves within the polymer subphase; DMMP forms clusters at the interface. Via a series of molecular dynamics simulation, we parameterized a coarse-grained model of Nafion and performed a series of dissipative particle dynamics simulations of microphase segregation in hydrated membranes with different water content. With the increase of the water content we found a percolation-type transition at about 6 wt% from the system of isolated hydrophilic clusters to the three dimensional network of irregular channels forming a hydrophilic subphase. A random walk model was developed for DMMP diffusion in hydrated polymer including volume and surface mechanisms. Simulation results correlate with experimental studies at US Army RDECOM.
DTIC
Electrolytes; Membranes; Polymers

20050167301 California Univ., Los Angeles, CA USA
First Principles and Multi-Scale Modeling of the Roles of Impurities and Dopants on thermal Barrier Coating Failure
Carter, Emily A.; Dec. 2004; 13 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0060
Report No.(s): AD-A431778; AFRL-SR-AR-TR-05-0140; No Copyright; Avail: CASI; A03, Hardcopy

Prevention or at least delay of thermal barrier coating failure Is the main objective of this research, In order to increase the service lifetimes of aircraft engines. To this end, It is critical to first understand mechanisms of failure, and then use that insight to design materials countermeasures. This grant supported the following research efforts in those directions: * Developments of a new pseudo potential theory and a solid state transition path search algorithm. * Applications of first principles density functional theory to * metal-ceramic, silicon-ceramic, and ceramic-ceramic interfaces * dopants placed between alumina and late transition metals, with implications for catalysis * fatigue in silicon and alumina * temperature hysteresis in the monoclinic-to- tetragonal phase transformation pathway for zirconia * dopants and impurities on a NiAl alloy * understanding the stability of early-late transition metal intermetallics.
DTIC
Failure; Impurities; Thermal Control Coatings; Thermal Insulation

20050167320 Army War Coll., Carlisle Barracks, PA USA
Conversion to a Hydrogen Fuel Transportation Industry, Incremental Route or Direct Route
King, William A.; Mar. 2005; 31 pp.; In English
Report No.(s): AD-A431846; No Copyright; Avail: Defense Technical Information Center (DTIC)
This research project reviews current transportation industry policies of the USA and uses the ends-ways-means strategic model to examine the course of action government and industry need to take to reach policy objectives. It begins by reviewing the key objectives of the transportation industry in energy policy documents. It explores the economic (domestic and foreign) and geo-political implications of converting to a hydrogen fuel transportation industry and of failing to convert. Finally it identifies two approaches to implement the conversion the incremental conversion approach and the direct conversion approach. It investigates the level of effort required from government and industry for both approaches the environmental impact of both approaches and the economically feasible time line available.
DTIC
Economic Analysis; Hydrogen; Hydrogen Fuels; Industries; Routes; Transportation

20050167322 Army Construction Engineering Research Lab., Champaign, IL USA
DOD Residential Proton Exchange Membrane (PEM) Fuel Cell Demonstration Program. Volume 1. Summary of the Fiscal Year 2001 Program
White, Melissa K.; Holcomb, Franklin H.; Josefik, Nicholas M.; Lux, Scott M.; Binder, Michael J.; Feb. 2004; 62 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431855; ERDC/CERL-TR-04-3; No Copyright; Avail: Defense Technical Information Center (DTIC)
Beginning in Fiscal Year 2001 (FY01), Congress funded the DOD Residential PEM Demonstration Program to demonstrate domestically-produced, residential Proton Exchange Membrane (PEM) fuel cells at military facilities. The objective of the program was to assess PEM fuel cells in supporting sustainability in military installations, increasing efficiency in installation, operation, and maintenance of fuel cells at these sites, and assessing the role of PEM fuel cells in DOD training, readiness, and sustainability missions. Other objectives were to provide: a military base market for this technology, evaluation and feedback to promote commercialization and market growth, operational product testing and validation, grid interconnection standards, and system operation in diverse environmental conditions. For this program, researchers developed and advertised a Broad Agency Announcement (BAA), which outlined a core set of requirements for proposals. Twelve pre-proposals were received from the FY01 Program BAA solicitation. After review and evaluation of full proposals, six contracts were awarded, representing 22 fuel cells at 10 military installations. The awardees are required to report operational performance of each of the fuel cell power plants in the DOD program, including total operating hours, total electricity production, total fuel usage, total waste heat recovery, availability, electrical efficiency, and thermal efficiency.
DTIC
Fuel Cells; Ion Exchanging; Membranes; Protons

20050167345 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA
Sampling Efficiency Measurement Methods for Aerosol Samplers
Kesavan, Jana S.; Bottiger, Jerold R.; Doherty, Robert W.; Jan. 2005; 21 pp.; In English
Report No.(s): AD-A431925; ECBC-TN-022; No Copyright; Avail: CASI; A03, Hardcopy
Aerosol samplers and concentrators are characterized at the U.S. Army Edgewood Chemical Biological Center. The characterization methods are summarized and include (1) monodisperse fluorescent/nonfluorescent Polystyrene Latex (PSL) microspheres with fluorometric analysis or Coulter Multisizer Analysis; (2) polydisperse solid aluminum oxide particles with

Aerodynamic Particle Sizer (APS) analysis or Coulter Multisizer Analysis; (3) liquid fluorescent oleic acid particles with fluorometric analysis; and (4) bioparticles with Coulter Multisizer, culturing, enzyme linked immunosorbent assays (ELISA), polymerase chain reaction (PCR), and APS analyses. Samples are sent out for ELISA and PCR analysis. Aerosols are generated using several methods. The PSL microsphere aerosols are generated using a Collison nebulizer, sonic nozzle, Ink Jet Aerosol Generator (IJAG), and puffers. Aluminum oxide particle aerosols are generated using a sonic nozzle. Fluorescent oleic acid particle aerosols are generated using a Vibrating Orifice Aerosol Generator (VOAG). Bioparticle aerosols are generated using puffers (metered dose inhaler devices), nebulizers, IJAG, and sonic nozzle.
DTIC
Aerosols; Measurement; Samplers; Sampling

20050167346 Air Force Research Lab., Hanscom AFB, MA USA
Ion-Molecule Kinetics at 15-700 Torr
Viggiano, A. A.; Fernandez, Abel I.; Troe, J.; Jan. 2005; 8 pp.; In English
Contract(s)/Grant(s): Proj-2303
Report No.(s): AD-A431926; AFRL-VS-HA-TR-2005-1038; No Copyright; Avail: CASI; A02, Hardcopy

Studies of ion-molecule chemistry are usually made at pressures of a few Torr and below. By contrast, there are numerous plasmas that occur at higher pressures. For that reason, we have constructed a turbulent ion flow tube (TIFT) for studying ion-molecule kinetics from 15 to 700 Torr. Currently, the TIFT operates from room temperature to 700 K. Here we present a summary of the measurements we have made to date. The first measurements involved SF6-reactions with SO2, H2O, CH3OH and C2H5OH at room temperature. The SO2 reaction showed the same kinetics as low pressure measurements indicating that the reaction occurs rapidly. The other reactions were all found to be cluster-mediated with branching fractions that depend on pressure. More recently, charge transfer reactions of O2+ to alkylbenzenes have been studied at elevated temperatures, from 400 to 700 K. Both dissociative and non-dissociative charge transfer occurs, with the latter being favored at high pressures, indicating that excited states live long enough to be stabilized by the buffer gas. Combining the TIFT measurements with detailed statistical adiabatic channel model/classical trajectory (SACM/CT) calculations of the unimolecular decay constant allows energy transfer parameters to be derived. Extending the temperature range upwards to 750 K has allowed thermal decomposition rate constants to be measured. The thermal decomposition has been successfully modeled using the same parameters as for the collision quenching modeling. This allows bond strengths for the dissociation to be derived with high accuracy. Both the measurements and models show that the conditions correspond to the high pressure kinetics regime.
DTIC
Ions; Kinetics; Molecules; Pressure Measurement; Temperature Measuring Instruments; Turbulent Flow

20050167368 Army Research Lab., Aberdeen Proving Ground, MD USA
Experimental and Computational Studies of Oxidizer and Fuel Side Addition of Ethanol to Opposed Flow Air/Ethylene Flames
McNesby, Kevin L.; Miziolek, Andrzej W.; Nguyen, Thuvan; Delucia, Frank C.; Skaggs, R. R.; Litzinger, Thomas; Feb. 2005; 50 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431967; ARL-TR-3433; No Copyright; Avail: Defense Technical Information Center (DTIC)

Results of computations based upon a detailed chemical kinetic combustion mechanism and results of experiments are compared to understand the influence of ethanol vapor addition upon soot formation and OH radical concentration in opposed flow ethylene/air diffusion flames. For this work, ethanol vapor was added to either the fuel or the oxidizer gases. Experiment and calculations are in qualitative agreement, and both show differing concentrations of soot, soot precursors, and OH depending on whether the ethanol is added to the fuel or oxidizer gases. An explanation for the observed differences for oxidizer or fuel side ethanol addition to opposed flow ethylene/air diffusion flames is proposed, based upon an analysis of the chemical kinetic mechanism used in the computations.
DTIC
Additives; Contaminants; Ethyl Alcohol; Ethylene; Flames; Oxidizers; Soot

20050167377 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA
Development and Testing of a Colorimetric 96 Well Plate Assay for the Determination of HD Hydrolysis Rate in Various Formulations
Harvey, Steven P.; DeFrank, Joseph J.; Jan. 2005; 18 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431980; ECBC-TR-419; No Copyright; Avail: Defense Technical Information Center (DTIC)

Previous aqueous studies using HD pre-dissolved in isopropanol have shown that the effectiveness of HD enzymatic degradation is a function of the homogeneity of the HD-water system. In this study, a microtiter plate assay was developed for the purpose of screening a series of compounds with the potential to increase the solubility or dispersion of HD in an aqueous matrix. The assay used meta-cresol purple dye as a pH indicator in a series of buffer concentrations to monitor the acid produced from HD hydrolysis. The extent of hydrolysis could be observed colorimetrically in a time-controlled series of reactions that allowed simultaneous comparison of numerous compounds or conditions on a single microtiter plate. Sixty-seven different detergents, surfactants, or different concentrations thereof were screened to determine their effect on HD hydrolysis rate. All were observed to inhibit HD hydrolysis. The simplest explanation of the results observed was probably that the micelles effectively sequestered the HD molecules from water in a hydrophobic environment.
DTIC
Assaying; Colorimetry; Decontamination; Hydrolysis; Sulfur

20050167432 Army Construction Engineering Research Lab., Champaign, IL USA
Interface Modeling for Electro-Osmosis in Subgrade Structures
Morefield, Sean W.; McInerney, Michael K.; Hock, Vincent F.; Marshall, Orange S., Jr.; Malone, Phillip G.; Weiss, Charles A., Jr; Dec. 2004; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A432094; No Copyright; Avail: Defense Technical Information Center (DTIC)

Conventional waterproofing techniques for below grade structures are ineffective, expensive and short lived. Electro-Osmotic Pulse technology is an alternative technique to controlling moisture movement in porous medium. A research study was undertaken to model the complex osmotic behavior of a system consisting of portland cement with aggregate and different clays (kaolinite. montmorillonite, limestone and quartz sands) created to simulate below grade structures. A direct current 30- to 45-Volt source was applied across the 8-inch cell of concrete and backfill. The electrolytes used were sodium chloride and calcium chloride. The results showed the electromigration of a low pH front interacted with the high pH present in the concrete matrix to form complex calcium precipitates (CaCO3) that fill the pore space and microcracks along the path of osmotic flow. As the experiment continued, the osmotic flow reduced as the pore voids continued to fill with water insoluble precipitate.
DTIC
Osmosis; Waterproofing

20050167446 Vicus Technologies, LLC, Kennebunk, ME USA
Development of Zinc Sulfide Seeker Window Material
Jan. 2005; 31 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W9113M-04-P-0072
Report No.(s): AD-A432111; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report presents the thermophysical property data measured on Zinc Sulfide seeker window material. The overall objective of this research and development effort is to establish an alternate seeker window material as contrasting to the currently used THAAD sapphire window and validate the predictions for an alternate seeker window material, multispectral zinc sulfide, by conducting thermal and structural testing of ZnS coupons. Vicus Technologies LLC has teamed with Lockheed Martin Space Company to evaluate and validate the capability of multispectral zinc sulfide seeker window material. The use of zinc sulfide as a replacement window for the current sapphire offers significant increase in waveband and reduced costs for the final interceptor window (70%-80%. reduction as compared to sapphire). Zinc sulfide is currently available from a number of manufacturers and the selected material for this evaluation was Cleartran , a product of Rohm & Haas. Cleartran is a multispectral version of zinc sulfide where Hot-Isostatic Pressing is used to post-process the material which increases its waveband by removing porosity from the material.
DTIC
Homing Devices; Optical Materials; Thermophysical Properties; Windows (Apertures); Zinc Sulfides

20050167471 Reaction Engineering International, Salt Lake City, UT USA
Advanced Computer Simulations Of Military Incinerators
Denison, Martin; Montgomery, Chris; Sarofim, Adel; Sadler, Brooke; Bockelie, Mike; Gouldin, Fred; Bozzelli, Joe; Magee, Dick; Dec. 2004; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-C-0050
Report No.(s): AD-A432187; No Copyright; Avail: Defense Technical Information Center (DTIC)
Briefing charts only.
DTIC
Computerized Simulation; Incinerators

20050168152 Rutherford Appleton Lab., Chilton
Electronic Properties of Materials Observed in X-ray Diffraction
Lovesey, S. W.; Balcar, E.; Knight, K. S.; Fernandez-Rodriguez, J.; Jan. 20, 2005; 78 pp.; In English
Report No.(s): PB2005-103034; RAL-TR-2004-039; Copyright; Avail: National Technical Information Service (NTIS)
The few electrons in valence states of a material participate in many of its physical properties. including both structural and transport properties. In the diffraction of x-rays, or neutrons. valence electrons can lead to weak Bragg reflections that are extremely sensitive signatures of their charge and magnetic degrees of freedom. In this regard. diffraction instruments supplied with x-rays from a synchrotron source are particularly useful because the brightness, tuneability and polarization of the x-rays are all helpful in making valuable observations. The data obtained from Bragg diffraction can be analyzed on the basis of an atomic model. which has the virtue that it can be used as a common platform for the analysis of x-ray and neutron diffraction and. in addition, the analysis of observations made with x-ray absorption, NMR, EPR, muon and Mossbauer spectroscopies. We present the salient features for the calculation of structure factors based cn an atomic model and applied to the analysis of Bragg diffraction by non-magnetic and magnetic materials, with an emphasis on resonant x-ray Bragg diffraction. In addition we discuss the complementary observation of dichroic signals.
NTIS
Electrons; Neutron Diffraction; Nuclear Magnetic Resonance; Electrical Properties

20050169162 NASA Lewis Research Center, Cleveland, OH, USA
Chemical Vapor-Deposited (CVD) Diamond Films for Electronic Applications
[1995]; 1 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy
Diamond films have a variety of useful applications as electron emitters in devices such as magnetrons, electron multipliers, displays, and sensors. Secondary electron emission is the effect in which electrons are emitted from the near surface of a material because of energetic incident electrons. The total secondary yield coefficient, which is the ratio of the number of secondary electrons to the number of incident electrons, generally ranges from 2 to 4 for most materials used in such applications. It was discovered recently at the NASA Lewis Research Center that chemical vapor-deposited (CVD) diamond films have very high secondary electron yields, particularly when they are coated with thin layers of CsI. For CsI-coated diamond films, the total secondary yield coefficient can exceed 60. In addition, diamond films exhibit field emission at fields orders of magnitude lower than for existing state-of-the-art emitters. Present state-of-the-art microfabricated field emitters generally require applied fields above 5x10^7 V/cm. Research on field emission from CVD diamond and high-pressure, high-temperature diamond has shown that field emission can be obtained at fields as low as 2x10^4 V/cm. It has also been shown that thin layers of metals, such as gold, and of alkali halides, such as CsI, can significantly increase field emission and stability. Emitters with nanometer-scale lithography will be able to obtain high-current densities with voltages on the order of only 10 to 15 V.
Author
Diamond Films; Electronic Equipment; Vapor Deposition

20050169164 NASA Lewis Research Center, Cleveland, OH, USA
Combustion Module 1: Spacelab Racks Integrated at the Lewis Research Center for the First Time
[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy
The Combustion Module-1 (CM-1), NASA's largest (over 1800 lb) and one of the most sophisticated combustion experiments ever to fly on the Spacelab, will be carried on the first Microgravity Science Laboratory (MSL-1) mission aboard the space shuttle flight STS-84 in April 1997. The CM-1 project is a stepping stone to the space station era, because the hardware can support multiple investigators on the same mission and can be integrated at user locations and shipped to the launch site. CM-1 is being developed to accommodate microgravity combustion experiments that are designed to help explain and predict the behavior of combustion processes. Although the two principal investigators for CM-1 are both studying combustion processes, their investigations are quite different. Professor Paul D. Ronney of the University of Southern California will examine the Structures of Flame Balls at Low Lewis Numbers (SOFBALL), in which a variety of fuel-lean

gaseous mixtures fill the combustion chamber and are ignited. Professor Gerard M. Faeth of the University of Michigan will investigate Laminar Soot Processes (LSP) by studying the key properties of burning gas jets of fuel, employing different fuels and nozzle sizes.
Author
Spaceborne Experiments; Combustion Physics; Spacecraft Modules

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METALS AND METALLIC MATERIALS

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

20050166368 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Physicial Properties of Iron-Nitride Films Expitaxially Grown on Silicon (001) by Sputtering and Assessment of Giant Magnetic Moment in the Alpha-Iron-Nitride Phase
Brewer, M. A.; Dec. 1997; 222 pp.; In English
Report No.(s): DE2004-833812; LBNL-41456; No Copyright; Avail: Department of Energy Information Bridge

Intense scientific and technological interest in iron nitrides has persisted since saturation magnetizations much larger than that of (alpha)-Fe (1708 emu/cm(sup 3)) were reported for the metastable (alpha)(double underline prime)-Fe(sub 16)N(sub 2) phase (2300 emu/cm(sup 3)) using technologically-relevant deposition processes and substrates have resulted in only a modest enhancement in moment, and are complicated by competition from more stable FeN phases. Furthermore, conventional band theory calculations for (alpha)(double underline prime) (1780 emu/cm(sup 3)) do not predict a 'giant' magnetic moment. The authors have grown several phases of FeN on Si(001) by lattice matching on Ag underlayers. Optimization of reactive N(sub 2) sputtering parameters has led to the growth of (alpha)-Fe, (gamma)(prime)-Fe(sub 4)N and (alpha)(prime)-Fe(sub 8)N films. Annealing of N-disordered (alpha)(prime)-Fe(sub 8)N films resulted in partial transformation to N-ordered (alpha)(double underline prime)-Fe(sub 16)N(sub 2). Quantification of X-ray diffraction peak intensities determined that the (alpha)(prime)/(alpha)(double underline prime) mixtures contained 48 vol% (alpha)(double underline prime) (remaining (alpha)(prime)). Selected-area diffraction (SAD) in the TEM determined that the orientation relationships of the (alpha), (alpha)(prime), and (alpha)(double underline prime) phases were FeN(001) double vertical bars Ag(001) double vertical bars Si(001) and FeN(100) double vertical bars Ag(110) double vertical bars Si(100), while the in-plane orientation of (gamma)(prime)(001) was FeN(110) double vertical bars Ag(110) double vertical bars Si(100). Electron energy-loss spectroscopy (EELS) determined that the FeN films were stoichiometrically correct and there was no significant change in N content with annealing.
NTIS
Iron Compounds; Magnetic Moments

20050166370 Los Alamos National Lab., NM
Infrared Images of Shock-Heated Tin
McCluskey, C. W.; White, M. D.; Turley, W. D.; Stevens, G. D.; Veeser, L. R.; 2004; 16 pp.; In English
Report No.(s): DE2004-834160; LA-UR-04-4434; No Copyright; Avail: Department of Energy Information Bridge

High-resolution, gated infrared images were taken of tin samples shock heated to just below the 505 K melting point. Sample surfaces were either polished or diamond-turned, with grain sizes ranging from about 0. 05 to 10 mm. A high explosive in contact with a 2-mm-thick tin sample induced a peak sample stress of 18 GPa. Interferometer data from similarly-driven tin shots indicate that immediately after shock breakout the samples spall near the free (imaged) surface with a scab thickness of about 0.1 mm.
NTIS
Tin; Shock Heating

20050166416 Lawrence Livermore National Lab., Livermore, CA
Deformation of Single Crystal Molybdenum at High Pressure
Bonner, B. P.; Aracne, C.; Farber, D. L.; Boro, C. O.; Lassila, D.; Feb. 19, 2004; 16 pp.; In English
Report No.(s): DE2004-15009799; UCRL-TR-202579; No Copyright; Avail: Department of Energy Information Bridge

Single crystal samples of micron dimensions oriented in the direction were shortened 10 to 40% in uniaxial compression with superposed hydrostatic pressure to begin investigation of how the onset of yielding evolves with pressure. A testing machine based on opposed anvil geometry with precision pneumatic control of the applied force and capability to measure

sub micron displacements was developed to produce shape changing deformation at pressure. The experiments extend observations of pressure dependent deformation to (approx.)5Gpa at shortening rates of (approx.)2*10(sup -4). Samples have been recovered for post run characterization and analysis to determine if deformation mechanisms are altered by pressure. Experiments under hydrostatic pressure provide insight into the nature of materials under extreme conditions, and also provide a means for altering deformation behavior in a controlled fashion.
NTIS
Deformation; Single Crystals; Molybdenum; High Pressure

20050167420 Old Dominion Univ., Norfolk, VA USA
Sensitivity Analysis for Dynamic Failure and Damage in Metallic Structures
Noor, Ahmed K.; Mar. 2005; 58 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-01-1-0371
Report No.(s): AD-A432077; ODU-PROJ-212151; No Copyright; Avail: Defense Technical Information Center (DTIC)
The objective of the study conducted under this grant is to develop effective computational strategies for: a) assessing the sensitivity of the dynamic failure and damage of metallic structures to variations in both the microstructure and macrostructure material parameters; and, b) incorporating the uncertainties in material parameters in the prediction of response and damage of these structures. The sensitivity coefficients, which are the derivatives of the various structural response quantities with respect to the material parameters, are evaluated by using the direct differentiation method.
DTIC
Damage; Damage Assessment; Failure; Metals; Sensitivity; Sensitivity Analysis; Welding

20050167427 Rockwell Scientific Co., LLC, Thousand Oaks, CA USA
Corrective Measures to Restore Corrosion Resistance Following Friction Stir Welding
Jan. 2004; 21 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-02-C-0212
Report No.(s): AD-A432085; No Copyright; Avail: Defense Technical Information Center (DTIC)
Friction stir welding (FSW) is a solid state joining process invented at TWI in 1991. This technology makes it possible to join aluminum alloys, which are difficult or impossible to weld by conventional techniques.(1-7) A schematic illustration of the FSW process is shown in Figure 1. To friction stir weld either a butt or lap joint, a specially designed cylindrical tool is rotated and plunged into the joint line. The tool has a small diameter entry probe with a concentric larger diameter shoulder. When descended to the part, the rotating entry probe contacts the surface and rapidly friction heats and softens a small column of metal. As the probe penetrates beneath the surface, part of this metal column is extruded above the surface. The tool shoulder and length of probe control the depth of penetration. The present program (N00014-02-C-0212) has investigated five different approaches to corrective measures that either produce less sensitization or restore the corrosion resistance: 1) Active cooling during FSW, where cold water is circulated through the anvil and a mist of water is sprayed on the tool. This is a process change, which lowers the maximum temperature and decreases the time at elevated temperature. 2) Laser surface melting where surface melting and rapid quenching alters the microstructure, 3) low plasticity burnishing, where a tool puts compressive stresses in a surface layer, 4) pre & post weld heat treatments which homogenizes the grain boundary chemistry, and 5) change in tool design which alters the temperature/time profile and microstructure during FSW. Only tool design and heat treatment had an effect on the corrosion properties. (11-13)
DTIC
Aluminum Alloys; Corrosion Resistance; Friction Stir Welding; Friction Welding

20050167474 Universal Energy Systems, Inc., Dayton, OH USA
Microstructure and Properties of Cast Ingots of Al-Zn-Mg-Cu Alloys Modified with Sc and Zr
Senkov, O. N.; Bhat, R. B.; Senkova, S. V.; Schloz, D.; Oct. 2004; 25 pp.; In English
Contract(s)/Grant(s): F04611-02-C-0014; Proj-3005
Report No.(s): AD-A432191; No Copyright; Avail: Defense Technical Information Center (DTIC)
The effect of combined additions of Sc and Zr on the microstructure and tensile properties of the direct chill (DC) cast ingots of developmental Al-Zn-Mg-Cu alloys has been evaluated in this work. The properties in both the longitudinal and transverse directions of the cast ingots were determined in as-cast and cast plus heat-treated conditions, at room and cryogenic temperatures. Extensive microstructural evaluation was carried out using optical and electron microscopy, including orientation image microscopy by the electron backscatter diffraction technique. The Sc-containing developmental cast alloys

showed the tensile properties, which are much better than the properties of any commercial cast Al alloys and are similar or even superior to the properties of 7075-T6 alloy forgings. The microstructural evolution, the strengthening mechanisms, optimum content of the dispersoid-forming elements, and the processing-structure-property correlations are discussed.
DTIC
Aluminum Alloys; Cast Alloys; Ingots; Magnesium Alloys; Microstructure; Zinc Alloys

20050168081 NASA Glenn Research Center, Cleveland, OH, USA
Blanch Resistant and Thermal Barrier NiAl Coating Systems for Advanced Copper Alloys
Raj, Sai V., Inventor; January 04, 2005; 11 pp.; In English
Patent Info.: Filed 20 May 2003; US-Patent-6,838,191; US-Patent-Appl-SN-441028; NASA-Case-LEW-17357-1; No Copyright; Avail: CASI; A03, Hardcopy

A method of forming an environmental resistant thermal barrier coating on a copper alloy is disclosed. The steps include cleansing a surface of a copper alloy, depositing a bond coat on the cleansed surface of the copper alloy, depositing a NiAl top coat on the bond coat and consolidating the bond coat and the NiAl top coat to form the thermal barrier coating. The bond coat may be a nickel layer or a layer composed of at least one of copper and chromium-copper alloy and either the bond coat or the NiAl top coat or both may be deposited using a low pressure or vacuum plasma spray.
Official Gazette of the U.S. Patent and Trademark Office
Copper Alloys; Thermal Control Coatings; Nickel; Aluminum

20050168143 Naval Surface Warfare Center, Bethesda, MD, USA, Brookhaven National Lab., Upton, NY
In Situ X-Ray Absorption Spectro-Electrochemical Study of Amorphous Tin-Based Composite Oxide Material
Mansour, A. N.; Mukerjee, S.; Yang, X. Q.; McBreen, J.; 1999; 16 pp.; In English
Report No.(s): DE2004-770794; BNL-66206; No Copyright; Avail: Department of Energy Information Bridge

No abstract available
Composite Materials; X Ray Absorption; In Situ Measurement; Electrochemistry; Tin Oxides

20050168182 Sandia National Labs., Albuquerque, NM, USA
Surface treatment and alloying with high-power ion beams to improve properties in Al-, Fe-, and Ti-based metals
Renk, T. J.; Buchheit, R. G.; Sorenson, N. R.; Senft, D. Cowell; Thompson, M. O.; Grabowski, K. S.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 192-197; In English; See also 20050168165
Contract(s)/Grant(s): DE-AC04-94AL-85000; Copyright; Avail: Other Sources

Intense pulsed high-power ion beams have been demonstrated to produce enhanced surface properties by changes in microstructure caused by rapid heating and cooling of the surface. Additional improvements can be effected by the mixing of a previously deposited thin-film layer (surface alloying or ion beam mixing) into any number of substrate materials. We have conducted surface treatment and alloying experiments with Al, Fe, and Ti-based metals on the RHEPP-1 accelerator (0.8 MV, 20 Ohm 80 ns FHWM, up to I Hz repetition rate) at Sandia National Laboratories. Ions are generated by the MAP gas-breakdown active anode, which can yield a number of different beam species including H, N, and Xe, depending upon the injected gas. Enhanced hardness and wear resistance have been produced by treatment of 440C stainless steel, and by the mixing of Pt into Ti-6AL-4V alloy. Mixing of a thin-film Hf layer into Al 6061-T6 alloy (Al- 1.0Mg-0.6Si) has improved its corrosion resistance by as much as four orders of magnitude in electrochemical testing, compared with untreated and uncoated AI6061. Experiments are ongoing to further understand the microstructural basis for these surface improvements.
Author
Surface Treatment; Alloying; Ion Beams; High Current; Aluminum; Iron; Titanium

20050169179 NASA Lewis Research Center, Cleveland, OH, USA
Creep Testing of High-Temperature Cu-8 Cr-4 Nb Alloy Completed
[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

A Cu-8 at.% Cr-4 at.% Nb (Cu-8 Cr-4 Nb) alloy is under development for high-temperature, high heatflux applications, such as actively cooled, hypersonic vehicle heat exchangers and rocket engine combustion chambers. Cu-8 Cr-4 Nb offers a superior combination of strength and conductivity. It has also shown exceptional low-cycle fatigue properties. Following preliminary testing to determine the best processing route, a more detailed testing program was initiated to determine the creep lives and creep rates of Cu-8 Cr-4 Nb alloy specimens produced by extrusion. Testing was conducted at the NASA Lewis Research Center with constant-load vacuum creep units. Considering expected operating temperatures and mission lives, we

developed a test matrix to accurately determine the creep properties of Cu-8 Cr-4 Nb between 500 and 800 C. Six bars of Cu-8 Cr-4 Nb were extruded. From these bars, 54 creep samples were machined and tested. The figure on the left shows the steady-state, or second-stage, creep rates for the samples. Comparison data for NARloy-Z (Cu-3 wt % Ag-0.5 wt % Zr), the alloy currently used in combustion chamber liners, were not unavailable. Therefore the steady-state creep rates for Cu at similar temperatures are presented. As expected, in comparison to pure Cu, the creep rates for Cu-8 Cr-4 Nb are much lower. The lives of the samples are presented in the figure on the right. As shown, Cu-8 Cr-4 Nb at 800 C is comparable to NARloy-Z at 648 C. At equivalent temperatures, Cu-8 Cr-4 Nb enjoys a 20 to 50 percent advantage in stress for a given life and 1 to 3 orders of magnitude greater life at a given stress. The improved properties allow for design tradeoffs and improvements in new and existing heat exchangers such as the next generation of combustion chamber liners. Average creep rates for Cu-8 Cr-4 Nb and pure Cu are shown. Average creep lives for Cu-8 Cr- 4 Nb and NARloy-Z are also shown. Currently, two companies are interested in the commercial usage of the Cu-8 Cr-4 Nb alloy. The Rocketdyne Division of Rockwell International is conducting independent testing to analyze the properties for their projected needs in advanced rocket engine applications. Metallamics, a company based in Traverse City, Michigan, is entering into a Space Act Agreement to evaluate and test Cu-Cr-Nb alloys as materials for welding electrodes that are used in robotic welding operations. Creep rate is one of the alloy properties that determines the degree to which a welding electrode will mushroom or expand at the tip. A material with a low creep rate will resist mushrooming and give the electrode a longer life, minimizing downtime. This application holds the potential for large-scale usage of the alloy in the automotive and other industries. Success here would dramatically decrease the cost of the alloy and increase availability for aerospace applications.
Author (revised)
Creep Tests; Copper Alloys; Chromium Alloys; Niobium Alloys; Heat Resistant Alloys

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NONMETALLIC MATERIALS

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

20050166378 Du Pont de Nemours (E. I.) and Co., Aiken, SC, USA
Analytical Results of DWPF Glass Sample Taken During Filling of Canister S01913
Cozzi, A. D.; Bibler, N. E.; Aug. 2004; 28 pp.; In English
Report No.(s): DE2004-833412; WSRC-TR-2004-00316; No Copyright; Avail: Department of Energy Information Bridge

The Defense Waste Processing Facility (DWPF) began processing Sludge Batch 2 (SB2) in December 2001 as part of Sludge Receipt and Adjustment Tank (SRAT) Batch 208. Sludge Batch 2 consists of the contents of Tank 40 and Tank 8 in approximately equal proportions. The sludge slurry is received into the DWPF Chemical Processing Cell and is processed through the SRAT and Slurry Mix Evaporator Tank. The treated sludge slurry is then transferred to the Melter Feed Tank and fed to the melter. During the processing of each sludge batch, the DWPF is required to take at least one glass sample. This glass sample is taken to meet the objectives of the Glass Product Control Program1 and to complete the necessary Production Records so that the final glass product may be disposed of at a Federal Repository.The DWPF requested analysis of a radioactive glass sample obtained from the melter pour stream during the processing of Macrobatch 3 (MB3) (Sludge Batch 2)2 with Frit 320. A glass sample was obtained while pouring Canister S01913 and was sent to the Savannah River National Laboratory Shielded Cells for characterization. Canister S01913 was the 267th canister poured during vitrification of Sludge Batch 2 (364 canisters of glass were prepared from SB2). The glass sample arrived from DWPF in primary container PC0034. The primary container contained pieces of glass. The glass had been extracted from the sample holder in the DWPF. This report contains the visual observations of the as-received glass sample, results for the density, the chemical composition, the Product Consistency Test and the calculated and measured radionuclide results needed for the Production Record for Canister SO1913.
NTIS
Glass; Radioactive Wastes; Sludge

20050166958 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Measurements of the Coefficient of Restitution of Quartz Sand on Basalt: Implications for Abrasion Rates on Earth and Mars
Banks, M.; Bridges, N. T.; Benzit, M.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Knowledge of the rates at which rocks abrade from the impact of saltating sand provides important input into estimating the age and degree of modification of arid surfaces on Earth and Mars. Previous work has relied on measuring mass loss rates in the field and the laboratory. The susceptibility of rocks and other natural materials has been quantified on a relative scale from laboratory studies.
Derived from text
Quartz; Basalt; Growth; Dimensional Measurement; Sands

20050167217 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Tensile Stress Rupture Behavior of a Woven Ceramic Matrix Composite in Humid Environments at Intermediate Temperature
LaRochelle, Kevin J.; Mar. 2005; 208 pp.; In English
Report No.(s): AD-A431532; AFIT/DS/ENY/05-01; No Copyright; Avail: Defense Technical Information Center (DTIC)

Stress rupture tests on the Sylramic(TM) fiber with an in-situ layer of boron nitride, boron nitride interphase, and SiC matrix ceramic matrix composite were performed at 550 degrees C and 750 degrees C with 0.0, 0.2, or 0.6 atm partial pressure of water vapor, pH(sub 2)O. The 550 degrees C, 100-hr strengths were 75%, 65% and 51% of the monotonic room temperature tensile strength, respectively. At 750 degrees C, the strengths were 67%, 51%, and 49%, respectively. Field Emission Scanning Electron Microscopy analysis estimated the total embrittlement times for 550 degrees C with 0.0, 0.2, and 0.6 atm pH(sub 2) O were \g63 hrs, \g38 hrs, and between 8 and 71 hrs, respectively. Corresponding estimated embrittlement times for the 750 degrees C were \g83 hrs, between 13 and 71 hrs, and between 1 and 6 hrs. A time-dependent, phenomenological, Monte Carlo-type failure model was developed and simulated total embrittlement times that were within the experimentally determined range for all cases. Variation in the room temperature ultimate strength, the elevated temperature ultimate strength, and the fiber reference strength affected the model the most. Variation in the modulus of elasticity of the matrix and fiber affected it the least. Stress rupture strength degradation increases with temperature, moisture content level, and exposure time.
DTIC
Ceramic Matrix Composites; Humidity; Room Temperature; Silicon Carbides; Tensile Stress; Woven Composites

20050167242 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Fatigue Evaluation of Multiple Fiber-Reinforced Polymer Bridge Deck Systems Over Existing Girders Phase II Report
Dutta, Piyush K.; Lopez-Anido, Roberto; Kwon, Soon-Chul; Durell, Glenn D.; Nov. 2003; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431608; No Copyright; Avail: Defense Technical Information Center (DTIC)

Decks manufactured with fiber-reinforced polymer (FRP) composite materials are used in highway bridges. A performance evaluation of FRP composite decks subjected to simulated traffic loads that induce repetitive stress cycles under extremely high and low temperature is presented. Fatigue testing of three FRP composite bridge deck prototypes and one FRP-concrete hybrid bridge deck prototype under two extreme temperature conditions: -30 C (-22 F), and 50 C (122 F) was conducted. The fatigue response of the deck prototypes was correlated with the baseline performance of a conventional reinforced concrete deck subjected to similar test conditions. Design loads were applied simultaneously at two points using servo-controlled hydraulic actuators specially designed and fabricated to perform under extreme temperatures. Quasi-static load-deflection and load-strain characteristics were determined at predetermined fatigue cycle levels. No significant distress was observed in any of the composite deck prototypes during ten million load cycles. The effects of extreme temperatures and accumulated load cycles on the load-deflection and load-strain response of FRP composite and FRP-concrete hybrid bridge decks are discussed based on the experimental results.
DTIC
Fiber Composites; Girders

20050167300 California Univ., Berkeley, CA USA
Supramolecular Engineering of New Lithium Ion Conducting Polymer Electrolytes
Arnold, John; Jan. 2001; 10 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0498
Report No.(s): AD-A431777; AFRL-SR-AR-TR-05-0139; No Copyright; Avail: CASI; A02, Hardcopy

This project involves a novel approach to the synthesis of new classes of materials designed to function as ion conducting systems. In particular, our aim is to synthesize materials for use as polymer electrolytes in solid-state lithium batteries. The current phase of this proposed work is designed to identify promising candidates and to study the mechanism by which ions

are transported through these new solids. The ultimate goal is to produce a working lithium battery incorporating the new electrolytes.
DTIC
Conducting Polymers; Electrolytes; Electrolytic Cells; Fuel Cells; Lithium; Lithium Batteries; Metal Ions; Solid State

20050167414 Texas Univ., Austin, TX USA
Polymer Nanocomposites by Melt Processing
Paul, D. R.; Dec. 2004; 21 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0111
Report No.(s): AD-A432066; AFRL-SR-AR-TR-05-0141; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this project was to establish the basic principles of formation of polymer-organoclay nanocomposites by melt processing techniques and their performance. The key issue is to exfoliate, or disperse, the clay platelets in the polymer so that the highest possible aspect ratio is achieved. It was shown that this depends critically on the extruder type, screw configuration, the structure of the surfactant on the organoclay, and the melt viscosity of the polymer matrix. Very high levels of exfoliation were demonstrated for polyamide systems as determined by quantitative transmission electron microscopy techniques developed as part of this project. The interaction of the organoclay with the polymer is perhaps the most important issue in achieving exfoliation; a - qualitative understanding of this interaction was developed which provides some guidance in-polymer and organoclay selection. A great deal of effort was devoted to characterizing the morphology or structure of the nanocomposites generated as well as documenting properties like modulus, strength, heat distortion temperature, thermal expansion coefficient, and to a limited extent barrier and flammability. Conventional composite theories seem to give a good description of the reinforcement achieved and can be a useful tool in predicting stiffness and thermal expansion behavior.
DTIC
Nanocomposites; Nanostructures (Devices); Polymers

20050167431 Army Tank-Automotive Research and Development Command, Warren, MI USA
Biodegradable Grease Technology for Future Army Combat Systems
Rhee, In-Sik; Dec. 2004; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A432093; No Copyright; Avail: Defense Technical Information Center (DTIC)

Environmental safety and compliance has recently become the most significant worldwide issue. Over the past decades, many Army installations throughout the USA have been contaminated with petroleum hydrocarbon-based fuels and lubricants. The generation of the potentially hazardous wastes by Petroleum, Oil, and Lubricant (POL) products not only cause both short and long term liability with respect to environmental damage, but can result in deteriorated mission performance and high cleanup costs. For this reason, the Army is currently soliciting a technology that can be used to minimize waste stream of POL products utilized in the current and Future Combat Systems. This paper presents the results of development of Army's biodegradable greases. laboratory biodegradation tests. and field demonstrations including bioremediation tests.
DTIC
Biodegradability; Biodegradation; Combat; Fuels; Greases; Lubricants

20050167877 NASA Langley Research Center, Hampton, VA, USA
Space Environmentally Durable Polyimides and Copolyimides
Connell, John W., Inventor; Smith, Joseph G., Jr., Inventor; Hergenrother, Paul M., Inventor; Watson, Kent A., Inventor; Thompson, Craig M., Inventor; January 11, 2005; 56 pp.; In English
Patent Info.: Filed 8 Mar. 2002; US-Patent-6,841,652; US-Patent-Appl-SN-0045670; US-Patent-Appl-SN-292262; NASA-Case-LAR-16176-1; No Copyright; Avail: CASI; A04, Hardcopy

Polyimides displaying low color in thin films, atomic oxygen resistance, vacuum ultraviolet radiation resistance, solubility in organic solvents in the imide form, high glass transition (T(sub g)) temperatures, and high thermal stability are provided. The poly(amide acid)s, copoly(amide acid)s, polyimides and copolyimides are prepared by the reaction of stoichiometric ratios of an aromatic dianhydride with diamines which contain phenylphosphine oxide groups in polar aprotic solvents. Controlled molecular weight oligomeric (amide acid)s and imides can be prepared by offsetting the stoichiometry according to the Carothers equation using excess diamine and endcapping with aromatic anhydrides The polyimide materials can be processed into various material forms such as thin films, fibers, foams, threads, adhesive film, coatings, dry powders, and fiber coated

prepreg, and uses include thin film membranes on antennas, second-surface mirrors, thermal optical coatings, and multilayer thermal insulation (MLI) blanket materials.
Official Gazette of the U.S. Patent and Trademark Office
Polyimides; Durability; Copolymers

20050168184 Academy of Sciences (USSR), Moscow, USSR
Diamonds Produced by Electric Wire Explosion
Fortov, V. E.; Korobenko, V. N.; Fortov, V. E.; Korobenko, V. N.; Rakhel, A. D.; Savvatimski, A. I.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 226-230; In English; See also 20050168165
Contract(s)/Grant(s): Proj. 2-3-10; Proj. 73-123-1; Copyright; Avail: Other Sources

After publication the classic papers of(Leipunski 1939), (Bundy 1963b), and (Bundy 1979 and 1989) as well, the two main directions of obtaining diamond phase have been established: stationary method and pulse method (with the help of explosive, on the whole). One of the first paper dealt with the production of diamond phase with the help only electric current, without initial external pressure, was (Bless 1972). Current pulse of several MA-s heated copper tube (diameter was 2.9 mm). The isolated rod of graphite sample (diameter - 1.65 mm) was placed inside the tube. Pressure 50-300 kbars arises from the compressed metal tube. Hexagonal forms of diamond were observed (in separate cases) under pressure more than 200 kbars. Tl'.e transition graphite-diamond, according to the valuation of the author, took place under temperature 1000 C. Non-constant yield of the diamond phase, high values of the currents, these main circumstances did not give a real chance to create in (Bless 1972) a new method for diamond powder production.
Derived from text
Diamonds; Explosions; Graphite; Powder (Particles)

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*.

20050167122 Defence Science and Technology Organisation, Edinburgh, Australia
Ageing of the Insensitive Explosive, ARX-4024
Smith, Matthew W.; Lu, Jing Ping; October 2004; 20 pp.; In English; Original contains color illustrations
Report No.(s): DSTO-TN-0586; DODA-AR-013-219; Copyright; Avail: Other Sources

An accelerated ageing program was undertaken to analyse the suitability of ARX-4024 as a replacement for Composition B in Australian munitions. Testing was undertaken utilising two different conditions, namely the B2 cycle, which is representative of extreme conditions in northern Australia, and at a constant 60 C with ambient humidity. An analysis of the ingredient composition, sensitiveness, and mechanical strength was made at 3 month intervals over a period of 12 months, and the results compared to Composition B samples similarly aged.
Author
Explosives; Aging (Materials); Mechanical Properties; Sensitivity; Weapon Systems

20050167123 Defence Science and Technology Organisation, Edinburgh, Australia
Toward a Methodology for Evaluating the Impact of Technologies on Infantry Situation Awareness
Guille, Madeleine; French, Han Tin; October 2004; 39 pp.; In English; Original contains color illustrations
Report No.(s): DSTO-TR-1628; DODA-AR-013-216; Copyright; Avail: Other Sources

One of the key force modernization initiatives for infantry operations is to enhance situation awareness (SA) capabilities. The design and acquisition of technologies that optimize the performance of the combat soldier must therefore be guided by the goal of enhancing and maintaining SA. Determining the value of these technologies requires a means of objectively evaluating a combat soldier s SA. In this study, the impact of Intra-Section Radios, which form part of the Soldier Combat System (SCS) enhancements, on SA was evaluated. The Situation Awareness Global Assessment Technique provides an objective measure of SA by comparing the real and perceived situation. In this study, the Direct Questioning Technique (DQT), an adapted version of the SAGAT was used to evaluate changes in SA under baseline and enhanced conditions during two loosely scripted exercises involving Australian Air Field Defence Guards. Results showed a significant increase in overall group SA during the enhanced patrol vignette. No significant results were found for the section attack vignette. The DQT

appears to be a valid and viable methodology that can be used in the evaluation of specific SCS technologies.
Author
Situational Awareness; Methodology; Military Technology

20050167709 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands
Effects of Ground Based Fire Support Ammunition on Behalf of SMARTER
Haverdings, W.; March 02, 2005; 27 pp.; In English
Contract(s)/Grant(s): A02/KLA/ll; TNO Proj. 014.13741
Report No.(s): TD-2005-0003; DV2-2005-A3; Copyright; Avail: Other Sources

Within the TNO Defense Research Programme 'Ground Based Fire Support (V019)' this project is to support the Operational Research model SMARTER. Research has been conducted to analyse, study and upgrade existing artillery lethality/effectiveness models. In essence, the main question to be answered is the number of rounds to be fired into enemy targets, depending upon the desired level of damage, type of munition, range and delivery accuracies according to selected aiming points and target size. Current models were improved, for example to include the penetration effects of tungsten projectiles, the impact distribution of submunitions in case of HE-ICM etc. Based on international developments circulating in the NATO Indirect Fire Support Kernel (NIFAK) where preference is made for a stochastic approach, a simplified model has been devised employing a deterministic and stochastic approach that may give a quick insight into a firing mission. This model, called FIST (Fire Support Tool) must be validated, although it performs similarly as the proposed NIFAK model. Despite its simplicity, additional non-combat targets, such as urban 'objects' (collateral damage) can be analysed. Currently it serves as a quick tool for afii:leiy aiia!yses, but further deve!oprr?ent is necessary.
Author
Ammunition; Fires; Mathematical Models; Ground Based Control; Weapons

20050168079 NASA Marshall Space Flight Center, Huntsville, AL, USA
Liquid Propellant Tracing Impingement Injector
Xenofos, George D., Inventor; Myers, W. Neill, Inventor; Trinh, Huu, Inventor; Michaels, R. Scott, Inventor; March 1, 2005; 6 pp.; In English
Patent Info.: Filed 9 Jan. 2003; US-Patent-6,860,099; US-Patent-Appl-SN-263297; NASA-Case-MFS-31646; No Copyright; Avail: CASI; A02, Hardcopy

An injector for use with the rocket thruster has a plurality of fuel ports separated from a plurality of oxidizer ports. The oxidizer and fuel ports are paired together directing their respective fluids along a path with radial and tangential components so that the two fluids impinge at a predetermined spaced apart distance from the chamber wall of the combustion chamber at an impingement track. By providing the fuel at a steeper angle relative to the chamber walls than the oxidizer, the fuel can be utilized to provide a fuel rich zone near the chamber walls to assist in cooling the chamber walls during operation.
Official Gazette of the U.S. Patent and Trademark Office
Impingement; Injectors; Liquid Rocket Propellants; Rocket Thrust

20050168098 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands
Quantity-distance Relations for Small Quantities Net Explosive Weight
Verolme, E. K.; vanderVoort, M. M.; vanDongen, P.; February 2005; 47 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): A04/CO/4QP; TNO Proj. 014.16020
Report No.(s): DV2-2005-A2; TD-2005-0002; Copyright; Avail: Other Sources

This report gives an overview of the results of the first phase of the project 'Quantity-Distance relations for small quantities net explosive weight'. An interim advice with reduced quantity-distance relations for the storage of small quantities is given and an initial application of a theoretical prediction tool for the explosion effects of small quantities is presented. The second phase of the project will focus on the directional dependence of QDs for earth-covered magazines, time-dependent QDs for the field storage of HD 1.2 and the effect of the behaviour of HD1.3 on QDs.
Author
Explosions; Mathematical Models

20050168101 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands
Evaluation of Risk-NL Regarding Fragment/debris Distribution: Review Summary
Heemskerk, A. H.; vanDongen, P.; February 2005; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): A-1/KL/424; TNO Proj. 014.11912
Report No.(s): PML-2004-A64; TD-2004-064; Copyright; Avail: Other Sources

A reliable prediction of fragment and debris throw out is essential for the quantification of safety-distances and risk-contours related to ammunition storage. One of the projects within the research programme Safety of Defence Infrastructure was to review current prediction (sub-)models of the PC tool Risk-NL by means of available experimental data. The review showed that the current models are conservative but that they can be improved.
Author
Debris; Fragments; Risk; Explosions

20050168107 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands
Physical Protection: The State of the Art
vdGijp, S.; Linders, M. J. G.; vanHouwelingen, T.; Tuinman, I. L.; Swenker, G. M.; February 2005; 34 pp.; In Dutch; Original contains color and black and white illustrations
Contract(s)/Grant(s): B04/CO/4AU; TNO Proj. 014.16362
Report No.(s): DV2-2005-A1; TD-2005-0001; Copyright; Avail: Other Sources

The study gives an overview of the current state of the art in physical protection. Protection provided to personnel by protective barriers in a military NBC-environment is considered. This covers respiratory protection, skin protection and collective protection. Air purification forms a base for the three aspects of protection. The most used current technologies and equipment types are mentioned and explained. Current problems and short-comings are mentioned and explained in the light of the modem threat and current operational use. Promising technologies that may solve these shortcomings in the nearby future are described and explained. Developments within NATO regarding doctrine and requirements are incorporated as well as the most recent developments of technology by companies. Alternative sorption technologies and improved filtration are considered to be of importance for the coming years, as well as new lightweight materials, active materials and improved, modular or integrated design with lesser physiological burden for the user. The study will provide a guideline regarding technology and equipment development in the field of military CB-defence for the next decade.
Author
Protective Clothing; Military Technology

20050168110 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands
RF/HPM Munitions: Applications and Possible Protection Measures
vanLeersum, B. J. A. M.; Naus, H. W. L.; vanWijk, C. V.; February 2005; 52 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 015.33846
Report No.(s): TNO-DV1-2004 A117; TD-2004-0209; Copyright; Avail: Other Sources

In this report, we have performed a study of applications and possible protection measures against electromagnetic weapons (RF/HPM munition). It is the result of a literature study combined with available knowledge present at TNO. The research focuses on the applications of and protection against RF/HPM weapons. Concluding, electromagnetic weapons are now technically feasible and relatively economical to build. A wide range of existing targeting and delivery techniques may be employed in using such weapons. Furthermore, an electromagnetic attack may instantly pass without being noticed. Combining the facts, it is obvious that these pose a serious terrorist threat. Therefore, awareness should grow as well as willingness to employ and develop protective measures.
Author
Radio Frequencies; Ammunition; Microwaves; Electromagnetism

20050169157 NASA Lewis Research Center, Cleveland, OH, USA
Capabilities Enhanced for Researching the Reduction of Emissions in Future Aircraft
[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Aircraft future aircraft jet engines will run at higher pressures to obtain greater fuel efficiency and performance. This will require new combustor designs to keep the nitrogen oxide and carbon monoxide emissions at environmentally acceptable levels. The actual pressures and temperatures found in gas turbine combustors must be duplicated in a laboratory to verify the emissions characteristics of gas turbine engines. Recognizing this, the U.S. aircraft gas turbine industry identified a need for a national facility that could duplicate the severe inlet conditions of future combustors. Because of our expertise in combustion emissions reduction research and in the design and operation of high-pressure test facilities, the NASA Lewis Research Center was seen as the natural location for such a facility. As a national laboratory, Lewis could provide these facilities to all U.S. gas turbine engine manufacturers while protecting their proprietary interests. Called the Advanced Subsonic Combustion Rig,

the facility will provide up to 60-atm pressures at inlet temperatures up to 1300 F and air flow rates up to 38 lb/sec. Furthermore, it will offer state-of-the-art diagnostic methods for characterizing advanced combustor concepts. Aeronautical combustion research at Lewis provided several significant accomplishments recently in support of both the High Speed Research (HSR) and Advanced Subsonic Technology (AST) programs. For example, in the High Speed Research Program, NO_x reductions of up to 90 percent were achieved in prototype combustor hardware. Advanced computational analysis, gas sampling, and laser diagnostic techniques were critical to this success. Working closely with the gas turbine industry, we have successfully transferred this low-emissions combustor technology into engine prototype hardware. This hardware is now being tested at the engine manufacturers facilities. Complementary tests in Lewis currently available 30-atm test facilities are also underway, taking advantage of Lewis unique diagnostic capabilities. By utilizing test facilities belonging to both NASA and its industry partners, we have tested multiple combustor concepts in a shorter period of time.
Derived from text
Exhaust Emission; Jet Engines; Exhaust Gases

31
ENGINEERING (GENERAL)

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

20050167433 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Field Tests of Frost Jacking of Unexploded Ordnance
Henry, Karen S.; Danyluk, Lawrence A.; Anderson, Thomas A.; Dec. 2004; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A432095; No Copyright; Avail: Defense Technical Information Center (DTIC)

We hypothesized that frost jacking (net seasonal upward movement) of buried unexploded ordnance (UXO) occurs in cold regions where there is frost-susceptible soil and adequate moisture. We buried 18 inert ordnance shapes in highly frost-susceptible soil in Hanover, NH, to determine whether they would experience frost jacking. Sixteen of the shapes were used for two, three-way factorial experiments to study frost jacking as a function of specific ordnance type, burial depth, and orientation (vertical or at 45 degrees). Frost jacking of ordnance occurred, and the net upward movement for objects buried from 4 to 36 inches deep ranged up to 3.2 inches for one season. During winter, the ordnance moved upward at approximately the same rate at which the ground heaved; however, during thaw the ground usually subsided to a greater degree than the ordnance. Variability of net upward movement was very high. The group of ordnance that included 2.75-inch rockets and 81 -mm mortars buried 24 to 36 inches moved upward more than the smaller 20-mm and 40-mm projectiles buried 4 to 12 inches deep.
DTIC
Ammunition; Field Tests; Frost; Ordnance

20050167726 Army Test and Evaluation Command, Aberdeen Proving Ground, MD USA
Test Operations Procedure (TOP) 1-1-014 Ride Dynamics
Jan. 2005; 18 pp.; In English
Report No.(s): AD-A431130; TOP-1-1-014; No Copyright; Avail: CASI; A03, Hardcopy

This TOP describes methods for evaluating the ride dynamics or ride quality of ground vehicles. Ride dynamics pertains to the sensation or feel of the passengers in the environment of a moving vehicle. The technique for evaluating the ride dynamics involves the use of instrumented seats or ride quality pads which contain accelerometers molded in a rubber disk to provide measurements in three mutually perpendicular axes. The instrumented seats are occupied by the normal vehicle crew. Ride dynamics data is acquired while the vehicle traverses various test courses at pre-determined speeds. The data is then processed by performing Fourier transformations and creating power spectral density (PSD) files for the individual test runs.
DTIC
Riding Quality; Fourier Transformation

20050168238 Naval Research Lab., Washington, DC, USA

Improved radiation output from a decade module

Weber, B. V.; Ottinger, P. F.; Rose, D. V.; Commisso, R. J.; Thompson, J. R.; Rauch, J. E.; Goyer, J. R.; Kortbawi, D.; Babineau, M. A.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 153-161; In English; See also 20050168165; Copyright; Avail: Other Sources

The DECADE generator consists of individual modules operated in parallel. Each module consists of a Marx bank, a water transfer capacitor, a passive water line, a vacuum line, a plasma opening switch (POS), and a bremsstrahlung diode load. Initial results from single module tests on DECADE Module 1 resulted in less radiation than originally specified. A subsequent, multi-laboratory effort demonstrated that the bremsstrahlung from this module can be increased to the levels originally specified for the multi-module system. The increased radiation was largely the result of two changes: discharge cleaning in the POS-load region with an argon-oxygen mixture (instead of pure argon), and a change in the converter package. Evidence exists for other processes that limit the radiation. If these limiting processes are circumvented, the radiation output could increase by an additional factor of two.

Author

Switches; Modules; Loads (Forces)

20050168264 Sandia National Labs., Albuquerque, NM, USA

Longevity of Optically Activated, High Gain GaAs Photoconductive Semiconductor Switches

Loubriel, G. M.; Zutavern, F. J.; Mar, A.; OMalley, M. W.; Helgeson, W. D.; Brown, D. J.; Hjalmarson, H. P.; Baca, A. G.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 405-413; In English; See also 20050168165

Contract(s)/Grant(s): DE-AC04-94AL-85000; Copyright; Avail: Other Sources

The longevity of high gain GaAs photoconductive semiconductor switches (PCSS) has been extended to well over 10 million pulses by reducing the density of carriers at the semiconductor to metal interface. This was achieved by reducing the density in the vertical and lateral directions. The first was achieved by varying the spatial distribution of the trigger light thereby widening the current filaments that are characteristic of the high gain switches. We reduced the carrier density in the vertical direction by using ion implantation. These results were obtained for currents of about 10 A, current duration of 3.5 ns, and switched voltage of -2 kV. At currents of approx. 70 A, the switches last for 0.6 million pulses. In order to improve the performance at high currents new processes such as deep diffusion and epitaxial growth of contacts are being pursued. To guide this effort we measured a carrier density of 6 x 10(exp 18) electrons (or holes)/cu cm in filaments that carry a current of 5 A. Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the USA Department of Energy under Contract DE-AC04-94AL85000.

Author

Gallium Arsenides; Photoconductivity; Semiconductors (Materials); Switches

20050169249 SENSIS Corp., Dewitt, NY, USA

Phased Array Beam Spoiling Technique

Kinsey, Richard; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 698-701; In English; See also 20050169243; Copyright; Avail: Other Sources

The phased array beam spoiling technique, to be described in this paper, is not new technology. It is simply based on the decades-old ray optics technique that was used in the design of cosecant-squared reflector antennas. However, conversations with other antenna engineers on the subject led me to conclude that the utility of this technique for the dynamic control of phased array patterns is often not understood and not utilized. In spite of its simplicity and lack of mathematical elegance, it has proven to be quite useful in certain applications.

Author

Dynamic Control; Phased Arrays

20050169414 Tokyo Univ. of Mercantile Marine, Japan

94 GHz Band Rough Surface Scattering Characteristics Based on Numerical Analysis

Yamaguchi, Hiroyuki; Kajiwara, Akihiro; Hayashi, Shogo; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1160-1163; In English; See also 20050169243; Copyright; Avail: Other Sources

This paper investigates rough surface scattering characteristics at 94 GHz band by means of an electromagnetic field integral equation. 94 GHz band, which has the least atmospheric attenuation between 75 GHz and 110 GHz and is considered to have narrower beamwidth and wider bandwidth in general, is vigorously studied for various applications, such as, collision

avoidance vehicle radar, weather radar and remote sensing with ultra wide band radar. In these applications, the scatterer such as asphalt pavement, pebbles and rain drops should be the almost same order as 94 GHz band wavelength. The 94 GHz band scattering characteristics is thus considered to belong in Mie region, not in Rayleigh, thereby should be unique as compared with microwave bands From this point of view, we have initiated the study of scattering characteristics for various scattering objects (land vehicle, rough ground, grass, etc.) in order to evaluate signal-to-clutter (land clutter) ratio at 94 GHz band. In this work, we carried out the prediction of 94 GHz band scattering electromagnetic wave field from rough surface with perfect conductivity for the purpose of understanding following two points: 1) 94 GHz band radar cross section (RCS) as a function of scatterer's roughness and 2) its polarization dependence.
Author
Surface Roughness; Scattering; Numerical Analysis; Electromagnetic Fields; Integral Equations

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COMMUNICATIONS AND RADAR

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

20050166395 Swedish Defence Research Establishment, Linkoeping, Sweden
Bit-Interleaving and Serial-Concatenation Techniques for Higher-Order Coded Modulation
Tullberg, H.; Jul. 2003; 222 pp.; In English
Report No.(s): PB2005-102993; FOI-R-0902-SE; No Copyright; Avail: CASI; A10, Hardcopy

In this report we investigate bandwidth-efficient reliable communication over wireless channels. We consider a generalized serial concatenated trellis coded modulation (SCTCM) system consisting of an outer code, one or more inner rate-1 accumulate codes preceded by interleavers, an optional channel interleaver, and a mapping to a higher-order, Gray-labeled signal constellation. The generalized SCTCM system encompasses bit-interleaved coded modulation (BICM) as a special case. We show that under maximum-likelihood (ML) decoding, there exists a system-dependent threshold, such that if the signal-to-noise ratio (SNR) exceeds this threshold, the bit error probability goes to zero as the blocklength goes to infinity. For finite blocklengths we derive a probabilistic performance bound which improves on the conventional union bound. For non-ML, message-passing decoders, we compute tight SNR-thresholds using density evolution, assuming infinite blocklengths. For the particular case of an outer parity check code and one inner accumulate code, we derive a stability condition, which provides a lower bound on the SNR threshold. The spectral efficiency of the proposed SCTCM system is determined by the outer code and the size of the signal constellation, and can easily be tailored to the prevailing channel conditions. The simulated performance in AWGN and i.i.d. Rayleigh fading is equal to or better than the performance of more complex systems suggested in the literature. The iterative decoding thresholds at high rates are within 1 dB of the channel capacity for higher-order constellations.
NTIS
Wireless Communication; Coding; Modulation

20050166397 Technology Resources International Corp., Alpharetta, GA, USA
Interference Mitigation: Theory and Application
Ghose, Rabindra N.; [1996]; 281 pp.; In English
Report No.(s): IEEE-Order-PC3061; LC-95-46317; Copyright; Avail: Other Sources

This book provides an overview of techniques for cancelling the electromagnetic interference caused by undesirable signals in radar and communication applications. The book addresses the cancellation of undesirable signals with minimal effect on a desired signal.
CASI
Electromagnetic Interference; Cancellation; Electronic Countermeasures

20050166401 Transportation Research Board, Washington, DC
Roadway INFOstructure: What, Why, How. Providing for Integrated Information to Roadway System Managers and Users
Nov. 2003; 40 pp.; In English
Report No.(s): PB2005-105630; TRB/E-C057; No Copyright; Avail: CASI; A03, Hardcopy

Contents: Workshop Summary; Introduction The What, Why, and How of INFOstructure; Addressing ITS and Surface Transportation Data Needs through the INFOstructure; Making the INFOstructure Work; Getting to the INFOstructure; Vehicle-Infrastructure Cooperation; Reflections and Directions; Appendixes: A- Workshop Agenda; B -Workshop Participants; C -Acknowledgments.
NTIS
Transportation Networks; Information Systems; Systems Integration; Systems Management

20050166883 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Cassini RADAR's First Look at Titan
Elachi, C.; Wall, S. D.; Allison, M. D.; Anderson, Y.; Boehmer, R.; Callahan, P.; Encrenaz, P.; Flamini, E.; Francescetti, G.; Gim, Y., et al.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Cassini Titan RADAR Mapper [1] is a Ku-band (13.78 GHz,lambda = 2.17 cm) linear polarized RADAR instrument capable of operating in synthetic aperture (SAR), scatterometer, altimeter and radiometer modes. Radar observations on Titan passes Ta and T3 included rastered scatterometry, SAR, altimetry and rastered radiometry images of a full hemisphere in orthogonal linear polarizations. At this writing only the Ta data have been acquired, but data from both passes will be discussed in the presentation.
Derived from text
Cassini Mission; Radar Tracking; Synthetic Apertures; Scatterometers; Radiometers; Altimeters

20050166922 California Univ., San Diego, CA, USA
Elements of Signal Detection and Estimation
Helstrom, Carl W.; [1995]; 593 pp.; In English
Report No.(s): LC-94-16150; Copyright; Avail: Other Sources

The key component of a communication, radar, or sonar system is its receiver, whose purpose is to detect information-bearing signals, signals that have been weakened and distorted during transmission and corrupted by random noise. The systematic design of receivers and the assessment of their performance are based on signal-detection theory, and that is the subject of this book. The detection of weak signals in noise can be viewed in the framework of the statistical testing of hypotheses, whose elementary foundations are presented in Chapter 1. These are applied in Chapter 2 to the basic problem of detecting a signal of known form in Gaussian noise. We then treat the detection of narrowband signals of unknown carrier phase, setting up a convenient formulation for narrowband signals and noise as a natural generalization of the phasors used in analyzing alternating currents and voltages (Chapter 3). The structure of optimum and near-optimum receivers to which multiple independent inputs are available is examined in Chapter 4. The performance of receivers is measured by their probabilities of error, the computation of which is treated in Chapter 5. Statistical estimation theory is introduced in Chapter 6. Maximum-likelihood detection, which draws on the estimation of signal parameters, figures in the design of receivers of radar signals of unknown arrival time and Doppler shift (Chapter 7). Chapter 8 describes how estimation theory plays a role in detecting signals in the presence of noise of unknown strength. Sequential processing is the topic of Chapter 9. The resolution of signals that are close together in arrival time and carrier frequency is approached in Chapter 10. Minimum-mean-square-error estimation of time series corrupted by noise is also treated in Chapter 6 as preparation for the analysis in Chapter 11 of detectors of Gaussian stochastic signals and the calculation of their error probabilities. Here the Kalman-Bucy equations play a role. The methods developed in this context figure in the treatment of the photocounting detection of optical signals in the last chapter.
Author (revised)
Signal Detection; Receivers; Antenna Design; Electromagnetic Noise

20050167227 Army Research Lab., Adelphi, MD USA
Rate-Optimal Signal Design for Wireless Communications
Misra, Saswat; Swami, Ananthram; Tong, Lang; Dec. 2004; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431575; No Copyright; Avail: Defense Technical Information Center (DTIC)

In a tactical communications scenario, the transmitter will only have an imperfect estimate of the temporally correlated mobile RF channel. Given imperfect channel state information (CSI), we address the optimal signal design problem. Using the cutoff rate metric, we determine: (a) the optimal allocation of power and bandwidth between information and training

signals, (b) the optimal binary input as a function of SNR and CSI quality, (c) and adaptive modulation scheme which switches between only two inputs based on the CSI quality. We show that this simple adaptive modulation scheme is nearly optimal at moderate to high SNR. We also establish that there is at most a 1 dB increase in the maximum penalty for using On-Off Keying instead of BPSK.
DTIC
Radio Transmitters; Signal Generators; Wireless Communication

20050167354 Nebraska Univ., Lincoln, NE USA
Wireless Multiple Access Communications Using Collision Frequency Shift Keying
Perez, Lance C.; Chen, Xia; Dec. 2004; 157 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0249
Report No.(s): AD-A431943; AFRL-SR-AR-TR-05-0125; No Copyright; Avail: CASI; A08, Hardcopy

This report investigates the design and performance of a novel wireless multiple access scheme based on collision frequency shift keying (CFSK). The CFSK system has been shown to have a greater capacity than a comparable CDMA system. However, the optimal multiuser receiver for the CFSK system has complexity that is exponential in the number of users, Several suboptimal reduced complexity receivers for the CFSK system are developed and their performance evaluated via computer simulation. These suboptimal receivers are shown via computer simulation to have performance close to that of the optimal receiver. These results indicate that CFSK is a promising system for ad hoc communications networks that cannot use a highly coordinated system.
DTIC
Collision Rates; Frequency Shift; Frequency Shift Keying; Multiple Access; Wireless Communication

20050167365 Army Research Lab., Aberdeen Proving Ground, MD USA
The Human Side of Automation: Lessons for Air Defense Command and Control
Hawkley, John K.; Mares, Anna L.; Giammanco, Cheryl A.; Mar. 2005; 36 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431964; ARL-TR-3468; No Copyright; Avail: Defense Technical Information Center (DTIC)

One of the defining properties of the next generation of air defense command and control (C2) systems is an increasing reliance on automation. This paper provides an overview of human performance and training issues in automated air defense C2 systems. Its primary focus is the impact of automation on air defense C2 operators and the consequences of their role change from traditional operator to supervisors of automated processes. Topics that are discussed include (a) the changing role of operators under automation, (b) human performance and automation, (c) the operator's role as a supervisory controller, (d) problems with undisciplined automation, (e) developing effective automated systems, and (f) the impact of automation on training and staff development. The paper is intended as a primer on automation and human performance for commanders, concept developers, system designers, trainers, and other personnel involved with decision-making for the next generation of automated C2 systems.
DTIC
Air Defense; Command and Control

20050167380 L-3 Communication Government Services, Inc., Rome, NY USA
Open Radio Communications Architecture Core Framework V1.1.0. Volume 3. Software Requirement Specification
Gudaitis, Mike; Feb. 2005; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-01-C-0205; Proj-APAW
Report No.(s): AD-A431985; AFRL-IF-RS-TR-2005-59; No Copyright; Avail: Defense Technical Information Center (DTIC)

This document describes the software requirements of a Joint Tactical Radio System (JTRS) Software Communications Architecture (SCA) implementation called the Core Framework (CF). This Software Requirements Specification (SRS) defines the requirements for the Open Radio Communications Architecture Core Framework (OrcaCF) v1.1.0 in accordance with the JTRS SCA version 2.2. The CF software package contains: an Operating System per SCA v2.2, Section 3.1.1, Middleware and Services per SCA v2.2, Section 3.1.2, a Core Framework per SCA v2.2, Section 3.1.3, and a simple application per SCA v2.2, Section 3.2. The OrcaCF was developed on a standard Intel x86-based PC running the Linux Operating System (OS) from RED HAT.
DTIC
Computer Programs; Radio Communication; Specifications

20050167403 L-3 Communication Government Services, Inc., Rome, NY USA

Open Radio Communications Architecture Core Framework V1.1.0. Volume 2. Quick Reference Guide

Gudaitis, Mike; Feb. 2005; 34 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-01-C-0205; Proj-APAW

Report No.(s): AD-A432045; AFRL-IF-RS-TR-2005-59; No Copyright; Avail: Defense Technical Information Center (DTIC)

This Quick Reference Guide (QRG) describes the installation and operation of the Open Radio Communications Architecture Core Framework (OrcaCF) v1.1.0 developed by L-3 Communications Government Services Inc. (L3) for Air Force Research Laboratory (AFRL). The OrcaCF implements the Joint Tactical Radio System (JTRS) Software Communications Architecture (SCA) version 2.2 specification. It was developed in C++ and uses ACE/TAO for CORBA middleware, Xerces for the SML parser, and Linux for the Operating System. The OrcaCF was derived from the LinuxCF v1.1.1 which was delivered to the JTeL in October 2003. However, it is significantly superior to the LinuxCF v1.1.1 with increased stability; better thread management; better exception handling; more complete XML parsing and better installation scripts. The OrcaCF v1.1.0 has also been thoroughly tested using the JTRS Test Application (JTAP).

DTIC

C (Programming Language); Computer Programs; Radio Communication

20050167444 Bolt, Beranek, and Newman, Inc., Cambridge, MA USA

Discovery of Directional Communication Channels in AD HOC Networks

Ke, Wang; Shurbanov, Vladimir; Dec. 2004; 3 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-2-0011

Report No.(s): AD-A432109; No Copyright; Avail: Defense Technical Information Center (DTIC)

We examine the process of discovering directional antenna communication channels in ad hoc networks and discuss how available location information can be used to guide the search. We outline methods to estimate the bearings of potential directional links and focus the search in sectors where greater payoff is expected, thus increasing its effectiveness and reducing unnecessary probing.

DTIC

Channels (Data Transmission); Directional Antennas; Local Area Networks

20050167445 Army Research Lab., Adelphi, MD USA

Advanced Command and Control Technologies for Enhancing Urban Operations

Yerace, Gary A.; Sciarretta, Albert A.; Dec. 2004; 3 pp.; In English; Original contains color illustrations

Report No.(s): AD-A432110; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper will address emerging tactics, techniques, and procedures (TTPs) for Joint urban operations. and provide a vision for the future of battle command (recent Army term for C2). Considering these emerging TTP's the proposed vision, and the challenges posed by the urban environment, it will identify needed capabilities. A brief discussion of related technology programs, projects, and initiatives will follow. Finally, there is a discussion of some capability gaps that need to be addressed.

DTIC

Command and Control; Military Operations

20050167450 Army Communications-Electronics Command, Fort Monmouth, NJ USA

An Innovative Approach to Minimizing Bandwidth Usage for Mobile Military Database Synchronization

Zieniewicz, Matthew J.; Szymanski, Ron; Nguyen, Thanh; Dec. 2004; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A432119; No Copyright; Avail: Defense Technical Information Center (DTIC)

The goal of our research is to recommend a systems approach and architecture, based upon solid network engineering principles and mathematics, to retrieve battlefield current database information from a remote database over an intermittent wireless communications link to a handheld device. As part of this research, several approaches are being attempted with performance comparisons between each. This research will tackle the first three of the four hurdles to the system stated above. We will explore methods to do database retrievals and/or synchronizations with large remote databases over a wireless link. The impact of dead zones and periods of time without connectivity will be examined and a solution explored. A means by which critical information can be pre-cached on the user's device will be examined as one possible solution. All solutions will be accomplished within the size/weight/power restrictions of a handheld computing device. For this research, commercial data transmission protocols will be employed. The military has successfully adapted commercial communications standards in the

past and added sufficient security methods to these techniques. Therefore, our use of commercial protocols in our model accurately reflects a realistic implementation scheme for a possible fielded system.
DTIC
Bandwidth; Data Bases; Data Transmission; Portable Equipment; Synchronism; Wireless Communication

20050167451 Delaware Univ., Newark, DE USA
D-FLASH: Dynamic Fault Localization and Self-Healing for Battlefield Networks
Kant, L.; Chen, W.; Lee, C-W.; Sethi, A.; Natu, M.; Luo, L.; Shen, C-C.; Dec. 2004; 3 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-2-0011
Report No.(s): AD-A432120; No Copyright; Avail: Defense Technical Information Center (DTIC)

The necessity for mechanisms that provide service survivability (i.e., seamless restoration of networking services affected by random failures) in battlefield networks, is both obvious and critical. This paper addresses the fundamental challenge of providing service survivability via efficient fault localization and self-healing techniques in the Army's Future Battlefield Networks, examples of which include the FCS, WIN-T and Objective Force Nets. More specifically, we develop efficient fault diagnosis techniques and self-healing mechanisms in order to both rapidly and accurately pin-point the root cause of a problem and to provide uninterrupted services amidst unforeseen failures, in the ad-hoc battlefield environment.
DTIC
Communication Networks; Fault Detection; Healing; Position (Location); Preventive Maintenance

20050167453 Florida Inst. of Tech., Melbourne, FL USA
Approximate Angular Directional Representation of Geometrical Objects
Mitra, Debasis; Dec. 2004; 3 pp.; In English
Report No.(s): AD-A432122; No Copyright; Avail: Defense Technical Information Center (DTIC)

Consider a scenario where a military intelligence ground-operative encounters an array of radars during a reconnaissance mission in enemy territory, where the shape of the array is important to determine its purpose. However, he does not have requisite gadgets to make any accurate positional assessment about the array. He starts noting down the approximate angular direction of each radar from its previous radar position in the array, with respect to the North (say, by observing the Pole Star in the sky). Thus, he tours around each point in the array and records this information. Obviously, without an appropriate gadget the angular directions estimated will be very qualitative in nature. In this paper we propose a scheme for, and discuss the related issues involved in, such a qualitative angular representation of geometrical objects. Primarily we are concerned here in studying the shape of a polygon that could be encaptured using the Star-ontology representation scheme developed in the literature.
DTIC
Angles (Geometry); Direction Finding; Position Sensing

20050167458 Maryland Univ., College Park, MD USA
Distributed Certification Authority Generation to Enhance Autonomous Key Management for Group Communications in Mobile Ad-Hoc Networks
Baras, John S.; Striki, Maria; Dec. 2004; 3 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-2-0011
Report No.(s): AD-A432129; No Copyright; Avail: Defense Technical Information Center (DTIC)

A MANET is a collection of wireless mobile nodes dynamically forming a temporary network, without the use of fixed infrastructure, and this is exactly the environment envisioned for military operations by the Objective Force. Military command and control rely on secure group communications, therefore key management (KM) schemes that ensure secure communications under MANET constraints are required. However, without fixed infrastructure, e.g., Certification Authorities (CAs), and trusted third parties (TTPs), the design of KM becomes very difficult, since its most fundamental service entity authentication, privileges update/revocation - rely on these entities to establish trust among nodes, and terminate or renew participation to secure operations in a pre-agreed, global manner. Without this guarantee, all subsequent KM operations make no sense. So, it is of paramount importance to provide a secure authentication service that detects misbehavior and defends against dishonest users in the network. Thus, the challenge lies in dynamically generating mechanisms that provide individual nodes and KM groups with functionalities similar to those of the original CAs of fixed infrastructure. In this work, we develop distributed, scalable, and efficient mechanisms for dynamically generating CAs in MANETs, by distributing the tasks of a CA

among legitimate members of existing KM groups (preferably hierarchical). We show how the features of our scheme render it superior in performance and resilience, and how group KM properties are exploited to avoid heavy bandwidth-delay solutions of other proposals in the literature.
DTIC
Autonomy; Certification; Communication Networks; Security; Wireless Communication

20050167707 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Optimal Maintenance for Stochastically Degrading Staellite Constellations
Cook, Timothy J.; Mar. 2005; 189 pp.; In English
Report No.(s): AD-A431516; AFIT/GOR/ENS/05-05; No Copyright; Avail: Defense Technical Information Center (DTIC)

This thesis develops a methodology to determine an optimal policy for maintaining a satellite constellation that degrades over time. Previous work has developed a methodology to compute an optimal replacement policy for a satellite constellation in which satellites were viewed as binary entities, either operational or failed. This research extends the previous models by developing an optimal maintenance policy for satellite constellations in which each satellite may operate in a finite number of degraded states. The constellation is assumed to consist of a finite number of satellites, each with a finite number of functions with distinct failure mechanisms. Assuming each function lifetime is exponentially distributed, the stochastic degradation process is modelled as a discrete-time Markov chain. The degradation process is subsequently used to formulate an optimization problem as a finite planning horizon Markov decision process in which the total expected loss of utility is minimized. The maintenance actions considered include on-orbit repairs and satellite replacements, each of which have an associated level of risk. Numerical examples are presented to illustrate the model, and a parametric sensitivity analysis is performed using notional data to determine conditions for which the resulting policy consists of only replacements, only on-orbit repairs, or mixtures of replacements and on-orbit repairs.
DTIC
Constellations; Degradation; Maintenance; Satellite Constellations; Stochastic Processes

20050167848 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands
Time Series Analysis of Ground Penetrating Radar Signals
vanWijk, C. V.; March 2005; 91 pp.; In English
Report No.(s): TD-2003-0076; TNO-DV1-2003-A23 1; Copyright; Avail: Other Sources

Ground penetrating radar is a technology for advanced land mine detection. Unfortunately, this sensor has a false alarm rate, i.e., a buried object is detected but there is ambiguity involved in determining the nature of the detected object. To be able to significantly reduce the false alarm rate and speed-up land mine detection, suitable signal processing algorithms must be developed with the aim of real-time target recognition. The problem how to recognize objects is addressed. We develop statistical approaches aimed at processing ground penetrating radar signals enabling the detection and recognition of buried objects. Recognition of an object can be inferred from analysis of a stochastic model. For each object we design a separate model. The first task is to build individual models. Once the set models has been designed, recognition of an unknown object is performed using a scoring, and select the model whose score is highest. Improving the signal-to-clutter ratio for detection systems based on ground penetrating radar measurements, we consider clutter/signal separation by means of inductive inference. The task of inductive inference is to find regularities underlying some given set of data. These regularities are then used to gain insight in the data, i.e. identify the clutter from the signals.
Author
Ground Penetrating Radar; Signal Processing; Time Series Analysis; Signal Analysis

20050167852 Defence Science and Technology Organisation, Edinburgh, Australia
Preliminary Report on Pulse Compression Waveforms and their Application to Waveform Agility
Nash, Graeme; October 2004; 46 pp.; In English; Original contains color illustrations
Report No.(s): DSTO-TR-1631; DODA-AR-013-212; Copyright; Avail: Other Sources

Pulse Doppler radars predominantly transmit the same pulse compression waveform pulse to pulse. This produces good Doppler performance in a jammer free environment. But in a jammer environment the transmitted pulses can be captured by a digital RF memory (DRFM) and retransmitted creating false targets. By introducing pulse to pulse waveform agility the effectiveness of the jammer can be greatly reduced.
Author
Pulse Compression; Waveforms; Electronic Countermeasures; Jamming; Pulse Radar

20050168090 NASA Glenn Research Center, Cleveland, OH, USA
Microelectromechanical Systems Actuator Based Reconfigurable Printed Antenna
Simons, Rainee N., Inventor; January 18, 2005; 14 pp.; In English
Patent Info.: Filed 31 Mar. 2003; US-Patent-6,844,852; US-Patent-Appl-SN-401863; NASA-Case-LEW-17389-1; No Copyright; Avail: CASI; A03, Hardcopy

A polarization reconfigurable patch antenna is disclosed. The antenna includes a feed element, a patch antenna element electrically connected to the feed element, and at least one microelectromechanical systems (MEMS) actuator, with a partial connection to the patch antenna element along an edge of the patch antenna element. The polarization of the antenna can be switched between circular polarization and linear polarization through action of the at least one MEMS actuator.
Author
Actuators; Microelectromechanical Systems; Patch Antennas; Antenna Components; Reconfigurable Hardware

20050168095 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands
Investigation on an Antenna Configuration for Multi-function Radar Applications
Bolt, R. J.; Bertuch, T.; January 2005; 128 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 015.34000
Report No.(s): TNO-DV1-2004 A212; TD-2004-0194; Copyright; Avail: Other Sources

This report is the result of literature search performed in the 'Dual-Band Antennas'-project which is part of the V053 Radar Program. In this study we have focused on radiating elements suitable for use in naval military radar systems considering both the dual-band concept and the requirements of a Scalable Multifunction RF (SMRF) system. This so-called SMRF concept is a direct result of the demand for cost efficient (with respect to fabrication, maintenance, and commonality) radar systems. Solutions can be found in the combining of different radiators to fulfill several radar applications from a single antenna array or radiators that are able to deal with as many radar applications as possible. A laborious literature search has been performed from which an extended radiator portfolio was created, containing their description, their pros and the cons with respect to use in an array environment and an SMRF system. Several configurations have been proposed for a suitable combination of radar applications. It was however found that, at the present time, a significant technological advancement and effort is necessary to fruitfully design a dual-band antenna array to perform the functions in different frequency bands while meeting the system requirements. They should, for the time being, no longer be emulated as a cost efficient solution from an antenna point of view.
Author
Antenna Design; Radar Antennas; Multispectral Radar

20050168097 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Delft, Netherlands
Tactical Data Link 22: Overview and Operations
Copeland, P. P.; Smallegange, J. A. P.; March 2005; 72 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): A01/KM/081; A04/KM/115; TNO Proj. 019.20372
Report No.(s): TD-2004-0431; TNO-Information-and-Communication-Technology-33469; Copyright; Avail: Other Sources

This document gives a technical description of the tactical data exchange system, Link 22. Link 22 has been developed by the NATO Improved Link Eleven (NILE) Project nations. Link 22 was developed to overcome the deficiencies found in Link. With its improved performance it is expected that Link 22 will eventually replace Link 11. The document firstly provides a technical overview of Link 22, i.e. network structure, operating frequencies, message structure, message series, etc. and then provides a description of how a Link 22 network is initialized and managed.
Author
Data Links; Data Systems; Data Transmission; Communication Networks

20050169148 NASA Lewis Research Center, Cleveland, OH, USA
Advanced Communication Technology Satellite (ACTS) Multibeam Antenna On-Orbit Performance
[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The NASA Lewis Research Center's Advanced Communication Technology Satellite (ACTS) was launched in September 1993. ACTS introduced several new technologies, including a multibeam antenna (MBA) operating at extremely short wavelengths never before used in communications. This antenna, which has both fixed and rapidly reconfigurable high-energy spot beams (150 miles in diameter), serves users equipped with small antenna terminals. Extensive structural and thermal analyses have been performed for simulating the ACTS MBA on-orbit performance. The results show that the reflector

surfaces (mainly the front subreflector), antenna support assembly, and metallic surfaces on the spacecraft body will be distorted because of the thermal effects of varying solar heating, which degrade the ACTS MBA performance. Since ACTS was launched, a number of evaluations have been performed to assess MBA performance in the space environment. For example, the on-orbit performance measurements found systematic environmental disturbances to the MBA beam pointing. These disturbances were found to be imposed by the attitude control system, antenna and spacecraft mechanical alignments, and on-orbit thermal effects. As a result, the MBA may not always exactly cover the intended service area. In addition, the on-orbit measurements showed that antenna pointing accuracy is the performance parameter most sensitive to thermal distortions on the front subreflector surface and antenna support assemblies. Several compensation approaches were tested and evaluated to restore on-orbit pointing stability. A combination of autotrack (75 percent of the time) and Earth sensor control (25 percent of the time) was found to be the best way to compensate for antenna pointing error during orbit. This approach greatly minimizes the effects of thermal distortions on antenna beam pointing.
Derived from text
Multibeam Antennas; Technology Utilization; Satellite Design; Satellite Communication

20050169166 NASA Lewis Research Center, Cleveland, OH, USA
Compilation and Analysis of 20- and 30-GHz Rain Fade Events at the ACTS NASA Ground Station: Statistics and Model Assessment
Manning, Robert M.; [1995]; 1 pp.; In English; ACTS Results Conference, 11-13 Sep. 1995, Cleveland, OH, USA; No Copyright; Avail: CASI; A01, Hardcopy

Since the beginning of the operational phase of the NASA Research Center's Advanced Communication Technology Satellite (ACTS), signal-fade measurements have been recorded at the NASA Ground Station located in Cleveland, Ohio, with the use of the 20- and 30-GHz beacon signals. Compilations of the daily data have been statistically analyzed on a monthly and yearly basis. Such analyses have yielded relevant parameters as (1) cumulative monthly and yearly probability distributions of signal attenuation by rain, (2) attenuation duration versus attenuation threshold probabilities, and (3) rate-of-fade probabilities. Not only are such data needed for a realistic data base to support the design and performance analysis of future satellite systems, but they are necessary to assess predictions made with the ACTS Rain Attenuation Prediction Model.
Author
Rain; Signal Fading; Ground Stations; Signal Measurement; ACTS

20050169203 NASA Lewis Research Center, Cleveland, OH, USA
ACTS Aeronautical Terminal Experiment (AERO-X)
[1995]; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

During the summer of 1994, the performance of an experimental mobile satellite communication system was demonstrated. Using the Advanced Communications Technology Satellite (ACTS) and the ACTS Mobile Terminal (AMT), the system demonstrated an active Monolithic Microwave Integrated Circuit (MMIC) phased-array antenna system. The antenna system was installed onboard one of NASA Lewis Research Center's research aircraft, a Learjet Model 25. It proved the viability of in-flight satellite communications services via small, flush, mountable electronic phased-array antennas. The overall system setup for the ACTS Aeronautical Terminal Experiment (AERO-X) is illustrated. The Link Evaluation Terminal (LET) at Lewis in Cleveland, Ohio, interfaced with fixed-AMT equipment, providing a seamless connection with the Public Service Telephone Network. As the Learjet was flown over several major cities across the U.S., this demonstration system allowed passengers onboard to make telephone calls as if they were using a cellular system. ACTS was operated in its microwave switch matrix mode with a spot beam for the Learjet and another spot beam dedicated to the LET.
Author (revised)
ACTS; Airborne Equipment; Communication Equipment; Satellite Antennas; Mobile Communication Systems

20050169243 Institute of Electrical and Electronics Engineers, Piscataway, NJ, USA
IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest
[1997]; 865 pp.; In English; IEEE Antennas and Propagation Society International Symposium, 21-26 Jun. 1998, Atlanta, GA, USA; See also 20050169244 - 20050169460
Report No.(s): IEEE-Catalog-97CH36122-Vol-2; LC-90-640397; Copyright; Avail: Other Sources

Contents include the following: Antenna and Ionospheric Propagation Analysis of Marconi's Experiment in Newfoundland. Temporal Variations of the Wideband Indoor Wireless Millimeter-Wave Channel. Waveguide Modal Analysis

of Single and Stacked Probe-Fed Microstrip Antennas with Circular Geometries. Convergence Considerations in Moment-Method Analysis of a Class of Microstrip Antennas. Patch Antennas on Ferromagnetic Substrates. Analysis of Stub Loaded Microstrip Patch Antennas. Improved Linear Transmission Line Model for Rectangular, Circular and Triangular Microstrip Antennas. Inclusion of Finite Substrate Effects in the Analysis of Printed Antennas and MIC's by the CGF Technique. Analysis of a Patch Antenna Coupled to a Transmission Line. Generalized Scattering Matrix Computation of the Transition: Microstrip Line-Rectangular Waveguide, as a Building Block for the Analysis of Multilayer Microstrip Circuits and Antennas. Effects of the TE Cavity Modes in the Full Wave Analysis of Printed Patch Antennas. Chebyshev Space Domain Green's Functions Closed Form for Microstrip Circuits. 'Static' Modes in the Full-Wave Analysis of Printed Antennas. Hybrid MoM/SBR and FEM/SBR Methods for Scattering by Large Bodies with Inhomogeneous Protrusions. Novel Class of Hierarchical Higher Order Tangential Vector Finite Elements for Electromagnetics. Analysis of Ferrite Loaded Cavity Backed Slot Antennas Using a Hybrid FEM/MoM Approach. Analysis of Large Cavity Field Problems Using a Finite Element Formulation of the Connection Scheme. PVM Based Parallel Sparse Matrix Equation Solver to Speed up Computation of MEI Method. Error Estimation and h-Adaptivity for Optimal Finite Element Analysis. Analysis of Microwave Integrated Circuits Using the Finite Element Method. Analysis of Arbitrary Shaped Cross-Sectional Discontinuity in Rectangular Waveguides Using FEM-BIM with Triangular Prism Elements. Application of High-Order Finite Element in Grid Truncation Scheme for Open Region Electromagnetic Problems. Anisotropic Perfectly Matched Layer-Absorbing Medium in Finite Element Time Domain Method for Maxwell's Equations. Flat-Topped Beams from a Uniform Amplitude Rectangular Aperture. Active Phased Array of Dielectric Resonator Antennas. Dual-Band, Dual-Polarization, Interleaved Cross-Dipole and Cavity-Backed Disc Elements Phased Array Antenna. Phased Array Beam Spoiling Technique.
CASI
Antenna Arrays; Apertures; Broadband; Error Analysis; Microstrip Antennas; Rectangular Waveguides; Resonators

20050169252 Vigo Univ., Vigo, Spain, Vigo Univ., Vigo, Spain
Statistics for the Determination of Propagation Parameters from Polarimetric Radar Data
Antar, Y. M. M.; SantalladelRio, V.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 822-825; In English; See also 20050169243; Copyright; Avail: Other Sources

Besides attenuation, propagation media often present some anisotropy. As a consequence different polarizations present different propagation constants that lead to differential attenuation, differential phase shift and hence depolarization of the waves. Any application that considers polarization related information requires accounting for and correcting those effects prior to any data analysis or results interpretation. Therefore, statistical characterization of propagation parameters is needed for accurate estimation as well as comparison of algorithms performance.
Author
Polarimetry; Radar Data; Algorithms; Correction; Phase Shift

20050169254 Southeast Univ., Nanjing, China
Electromagnetic Scattering by a Bianisotropic Cylinder
Zhang, Ming; Hong, Wei; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 910-913; In English; See also 20050169243; Copyright; Avail: Other Sources

The problem of electromagnetic scattering by a homogeneous general uniaxial bianisotropic cylinder of arbitrary cross section is investigated first time via the Generalized Multipole Technique(GMT) where only the longitudinal fictitious electric and magnetic filament currents are involved. Computed results of the internal field and bistatic echo width are presented, in which the results for circular cylinder is in good agreement with exact solution.
Author
Electromagnetic Scattering; Circular Cylinders; Anisotropic Shells

20050169260 Essex Univ., Colchester, UK
Numerical Modeling of V-Shaped Linearly Tapered Slot Antennas
Wang, H. Y.; Mirshekar-Syahkal, D.; Dilworth, I. J.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1118-1121; In English; See also 20050169243; Copyright; Avail: Other Sources

Efficiency, bandwidth, light weight and geometric simplicity are among the most crucial requirements for antennas designed for some specific applications, such as airborne radars and communication systems. One of the most desirable candidates catering for these demands is the tapered slot antenna (TSA), which belongs to a group of endfire traveling wave antennas and consists of a tapered slot etched onto a thin film of metal with or without substrate on one side of the film. The

most attractive features of the TSAs in contrast to other kinds of planar antennas are that it can work over a large frequency bandwidth and produce a symmetric endfire beam with appreciable gain and low sidelobes. This paper reports a study of a V-shaped linearly tapered slot antenna (V-LTSA) proposed in reference by employing the spectral domain method (SDM). The method is based on the exact Green's function and the moment method procedure in the spectral domain to obtain the reflection coefficient and the unknown electric currents on the antennas. The currents are approximated by subsectional basis functions in both transverse and propagation directions. Several examples of the V-LTSA have been examined using the piecewise sinusoidal and roof-top basis functions, respectively. Results are presented for reflection coefficients, equivalent circuit parameters and current distributions, some of which are validated by measured results and those obtained from the FDTD.
Author
Mathematical Models; Slot Antennas; Efficiency; Bandwidth; Antenna Design

20050169262 Saab Ericsson Space A.B., Goeteborg, Sweden
X-Band Microstrip Array Antenna in Suspended Technology
Baracco, J. M.; Carlstrom, A.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1256-1259; In English; See also 20050169243; Copyright; Avail: Other Sources

Future spaceborne synthetic aperture radar (SAR) instruments for high resolution mapping of the Earth will require dual polarized phased array antennas with large frequency bandwidths and high efficiencies. A novel type of dual polarized microstrip array antenna has been developed for C or X band SAR application. The radiating element is made of two perpendicular grids which gives a reduced surface area and good port to port and cross-polarisation isolation. An array of these elements working at X-band has been manufactured in flight representative suspended technology. The technology is based on thin dielectric layers suspended in air which reduces losses and surface wave coupling.
Author
Microstrip Antennas; Antenna Arrays; Surface Waves; Microwave Antennas; C Band

20050169263 Belgrade Univ., Yugoslavia
Ultrawideband Printed Antenna Array for 60 GHz Frequency Range
Nesic, Aleksandar; Radnovic, Ivana; Brankovic, Veselin; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1272-1275; In English; See also 20050169243; Copyright; Avail: Other Sources

The paper presents a two-dimensional ultrawideband printed antenna array of 64 pentagonal dipoles operating at 60 GHz range. Shape and dimensions of the dipoles are optimized to obtain as wide as possible bandwidth. The bandwidth is greater than 30%, gain is between 22 dB and 23.5 dB, sidelobe suppression is better than 10 dB, and crosspolarization suppression greater than 35 dB.
Author
Broadband; Antenna Arrays; Dipole Antennas

20050169264 Hughes Missile Systems Co., Tucson, AZ, USA
Conformal Microstrip Patch Circular Array with Orthogonal Conformal Stripline Feed and All-Angle Transition
Cock, Robert T.; Cook, Ryan D.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1292-1295; In English; See also 20050169243; Copyright; Avail: Other Sources

A prototype Ku-band, 32-element, circular microstrip patch array connected to a conformal stripline feed with an orthogonal all-angle transition was designed, fabricated and tested. The low cost antenna uses standard printed circuit technology. It shows the antenna which consists of a stripline feed conformally encased in a metal ring orthogonal to microstrip patch radiating elements which are etched on the front Duriod 5880 ring. The calculated pattern and predicted gain agreed quite well with the measured array prototype patterns and gain. The circular array configuration is of very practical interest and spans many system uses.
Author
Microstrip Antennas; Circular Plates; Superhigh Frequencies

20050169266 Hughes Space and Communications Co., Los Angeles, CA, USA
Shaped Reflector Antenna Configurations for Generating a Rotatable Elliptical Spot Beam
Law, P. H.; Kresco, D.; Ramanujam, P.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1390-1393; In English; See also 20050169243; Copyright; Avail: Other Sources

Reconfigurable antennas will be an active field of antenna technology in the coming years. A simple beam shape which can be used to illuminate many different regions on the earth is an arbitrary ellipse, which is the best fit ellipse to a given shape. The parameters which define an arbitrary ellipse are the major and minor axes, the orientation and the location of the ellipse with reference to the coverage area (pointing). Limited reconfigurability can be obtained by fixing the axes of the ellipse, allowing arbitrary orientation and pointing. A steerable elliptic spot beam antenna is discussed in. This paper describes three different shaped reflector antenna configurations for generating a rotatable elliptical spot beam.
Author
Antenna Design; Reflector Antennas; Shapes

20050169267 Bremen Univ., Germany
Modal Analysis of Coupled Circular Horns in a Metal Body of Revolution
Reiter, J. M.; Arndt, F.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1430-1433; In English; See also 20050169243; Copyright; Avail: Other Sources

An efficient hybrid technique is described for the rigorous analysis of coupled circular waveguide horns in an arbitrarily shaped finite metal body of revolution. The technique is based on the boundary contour mode matching (BCMM) method with a spherical wave expansion for the inclusion of the outer cluster geometry. To show the usefulness of the method, a three horn cluster is analyzed including the influence of a thick finite metal plate.
Author
Bodies of Revolution; Metal Plates; Coupled Modes; Circular Waveguides; Horn Antennas

20050169268 La Sapienza Univ., Rome, Italy
Theoretical and Experimental Investigations on the 'Stepped' Leaky-Wave Antennas
DiNallo, C.; Frezza, F.; Galli, A.; Lampariello, P.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1446-1449; In English; See also 20050169243; Copyright; Avail: Other Sources

A recently-proposed topology of electronically-scannable radiators, the so-called 'stepped' leaky-wave antenna, is investigated here from both a theoretical and an experimental point of view. Based on quite simple but accurate procedures, the synthesis of this type of antenna is shown to be very effective, allowing the design of arbitrary aperture distributions. On this ground, prototypes of stepped antennas have been built and tested, both of non-tapered and of tapered type for sidelobe control. The results of the measurements confirm the validity of the theoretical analysis and illustrate the interesting perspectives of this class of radiators for microwave and millimeter-wave applications.
Author
Numerical Analysis; Experimentation; Waveguide Antennas

20050169280 ATR Adaptive Communications Research Labs., Kyoto, Japan
Beam Formation by Using Optical Signal Processing Techniques
Ji, Y.; Inagaki, K.; Shibata, O.; Karasawa, Y.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 739-742; In English; See also 20050169243; Copyright; Avail: Other Sources

The basic concept and configuration of the coherent Fourier optical processor for array antenna beam forming and steering were proposed by Koepf in 1984. Although true-time fiber delay technique which allows for an instantaneous bandwidth and squint-free operation is receiving a great attention, the Fouier optical processing is still an attractive approach for the beam shaping, multibeam operation and large element number array feeding. In this paper, we will discuss the array antenna beam forming and multibeam operation controlled by an optical processor which performs signal processing by means of Fourier optics. We also will give the antenna radiation pattern analysis, antenna system parameter evaluation, as well as the comparison with measured data in this paper.
Author
Beamforming; Signal Processing; Optical Data Processing; Antenna Arrays

20050169283 Drexel Univ., Philadelphia, PA, USA
Millimeter Wave over Fiber: A New Approach
Vieira, A. J. C.; deBarros, L. E. M., Jr.; Herezfeld, P. R.; Contarino, V. M.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 774-777; In English; See also 20050169243
Contract(s)/Grant(s): N62269-93-0501; 111/90; NSF INT-90-02289; Copyright; Avail: Other Sources

There is increased demand for high speed fiberoptic links operating in the millimeter wave range with good noise figure

and high dynamic range. These links are used in data communications, multimedia signal distribution, providing fiberoptic access to wireless communications, as well as radar and remote sensing. This paper is concerned with a next approach to millimeter wave fiberoptic links which is examined here in the context of ar optically fed wireless communication system, shown. As cells of the wireles: communication systems become smaller (picocells) in a densely populated area, there is necessity to advance to the millimeter wave region where rapid signal fading occurs. Th(system comprises of a central station, which must provide the millimeter wave subcarrier a., well as the different information channels. The base stations which transmit and receive th(millimeter wave carriers, depicted, must be of low cost.
Derived from text
Millimeter Waves; Fiber Optics; Signal Fading

20050169286 Hacettepe Univ., Ankara, Turkey
Multi-Frequency Electromagnetic Scattering from Inhomogeneous Rectangular Waveguides Using Shifted Frequency Equivalence
Koksal, Adnan; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 812-815; In English; See also 20050169243; Copyright; Avail: Other Sources

In this work, shifted frequency internal equivalency (SFIE) principle is applied to multifrequency electromagnetic scattering problem from a two-dimensional inhomogeneous rectangular waveguide. As is well known, surface integral formulation is only applicable to homogeneous structures, and in volume integral formulation it is necessary to repeat the solution process by generating data at each incident field frequency. Here, it is shown that, volume interaction part of the data may be generated only at a single frequency and be utilized at other frequencies over a wide frequency band. Earlier, we have demonstrated the use of the SFIE principle for one-dimensional problems. In this work, its extension to two-dimensional structures is presented.
Author
Electromagnetic Scattering; Rectangular Waveguides; Frequencies; Equivalence

20050169287 Comlab Telecommunications, Inc., Quebec, Canada
Polarimetric Responses of Underground Targets Using an Hybrid Transfer Function FDTD Method
Luneau, Patrick; Delisle, Gilles Y.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 826-829; In English; See also 20050169243; Copyright; Avail: Other Sources

Polarimetry has become a very powerful tool to enhance the performances of all sort of radar detection systems. However, to the knowledge of the authors, it has found little or no interest up to now for a very special variety of radar systems: ground penetrating radars (GPR). The reason for this is the range at which the target is located. Due to the highly lossy media into which the wave propagates, the transmitting and receiving antennas are generally located close to the ground interface, for a maximum power transfer and a better signal reception. Objects at shallow depths cannot be considered to be in the far field. At the base of radar polarimetry is the scattering matrix which, unfortunately, is defined by the ratios of the scattered to the incident far fields components. Other results, presented elsewhere, have shown that the near field can be obtained easily using a standard FDTD computer code [1] with some modifications. This paper goes a step further by explaining how to compute the far field scattering matrix and the polarimetric responses. The contribution of the interface to the polarimetric responses is also discussed.
Derived from text
Polarimetry; Radar Detection; Targets; Lossy Media; S Matrix Theory

20050169288 Advanced Space Communications Research Lab., Iwamoto, Japan
Pattern Correction in Large Deployable Reflector Antennas with Phased Array Feed
Hariu, Kenichi; Tsunoda, Hiroaki; Kawakami, Yoichi; Noguchi, Tatsubiro; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 844-847; In English; See also 20050169243; Copyright; Avail: Other Sources

Recently, engineers have focused on developing mobile satellite communications systems using GEO, MEO and LEO satellites. We are now studying an on-board antenna for future S-band mobile satellite communications using hand-held terminals. This antenna is carried on a GEO satellite, and consists of a large deployable mesh reflector and a primary feed using an active phased array. It has the advantage of beam forming flexibility. For example, when its radiation pattern changes due to an amplifier problem, we can obtain the desired pattern by adjusting the only excitation phase of the array feed. In this paper,

we will first present the satellite antenna's configuration, then describe pattern correction by adjusting the excitation phase of the array feed.
Author
Antenna Radiation Patterns; Large Deployable Reflector; Mobile Communication Systems; Phased Arrays; Reflector Antennas

20050169292 Aalborg Univ., Aalborg, Denmark
Radiosity: An Approach to Determine the Effect of Rough Surface Scattering in Mobile Scenarios
Kloch, Christian; Andersen, Jorgen Bach; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 890-893; In English; See also 20050169243; Copyright; Avail: Other Sources

In this paper, Radiosity is applied to radio propagation problems showing that the influence of the rough surface is not just included by reducing the specularly reflected component since also contributions from the rest of the surface contribute to the total received power, confirming the cluster theory. Furthermore, the decay factor is determined for both indoor and rural environments and approaches the power of -2 and -2.5, respectively, baving Line Of Sight.
Author
Scattering; Radio Transmission; Surface Geometry

20050169294 Tehran Univ., Tehran, Iran (Islamic Republic of)
Rectangular Microstrip Antenna with a Finite Pyramidal Horn-Shaped Ground Plane
Fayyaz, N.; Hojjat, N.; Safavi-Naeini, S.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 916-919; In English; See also 20050169243; Copyright; Avail: Other Sources

A rectangular microstrip antenna with a pyramidal-shaped ground plane has been designed. A simple theoretical model is presented along with some experimental results The new design has higher gain compared to an ordinary finite ground plane microstrip antenna. It is also shown that it is possible to adjust nulls and the resonance frequencies by varying the inclination angle.
Author
Rectangular Plates; Microstrip Antennas; Design Analysis

20050169305 Bristol Univ., UK
Modelling a Three-Element Printed Dipole Antenna Array Using the FDTD Technique
Hilton, G. S.; Railton, C. J.; Ball, G. J.; Dean, M.; Hume, A. L.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1062-1065; In English; See also 20050169243; Copyright; Avail: Other Sources

This paper shows that Finite-Difference Time-Domain (FDTD) analysis incorporating a graded grid may be used to accurately model a three-element triangular array of printed dipoles. Each element forms a complicated structure that combines the microstrip teedline, balun and dipole. Examples of an input response and an element coupling are presented for the range 2GHz - 14GHz, together with tar-field radiation patterns for one of the elements lit a frequency of 9.3GHz. All the results obtained by the FDTD model run on a low-powered HP 9000 series workstation are compared with measurements of the actual antenna array.
Author
Antenna Arrays; Finite Difference Time Domain Method; Mathematical Models; Dipole Antennas

20050169312 National Taiwan Univ., Taipei, Taiwan, Province of China
Near-Field Scattering by Physical Theory of Diffraction and Shooting and Bouncing
Jeng, Shyh-Kang; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1176-1179; In English; See also 20050169243
Contract(s)/Grant(s): NSC-CS-85-0210-D002-012; Copyright; Avail: Other Sources

The problem of electromagnetic wave scattering is very important in defense applications. The research on this topic was mostly centered on far-field analysis: Assume an incident plane wave, compute its scattered field due to the scatterer, and evaluate the radar cross section (RCS) of the scatterer. When the transmitting and receiving antennas are far from the scatterer, the incident wave can be approximated by a plane wave on every part of the target, the far-field analysis thus applies. However, in practical applications, there are many situations that the distance between the transmitting antenna and the scatterer is not

large enough to treat the field arriving the scatterer as a plane wave. In these conditions the far-field analysis is not valid, and a near-field analysis is necessary.
Author
Electromagnetic Scattering; Radar Cross Sections; Wave Scattering

20050169318 Communications Research Centre, Ottawa, Ontario, Canada
A 20 GHz Active Integrated Multilayer Microstrip Patch Array for Portable Communication Terminals
Lafleur, P.; Roscoe, D. J.; Cuhaci, M.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1260-1263; In English; See also 20050169243; Copyright; Avail: Other Sources

This paper presents a multilayer microstrip array architecture utilizing electromagnetic coupling to reduce feed network complexity, device integration to improve noise performance, and bias integration for simplicity.
Author
Integrated Circuits; Microstrip Antennas; Architecture (Computers)

20050169319 Manitoba Univ., Winnipeg, Manitoba, Canada
Experimental Study of Parasitically Steered, Fixed Beam Microstrip Patch Arrays
Gray, D. P.; Lu, J. W.; Shafai, L.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1276-1279; In English; See also 20050169243; Copyright; Avail: Other Sources

The linearly polarized single feed point Yagi microstrip patch array was developed from the concept of the thin wire Yagi-Uda array. It is possible to build either vertically polarized or horizontally polarized arrays. Both feed points of an array can be excited with the correct amplitude and phasing to produce circular polarization. A Yagi microstrip patch array produces a mainlobe away from the zenith, and has the advantage of being planar for applications such as wireless office. The aim of this paper is to investigate the influence of various characteristics of the dielectric substrate upon array performance and to access the effects of reduction of the array size upon its behavior. The collected experimental data will be useful for comparison to numerical simulations in future work. The linear polarized measurements were undertaken in the anechoic chamber at the University of Manitoba.
Author
Microstrip Antennas; Patch Antennas; Parasitic Elements (Antennas); Yagi Antennas

20050169320 NASA Lewis Research Center, Cleveland, OH, USA
A Spherical to Plane Wave Transformation Using a Reflectarray
Zaman, Afroz J.; Lee, Richard Q.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1284-1287; In English; See also 20050169243; Copyright; Avail: Other Sources

A reflectarray has generally been used as a replacement for a reflector antenna. Using in this capacity, different configurations (prime focus, offset etc.) and various applications (dual frequency, scanning etc.) have been demonstrated with great success. Another potential application that has not been explored previously is the use of reflectarrays to compensate for phase errors in space power combining applications such as space-fed lens and power combining amplifier. In these applications, it is required to convert a spherical wave to a plane wave with proper phase correction added to each element of the reflectarray. This paper reports an experiment to investigate the feasibility of using a reflectarray as an alternative to a lens in space power combining. The experiment involves transforming a spherical wave from a orthomode horn to a plane wave at the horn aperture. The reflcctarray consists of square patches terminated in open stubs to provide necessary phase compensation. In this paper, preliminary results will be presented and the feasibility of such compensation scheme will be discussed.
Author
Antenna Arrays; Reflector Antennas; Phase Error; Replacing

20050169327 TRW Space and Defense Sector, Redondo Beach, CA, USA
Comparison of Abbe Sine Shaped Offset Dual Reflectors
Chan, Ronald; Toland, Brent; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1374-1377; In English; See also 20050169243; Copyright; Avail: Other Sources

Spaceborne Multiple Beam Antennas (MBA's) generally consist of a reflector fed by multiple feeds, with each feed (or cluster) corresponding to a single beam directed at a separate geographic region. In general, spaceborne reflector antennas must provide high aperture efficiency and focusing reflectors are preferred (e.g. paraboloids, conics with eccentricity close to

1.0, or high efficiency surface shapes). Focusing reflector systems provide high aperture efficiency when a feed is located on or near the antenna boresight but gain degrades significantly for feeds that are displaced in the focal plane and can limit the field of regard of the MBA to a few beamwidths about the reflector boresight. Reflector 'scan losses' can be reduced by increasing the equivalent focal length of a dual reflector system. Because long focal length single reflector designs are mechanically untenable, dual reflector configurations are preferred. However, longer equivalent focal lengths require higher gain feeds to efficiently illuminate the reflector, and higher gain feeds have several drawbacks including size, weight and cost. Derived from text

Reflector Antennas; Surface Properties; Spacecraft Antennas

20050169329 TRW Space and Electronics Group, Redondo Beach, CA, USA

A Septet Beam Forming Network for Reflector Multiple-Beam Antennas

Huynh, Son H.; Ho, antony; Chen, C. Harry; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1394-1397; In English; See also 20050169243; Copyright; Avail: Other Sources

The problem of multiple feeds for a reflector (or lens) multiple-beam antenna (MBA) is a long-standing one in the field of microwave antennas. The dilemma is that such a system has either good beam-to-beam crossover or reasonable aperture efficiency, not both. When the feed radiators are small to be placed close enough together to obtain good beam crossover level, the aperture efficiency is poor due to excessive spillover loss. If the spillover loss is cut down using large feed radiators, the beams are too far apart, causing too much gain variation within the coverage. The problem can be overcome using the feed sharing technique. The technique requires a beam forming network (BFN) to share feeds between beams. This paper describes a BFN for a septet MBA, i.e., each beam of the MBA is produced by a 7-feed cluster and two adjacent beams share four feeds. The unique circuit topology of the BFN leads to a reliable, compact, lightweight, and low cost implementation. A breadboard model was fabricated using flight qualified multiple-layer stripline process. The test results verified the design concept and demonstrated the excellent performance of the design.

Author

Septum; Beamforming; Networks; Reflector Antennas; Multibeam Antennas

20050169330 Academy of Sciences (Russia), Nizhny Novgorod, Russia

Time-Domain Far Fields of Reflector Antennas

Skulkin, Sergey P.; Turchin, Victor I.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1414-1416; In English; See also 20050169243; Copyright; Avail: Other Sources

This paper considers the calculation of time-domain far fields radiated from a parabolic reflector antenna which feed by a dipole. The exact expressions are obtained. The results are compared for different parabolic reflectors.

Author

Time Domain Analysis; Far Fields; Parabolic Reflectors; Reflector Antennas; Antenna Radiation Patterns

20050169352 Phillips Lab., Kirtland AFB, NM, USA

Numerical Analysis of Planar Bicone and TEM Horn Array Antennas

McGrath, Daniel T.; Baum, Carl E.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1058-1061; In English; See also 20050169243; Copyright; Avail: Other Sources

Focused radiation of high power radio frequency (RF) transients has previously been achieved using reflector antennas fed by single spark-gap switches. An attractive alternative would use an array of many medium-power sources, which are capable of lower pulse-to-pulse jitter than the spark gaps, and would offer the added advantage of time-delay scanning. This paper presents results of theoretical and numerical modeling of candidate radiating elements for ultrawideband (UWB) arrays. The elements examined are TEM horns that connect to one another at the mouths, and their limiting case, the planar bicone. Derived from text

Antenna Arrays; Numerical Analysis; Planar Structures; Horn Antennas

20050169354 Hughes Aircraft Co., Los Angeles, CA, USA

Planar, Low-Profile, Wideband, Wide-Scan Phased Array Antenna Using Stacked Disc Radiator

Wang, Allen T. S.; Chu, Ruey-Shi; Lee, Kuan Min; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 702-705; In English; See also 20050169243

Contract(s)/Grant(s): N66604-95-C-0821; Copyright; Avail: Other Sources

Many of today's satellite communication and radar systems demand phased array antennas that are wideband and capable

of dual linear or circular polarization. These types of antennas are necessary in order to achieve the desired multifunction operation and polarization diversity. A phased array antenna that satisfies these requirements have been developed. The antenna can provide an octave-bandwidth performance with excellent scan and polarization behavior. More importantly, it is very compact and low-profile in nature. The design of this planar array antenna is described in this paper. Its performance has been validated using waveguide simulator and test array measurements. Some of these results are presented below.
Author
Antenna Arrays; Circular Polarization; Linear Polarization; Radar Antennas; Satellite Communication

20050169356 Karlsruhe Univ., Germany
A Bi-conical Multibeam Antenna for Space Division Multiple Access
Demmerle, Frank; Kern, Stefan; Wiesbeck, Werner; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1082-1085; In English; See also 20050169243; Copyright; Avail: Other Sources

Bi-conical horn antennas are commonly used as high bandwidth omnidirectional antennas for vertical polarisation. They are excited by a TEM-mode in the coaxial feed of the bi-conical antenna, which results in a field distribution in the aperture surface that is independent of the azimuth angle. In a new approach the bi-conical horn antenna is excited by a mixture of TEM- and TE(sub nl)-modes. Single directional beams can be radiated, and the use of multiple feed connectors allows simple and inexpensive implementation of space division multiple access (SDMA). Also up to now not available adaptive antenna pattern synthesis is realised by this set-up. For the excitation of the additional higher modes the coaxial waveguide feeding the bi-conical antenna is overmoded. In the special case shown here the cut-off frequencies for some of the higher modes are given in Figure 1, with an outer radius chosen as 20 mm. Linear superposition of the modes in the coaxial waveguide results in angle dependent electromagnetic fields in the radiating aperture as well. As the field distribution in this surface determines the far-field radiation pattern of the antenna, pattern synthesis can be realised by adequate mode mixing.
Derived from text
Antenna Design; Multibeam Antennas; Multiple Access; Horn Antennas

20050169357 Monash Univ., Melbourne, Australia
Design of Hollow Dielectric Pyramidal Horn Antennas
Palit, Sajal K.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1086-1089; In English; See also 20050169243; Copyright; Avail: Other Sources

Pyramidal horn antenna has extensively been used as a feed element for radio astronomy, satellite communications and in the antenna test bench as a reference antenna for last several decades due to its simplicity in construction, ease of excitation, versatility, large gain and relatively better radiation characteristics at microwave frequencies. Much research work has been devoted to develop improved feed systems utilising corrugated horns in pyramidal and conical shapes to reduce spillover efficiency, cross polarisation losses and increase radiation efficiency. One of the main limitations of a conical horn is its incompatibility with rectangular waveguides though with its tapered aperture distribution in the E-plane exhibit more symmetric beamwidths and reduced side lobe levels than does a conventional pyramidal horn. Over the years much research work has been carried out on dielectric-loaded horns of different geometries to obtain nigh efficiency, low crosspolarisation, low side lobe levels, enhanced bandwidth and pattern shaping capabilities by controlling the amplitude and phase distributions over the aperture. Palit et al have derived radiation fields of solid dielectric and dielectric-loaded pyramidal horns using the step approximation method and found that the computed far field patterns are in good agreement with the measured ones. It seems not much significant work has been done on hollow dielectric pyramidal horn which is light in weight and can find useful use in radio astronomy and satellite communications as a primary feed. The purpose of this paper is to design and confirm the step approximation analysis technique by deriving and computing the radiation fields of the hollow dielectric horn and comparing the values with the measured ones. The field components are derived for hybrid TE(sup x) (sub mn) modes by solving Maxwell's equations. It is found that the computed patterns using Schelkunoff's equivalence principle agree well with the measured patterns.
Derived from text
Dielectrics; Horn Antennas; Antenna Design; Mathematical Models; Satellite Communication

20050169359 Ecole Superieure d'Electricite, Gif-sur-Yvette, France
Regularized Matrix Method for Near-Field Diagnostic Techniques of Phased Array Antennas
Gattoufi, L.; Picard, D.; Samii, Y. Rahmat; Bolomey, J. C.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1066-1069; In English; See also 20050169243; Copyright; Avail: Other Sources

Near-field measurements can be used as diagnostic tools to reconstruct aperture field distribution of planar array antennas and to locate their possible defective elements. In this paper, a regularized matrix method for obtaining the individual element excitation of an array antenna from measured near-fields is presented. A computer simulation is performed to evaluate the effect of various near-field parameters such as the measurement distance and the sample spacing on the reconstruction of the excitation. The validity of the approach has been verified using both synthetic and actual measurements data. Good results have been obtained.
Author
Matrix Methods; Near Fields; Phased Arrays; Mathematical Models; Antenna Design

20050169360 European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands, Siena Univ., Italy
Edge Fringe Approach for the Full-Wave Solution of Large Finite Arrays
Neto, A.; Maci, S.; Sabbandini, M.; Vecchi, G.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1074-1077; In English; See also 20050169243; Copyright; Avail: Other Sources

The electromagnetic modeling of large finite arrays has been the object of recent investigations. A rigorous element by element method of moments (MoM) becomes too complex and computationally inefficient when the size of the array increases, and large finite arrays are often studied by supposing the structure as infinite, thus reducing the numerical efforts to that of a unit cell of the periodic array. The technique proposed, accounts for the edge effects by a windowing approach, which is based on a Physical Optics (PO)-type approximation. This latter approach is attractive for its simplicity, since it requires the same number of unknowns of the infinite array analysis, but may be unsatisfactory in predicting input impedance of elements close to the edge of the array. An interesting hybrid method incorporating a Floquet mode expansion in a Method of Moments (MoM) solution is proposed for an array of strips. In this paper, a Method of Moment (MoM) formulation is suggested, for predicting the distributions of the radiating currents (including those belonging to the edge elements of the array) but retaining a number of unknowns which is comparable with those occurring in the infinite array approach. This formulation is based on an integral equation in which the unknown function is the difference between the exact current distribution on the truncated array and the current distribution pertinent to infinite array. This unknown function can be associated to the field diffracted at the edge of the array by the Floquet modes of the infinite-array. Following this physical interpretation the unknown of the integral equation are efficiently represented by a few entire domain basis functions which are properly shaped.
Derived from text
Mathematical Models; Antenna Arrays; Waveguide Antennas; Electromagnetism

20050169361 Siena Univ., Italy
Edge-Diffracted Floquet Waves at a Truncated Array of Dipoles
Capolino, F.; Neto, A.; Albani, M.; Maci, S.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1078-1081; In English; See also 20050169243; Copyright; Avail: Other Sources

The electromagnetic modeling of large finite arrays has been the object of recent investigations. A rigorous element by element method of moments (MoM) becomes too complex and computationally inefficient when the size increases, so that large arrays are usually studied by supposing the structure as infinite. The technique which is proposed, accounts for the edge effects by a windowing approach, which is based on a Physical Optics (PO)-type approximation and on the active Green's function concept. This latter terminology denotes the near-field radiated by a finite array of elementary sources. To efficiently calculate the active free-space Green's function, a Floquet waves (FWs) representation may be used. This representation allows one to interpret the radiation (or scattering) of a finite phased array as a superposition of FW distributions on the global aperture of the array. Consequently, each FW radiation integral can be asymptotically represented by the FWs themselves plus ray contributions from the edge of the array. In this paper the Green's function of an array of dipoles which is truncated in one dimension and infinite in the other is formulated. The dipoles are considered of uniform amplitude and linearly phased for including a scan beam description. By invoking the locality of the high-frequency phenomena, the actual finite distribution may be treated by using local edges. The problem is firstly formulated by superimposing the near field contributions of each source. Next, the global radiation from the structure is represented in terms of a spectral integral which is asymptotically evaluated.
Derived from text
Floquet Theorem; Dipole Antennas; Antenna Arrays; Approximation; Physical Optics

20050169362 Los Alamos National Lab., NM, USA

Using an Impedance-Modulated Reflector for Passive Communication

Bracht, Roger; Miller, Edmund K.; Kuckertz, Thomas; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1070-1073; In English; See also 20050169243; Copyright; Avail: Other Sources

The idea of using modulated reflectors for communicating is not new. A 1948 IRE Proceedings article considered this possibility, envisioning however that the modulation would need to be achieved by mechanical means, stating that 'Modulation (of a reflector antenna) usually requires mechanical oscillation of large masses, joined into a rigid system by members of insufficient stiffness; thus the upper modulation cutoff frequency becomes unduly low.' In this summary we discuss the alternative of using electronic modulation of its terminating impedance to vary the reflectance of a passive-node antenna (PNA) and demonstrate its practical feasibility in a real system. The system described here was developed specifically to use an impedance-modulated reflector (IMR) as the PNA in a medium range (up to 10s of km), low power (a few watts at the active node), slow-scan video surveillance application using compression technology to permit it to utilize narrowband satellite and telephone channels. An advantage of an IMR in this application is that it is inherently covert and therefore hard to detect. The passive-node hardware can also be made small, lightweight, rugged, reliable and power parsimonious (only a small amount of power is needed to operate the ancillary electronics). The active node in our system uses a Doppler radar as is discussed.

Derived from text

Communicating; Impedance; Reflector Antennas; Modulation

20050169365 Hughes Aircraft Co., Los Angeles, CA, USA

A Multibeam Array Using RF Mixing Feed

Lee, J. J.; Stephens, R. R.; Tangonan, G. L.; Wang, H. T.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 706-709; In English; See also 20050169243; Copyright; Avail: Other Sources

Multiple beams can be produced and independently scanned with a single photonic series feed without using multiple sets of phase shiffers. This is accomplished by mixing two counter-propagating signals to generate the required phase distribution for each beam. The linear progressive phase is proportional to the sum of two control frequencies, but the output frequency is equal to the constant beat frequency controlled by a phase locked loop. This design can be extended to 2-D scan by cascading two such feeds in the two orthogonal planes. Test results of a 2-element (X-band) transmit array constructed to,demonstrate the operation of two simultaneous beams will be reported. -- Recently there is an increasing need to provide shipboard multibeam antennas for the US Navy to achieve global connectivity through the (SHF band) DSCS III satellites. To support T1 data rate (1.544 Mbps) an array size of -3x3 m with 15,000 elements is required. It is not only costly but also difficult to build such a large array with so many elements, phase shifters, drivers, and the associated beam control circuitry. Moreover, the complexity of the beamforming network multiplies when more than one beam is required. Thus, the challenge for an array designer is to develop low cost feed networks and innovative beam scan techniques. This paper presents one potential solution to overcome these problems.

Derived from text

Multibeam Antennas; Antenna Arrays; Radio Frequencies

20050169368 Drexel Univ., Philadelphia, PA, USA

True Time Delay Challenge in Optically Controlled Phased Array Antennas

Daryoush, A. S.; Ghanevati, M.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 732-735; In English; See also 20050169243; Copyright; Avail: Other Sources

Optically fed phased array antennas is a viable solution to realize multibeam antennas for future generation of communication satellites. Squint free beam generation in phased array is assured using true time delay (TIT)) elements. Major efforts of the last couple years are to investigate various realization of the 'ITD elements such that a high beam pointing accuracy is obtained. Most system realizations are directed toward demonstration of various TI'D realization. However, the critical problem of design innovations to reduce the overall size and loss associated with TTD has not been addressed.

Derived from text

Antenna Arrays; Beams (Radiation); Multibeam Antennas

20050169369 Maryland Univ., College Park, MD, USA

Optoelectronic True Time Delay Beamsteering for RF Burst Spread-Spectrum Signal Transmission

Funk, Eric E.; Lee, Chi, H.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 736-738; In English; See also 20050169243; Copyright; Avail: Other Sources

Proven properties of spread-spectrum (SS) RF communications such as interference rejection and large information carrying capability have led to increased use of SS signaling schemes in RF wireless communications systems. Whether the system engineer seeks to increase information carrying capability or operate in a low signal-to-noise ratio environment, communications with a broadband RF signal can increase performance. One might envision an RF bandwidth that is greater than 50% of the RF center frequency. However, in practice, spreading bandwidths are often only a few percent of the center frequency or carrier frequency. A larger spreading bandwidth brings with it the problem of designing directional antennas that will faithfully transmit and receive the SS signal. Conventional phase-steered antenna arrays do not solve the problem since they lead to frequency dependent steering (beam-squint) of the broadband signal. However, photonic beamsteering using true-time delay can be a viable solution to the beam-squint problem. We are now in the process of developing a complete photonically controlled time hopped (TH) spread spectrum communications system. The system transmits and receives short precisely timed bursts of only a few RF cycles. The short bursts lead to SS processing gains on the order of the reciprocal of the transmission duty cycle. The receiver architecture employs picosecond photoconductivity for signal correlation. The system details are discussed in our previous paper. In this paper we focus on an interesting approach to generating, transmitting, and steering the broad-band burst mode signals. In a conventional photonic true-time delay (TTD) phased-array architecture; we could generate our RF signal at a remote transmitter. The RF signal would amplitude modulate a
Author
Beam Steering; Radio Frequencies; Spread Spectrum Transmission; Packets (Communication)

20050169370 Maryland Univ., College Park, MD, USA
Optical Generation of a mHz Linewidth Microwave Signal with a Discriminator-Aided Phase-Locked Loop Using Two Semiconductor Lasers
Fan, Zhencan Frank; Dagenais, Mario; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 766-769; In English; See also 20050169243; Copyright; Avail: Other Sources

Optical beam forming and steering of rf phased array antenna offers interesting advantages over standard microwave techniques, including inherently low transmission losses, large bandwidth and light weight. One important challenge of such a system is to optically generate a microwave carrier with a well controlled frequency. Offset optical phase locking of two semiconductor lasers can be an effective technique to achieve this goal. In our experiment, two external cavity semiconductor lasers were phase locked by using a discriminator aided optical phase locked loop with enhanced acquisition range over previous approaches.
Derived from text
Optical Equipment; Microwaves; Signal Detectors; Discriminators; Semiconductor Lasers

20050169374 Victoria Univ., British Columbia, Canada
Efficient Eigenvalue Analysis of Rectangular Coax for Slot-Fed Patch Antennas
Damaschke, John M.; Amari, Smain; Bornemann, Jens; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 800-801; In English; See also 20050169243; Copyright; Avail: Other Sources

Microstrip patch antennas have been investigated by several authors in the past, using different analysis techniques. With spectral methods, good results for the microstrip resonator can be achieved, but it is not practical to include the feed circuitry in the analysis. This might introduce a considerable error depending on the strength of the coupling between the feed and the patch. In order to account for its influence, the method of moments generally is applied. This, however, requires a considerable computational effort, especially for large matrices, since the elements in the computed matrix are frequency-dependent, and must be computed for each frequency point. An alternative approach is to look at the patch as a very short length of rectangular coax line. On one side it is bound by free space, on the other, by a dielectric layer and an electric wall, the ground plane. A slot in the wall enables aperture-coupling from a microstrip line on the other side of the ground plane. This problem is solved by determining the coupling from the slot to the patch. The first, and most time-consuming step of the analysis is to find the mode spectrum of the coax line and the corresponding field distributions. Therefore, this will be the main topic of this paper.
Derived from text
Spectral Methods; Apertures; Eigenvalues; Efficiency; Patch Antennas

20050169376 Tohoku Univ., Sendai, Japan
Characterization of Fracture Surface by Polarimetric Borehole Radar
Miwa, Takashi; Sato, Motoyuki; Miitsuma, Hiroaki; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 818-821; In English; See also 20050169243; Copyright; Avail: Other Sources

Borehole radars have successfully been applied to various fields such as geological survey, geophysical exploration and subsurface crack measurement. However, only single polarization measurement has been performed in conventional single-hole borehole radar measurement because dipole antennas which radiate electric field parallel to borehole axis are usually used. The radar polarimetry is a promising technique to extract more information such as size, shape, orientation or surface condition of radar targets in borehole radar measurement. We developed a system which uses an axially oriented slot antenna on a conducting thin cylinder which radiates electric field perpendicular to the borehole axis in order to obtain the polarimetric information. We also developed a method to compensate the characteristics in each antenna which gives a target scattering matrix. In this paper, we present the result of application of the polarimetric borehole radar measurement to characterization of surface roughness.
Author
Surface Roughness; Boreholes; Radar Targets; Cracks; Dipole Antennas

20050169377 Chan Technologies, Inc., Kirkland, Quebec, Canada
Focal Plane Beam Synthesis Method for Dielectric Lens Antennas
Chan, K. K.; Gimersky, M.; Pokuls, R.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 836-839; In English; See also 20050169243; Copyright; Avail: Other Sources

The thin spherical dielectric lens is an ideal multiple beam communications satellite antenna operating in the millimetre wave band. Typically, tens to hundreds of simultaneous closely-spaced beams are required. The design goal is to maximize edge-of-coverage gain that is consistent with low alternate beam copolar and crosspolar interference. Each beam is generated by a cluster of feed horns with excitations formed by a low-level beamforming network. The objective here is to develop an efficient procedure for determining the optimum locations, excitations and size of the feeds. The method of focal plane beam synthesis is proposed.
Author
Satellite Antennas; Lens Antennas; Dielectrics; Beamforming

20050169378 NTT Wireless Communications Systems Labs., Yokosuka, Japan
Multibeam Antenna Using a Phased Array Fed Reflector
Ueno, Kenji; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 840-843; In English; See also 20050169243; Copyright; Avail: Other Sources

Communication satellites presented recently achieve global communication coverage by using high gain multibeam satellite antennas. In geostationary satellites, large reflector antennas fed by cluster feeds arranged on the focal plane are common to meet the requirement of high gain and fixed multi-beams. Adopting phased array antennas for a geostationary satellite is attractive because they offer power reallocation according to traffic demand, reconfigurability of beams, and maintainability of beam pointing. Three typical antennas, direct radiating phased array, phased array fed dual reflector, and phased array fed single reflector, are available for this purpose. At the present time, the phased array fed single reflector is the most feasible of these candidates because it eliminates the furl-unfurl problem of a large array or the need for a large subreflector and its supporting structure. This antenna has been studied as a limited scan hybrid antenna since the 1960s, however, it has not been fully developed. Mailloux formulated the maximum beam scan angle with regard to the ratio of the diameters of the reflector and array, but electrical characteristics such as scanning loss were not described. Forti reported an example of a phased array fed reflector antenna for satellite use, but the prospect for larger scale multibeam antennas with high isolation was not clarified.
Derived from text
Multibeam Antennas; Antenna Arrays; Antenna Feeds; Reflector Antennas; Phased Arrays

20050169379 Academy of Sciences of the Ukraine, Kharkov, Ukraine
On the Realization of Superdirectivity Using Passive Scatterers
Veremey, Vladimir; Mittra, Raj; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 894-897; In English; See also 20050169243; Copyright; Avail: Other Sources

The problem of scattering of electromagnetic waves from cavity-backed apertures (CBAs) has received considerable recent attention. Single elements with resonant cavities have been investigated by a number of authors. A thin, cylindrical conducting screen with a longitudinal slot is a simple case of a two-dimensional CBA. An efficient solution to the problem of scattering from the slotted cylinder with a circular cross-section has obtained by using a rigorous approach based on the solution to the Riemann-Hilbert problem in the theory of functions of complex variables. The method has been successfully

applied to the problem of scattering from slotted circular cylinders, and is well-suited for the study of the influence of the resonance of the interior cavity on the characteristics of the scattered fields. Recently, the above method has been generalized to the problem of electromagnetic scattering from thin, two-dimensional screens whose cross-sections can be arbitrary. It is based on the extraction of the principal singular part of the integral equation kernel, and the subsequent inversion of the corresponding operator. This semi-inversion approach reduces the initial boundary value problem to an infinite system of linear algebraic equation of the second kind. The fact that the resulting system is a Fredholm system of the second kind contributes to the numerical efficiency of the method. An important feature of this type of second kind operator is that the condition number of its associated matrix system does not grow with the size of the truncated system, and this makes such a semi-analytic approach especially useful for analyzing scatterers of complex shapes in the resonance region.
Derived from text
Electromagnetic Scattering; Wave Scattering; Apertures; Cavities

20050169382 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Design and Near-Field Measurement Performance Evaluation of the Sea Winds Dual- Beam Reflector Antenna
Hussein, Z.; Rahmat-Samii, Y.; Kellogg, K.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 852-855; In English; See also 20050169243; Copyright; Avail: Other Sources

This paper presents the design and performance evaluation of a lightweight, composite material, elliptical-aperture, parabolic-reflector antenna. The performance characterization is obtained using the cylindrical near-field measurement facility at JPL as shown. The reflector has been designed and calibrated for the SeaWinds spaceborne scatterometer instrument. The instrument operates at Ku-band and is designed to accurately measure wind speed and direction over Earth's ocean surface. The SeaWinds antenna design requires two linearly polarized independent beams pointed at 40 deg.and 46 deg. from nadir as shown. The inner beam, pointed at 40 deg. from nadir, is horizontally polarized with 1.6 in x 1.8 in required beamwidths in the elevation and azimuth planes, respectively. The outer beam, pointed at 46 deg. from nadir, is vertically polarized with 1.4 in x 1.7 in required beamwidths. Noteworthy, the reflector boresight axis is pointed at 43 deg. from nadir. Both beams are required to have the first sidelobe level below -15 dB relative to the peak of the beam.
Derived from text
Performance Tests; Composite Materials; Weight Reduction; Antenna Design; Apertures; Parabolic Reflectors

20050169383 California Univ., Los Angeles, CA, USA
An Inflatable Parabolic Torus Antenna Design for the Soil Moisture Radiation Mission
Hoferer, Robert A.; Rahmat-Samii, Yahya; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 856-859; In English; See also 20050169243
Contract(s)/Grant(s): JPL-4541713-19907; Copyright; Avail: Other Sources

The Inflatable Radiometer Imaging System (IRIS) is a space-borne passive microwave system complementary to the existing Earth Observing System. It is designed to provide global measurements of land-surface soil moisture, surface temperature, vegetation water content and ocean salinity. Global measurement in a two day cycle, recorded with a high spatial resolution of 30 km at low frequencies (1.4 GHz and 2.56 GHz), demands an innovative multi-beam reflector antenna design. The multi-beam reflector antenna tailored to meet these requirements is an offset-fed parabolic torus reflector antenna (PTRA) with a torus tilt angle of 35 , providing 47 beams in a multichannel, conical push-broom shape. PTRAs have been used in the past as earth stations for wide-scan angle applications [2]. Limitations in weight, size and cost have hindered their application in large-scale space-borne systems. Recent developments ill inflated antenna technology by L'Garde have provided the opportunity for proposing space-borne wide-scan angle applications, such as the IRIS.
Derived from text
Inflatable Space Structures; Radiometers; Imaging Techniques; Microwaves; Soil Moisture; Moisture Content; Measuring Instruments

20050169386 Tokyo Inst. of Tech., Tokyo, Japan
Extraction of Errors in the Physical Optics Analysis of Dipole Wave Scattering by a Finite Size Anisotropic Reflector
Ando, Makoto; andrenko, Andrey; Sato, Yoshio; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 886-889; In English; See also 20050169243; Copyright; Avail: Other Sources

This paper verifies the accuracy of physical optics (PO) and discusses the mechanism of its errors' extraction in the analysis of dipole wave scattering by the finite strip array placed on the grounded dielectric disk. The numerical results are compared with the experimental ones for the vertical dipole antenna over the anisotropic reflector. To enhance the accuracy

of calculations, especially in the plane where the discrepancy of numerical results and measurements increases, the Green's function method has been applied to analyze the wave scattering from grounded dielectric slab and excitation of slab's surface modes.
Author
Errors; Excitation; Optics; Anisotropy; Reflectors

20050169387 National Inst. of Standards and Technology, Boulder, CO, USA
Calibration of Polarimetric Radar Systems
Muth, Lorant A.; Wittmann, Ronald C.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 830-833; In English; See also 20050169243; Copyright; Avail: Other Sources

The calibration of reciprocal radar systems has been studied in [1], where it was shown: (1) that full polarimetric calibration of radar systems can remove ero_-polarization errors from the measurements, and (2) that for reciprocal radars Fourier analysis of polarimetric data obtained using a rotating dihedral can reduce noise and background errors in the calibration. To calibrate nonreciprocal radar systems [2], we must obtain full polarimetric data from two objects whose scattering matrices have independent eigenvectors [3]. Thus, in addition to a rotating dihedral, a sphere or a flat plate is needed to solve for the transmitting and receiving characteristics of the system [3,4,5]. We find the current methods of solution of the calibration equations unattractive for the following reasons: (1) noise and clutter rejection is not built into the analysis, and (2) the mathematics seems unnecessarily complicated. In addition to mathematical simplification, several ways to verify data integrity are presented, so that system problems can be detected early in the calibration phase.
Derived from text
Calibrating; Fourier Analysis; Rotating Spheres; Noise Reduction; Polarimetry; Analysis (Mathematics); Radar Transmission

20050169405 Syracuse Univ., NY, USA
Prevention of Signal Cancellation in an Adaptive Space-Time Nulling Problem
Park, Sheeyun; Sarkar, Tapan K.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1040-1043; In English; See also 20050169243; Copyright; Avail: Other Sources

Signal cancellation is a serious problem in adaptive nulling. The problem arises when the actual direction of arrival or Doppler of the signal of interest is slightly off the assumed parameters. Adaptive algorithms consider the signal of interest as a jammer when it is not exactly specified. In this paper, multiple look-direction constraints are used to prevent signal cancellation. This paper outlines the principles and illustrates how multiple look directions can be incorporated in an adaptive Space-Time nulling situation using a deterministic direct data domain approach.
Author
Signal Distortion; Cancellation

20050169410 Nippon Idou Tsushin Corp., Tokyo, Japan
Up-Link Polarization Diversity Measurement for Cellular Communication Systems Using Hand-Held Terminal
Nakano, Masayuki; Aizawa, Susumu; Satoh, Toshio; Matsuoka, Tohru; Arai, Hiroyuki; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1360-1363; In English; See also 20050169243; Copyright; Avail: Other Sources

This paper compares the effectiveness of space and polarization diversity in the up-link of cellular communication systems with many hand-held terminals users. According to our experiments, when the transmitter was a hand-held terminal being attached to one of the ears, polarization diversity was found far more effective than space diversity, especially in line-of.sight areas. This is because the hand-held terminal is almost always held in an inclined position rather than the vertical. The effect of the human body is also Considered to be contributing to this phenomenon. We conclude that polarization diversity is very effective for the cellular communication systems.
Derived from text
Telecommunication; Transmitters; Reception Diversity

20050169424 Air Force Inst. of Tech., Wright-Patterson AFB, OH, USA
On the Concept of Near Field Radar Cross Section
Taylor, James M., Jr.; Terzuoli, Andrew J., Jr.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1172-1175; In English; See also 20050169243; Copyright; Avail: Other Sources

The notion of far field Radar Cross Section (RCS) is intuitively pleasing in that it provides a measure of the scattering

characteristics of an object independent of antenna orientation or range to the object. When the transmitting or receiving antenna of a radar move into the near field, the assumptions made to calculate far field RCS are no longer valid. This paper presents two definitions of near field RCS developed by Lee, Wang, and Labarre, based on variations of the radar range equation: RCSI and RCS2. Results of numerical simulations of a sphere and a square flat plate within the near field showed that these definitions failed to achieve the antenna orientation and range independence observed in far field RCS. The final conclusion drawn from this work is that the only physically meaningful quantity measured in a near field radar scenario is the ratio of the power received to the power transmitted called the power return ratio.
Author
Radar Cross Sections; Scattering; Near Fields

20050169425 Brigham Young Univ., Provo, UT, USA
Diversity Performance of Personal Communications Handset Antennas Near Operator Tissue
Green, Bruce M.; Jensen, Michael A.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1182-1185; In English; See also 20050169243; Copyright; Avail: Other Sources

Previous work shows that antenna diversity helps mitigate multipath fading suffered by personal communications transceivers. However, past diversity studies do not account for the effect that tile operator's tissue and movements have on the received signal envelope. This communication first presents Finite Difference Time Domain (FDTD) simulations estimating the branch correlation coefficients for three different diversity-employing transceivers modeled with and without the presence of the operator. Measured envelope correlation coefficients from two different indoor propagation environments confirm the simulation results showing that excellent diversity performance may be obtained for personal communications antennas in the presence of a human operator.
Author
Communication; Antenna Arrays; Transmitter Receivers; Fading

20050169427 National Cheng Kung Univ., Tainan, Taiwan, Province of China
Numerical Computation of EM Interaction between Human Body and Loop Antennas with Arbitrary Orientation
Chuang, Huey-Ru; Chen, Wen-Tzu; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1186-1189; In English; See also 20050169243; Copyright; Avail: Other Sources

In this paper, numerical simulation of the influence of the human body on the antenna radiation characteristics, such as input impedance, current distribution, radiation pattern, and directive gain, of a circular loop with arbitrary orientation relative to the human body is presented. A 3-D realistically shaped man model (175-cm height) with homogenous muscle phantom is constructed. Coupled integral equations (CIE), which consist of a Pocklington-type integral equation (PIE) and a 3-D volume electric field integral equation (EFIE) with mutual coupling terms, are developed for the loop antenna current and the induced electric field inside the body. The coupled integral equations are solved numerically by the method of moments (MoM). Numerical results of the loop antenna radiation characteristics at 280 MHz in flee space and proximate to the body are presented and compared.
Author
Numerical Analysis; Interactions; Human Body; Loop Antennas; Electric Fields; Orientation

20050169429 National Cheng Kung Univ., Tainan, Taiwan, Province of China
Human Body Coupling Effects on Radiation Characteristics of Superquadric Loop Antennas for Pagers' Application
Chen, Wen-Tzu; Chuang, Huey-Ru; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1190-1193; In English; See also 20050169243; Copyright; Avail: Other Sources

The influence of human body on the antenna radiation characteristics, such as input impedance, current distribution, radiation pattern, radiation effficiency(reduced due to the body absorption), and directive gain/power gain, etc., is a important consideration for pagers' antennas, which are usually a rectangular loop antenna. The superquadric loop is used to approximate the square loop antenna. Since a pager is usually worn on the belt, the pager antenna is in close proximity to the human body and the EM coupling effect will significantly affect the antenna characteristics. In this paper, the approach of coupled integral equations (CIE) and the method of moments (MoM) are employed to numerically simulate the EM coupling effect of the human body on the antenna characteristics of a superquadric loop. A 3-D realistically shaped man model (175 cm height) with homogenous muscle phantom is constructed for numerical simulation. Numerical results of the loop antenna radiation

characteristics at 280 MHz in flee space and proximate to the body are presented and compared.
Author
Human Body; Antenna Radiation Patterns; Current Distribution

20050169432 Brigham Young Univ., Provo, UT, USA
Alternative Antenna Polarization Schemes for Satellite-Handset Links Including Operator Tissue
Jensen, Michael A.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1336-1339; In English; See also 20050169243; Copyright; Avail: Other Sources

A major goal of personal communications networks and services is to provide seamless, ubiquitous wireless communications to the user. For the last several years, several providers have pushed to develop and deploy low-earth orbit satellite constellations which are intended to play a major role in providing this desired world-wide coverage [1]. However, it has recently become evident that the design of a transceiver handset which can link with the satellite network as well as the existing cellular infrastructure presents some challenges. This is particularly true of the antenna, which must provide linearly polarized (LP)isotropic coverage at the cellular frequency band and circularly polarized (CP)hemispherical coverage at two distinct satellite bands. The design of such an antenna is complicated by the fact that the user tissue [2] can significantly degrade the antenna radiation characteristics, particularly for CP elements [3].
Derived from text
Wireless Communication; Antenna Components; Communication Satellites; Data Links; Satellite Constellations; Satellite Networks

20050169435 Chiba Univ., Chiba, Japan
FDTD Analysis of Circularly Polarized Slot Array Antenna Fed by Coplanar Waveguide
Matsuzawa, Shin-ichiro; Ito, Koichi; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1264-1267; In English; See also 20050169243; Copyright; Avail: Other Sources

The popularity of the coplanar waveguide (CPW) has increased significantly in recent years. The main advantage of CPW is easier integration with solid state active devices. Many studies have been made on the antenna such as patch antenna, loop antennas and slot antennas. In this paper, we investigate a linear array of a circularly polarized slot loop antenna fed by CPW by using the FDTD method. The advantages of this antenna are simple structure and easy forming an array without complex feed line.
Author
Slot Antennas; Antenna Arrays; Planar Structures; Waveguides

20050169436 Manitoba Univ., Winnipeg, Manitoba, Canada
Beam Shaping Using Multiple Linear Arrays of Microstrip Slot Antennas
Shafai, Leili; Shafai, L.; Barakat, M.; Sebak, A.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1268-1271; In English; See also 20050169243; Copyright; Avail: Other Sources

Wireless telecommunication systems and analog/digital television applications are allotted the frequency range of 2.5 to 2.7 GHz. This wide frequency band complicates the use of single layer microstrip antennas for these applications, as they cannot easily be constructed for such wideband usage. However, by means of a single layer slotted design a microstrip antenna is implemented to accommodate this bandwidth. Both single-sided and three-sided slotted array antennas were constructed. The single-sided array antenna was used for initial testing, and the three-sided configuration was used to design an omni-directional antenna. Ultimately, directional transmitters and receivers can be fabricated using the studied single-sided array antenna design. The three-sided antenna can be used as an omni-directional transmitter.
Author
Beamforming; Linear Arrays; Microstrip Antennas; Slot Antennas; Antenna Arrays

20050169439 Illinois Univ. at Urbana-Champaign, Urbana, IL, USA
Calculation of SAR and B(sub 1)-Field within Human Head Excited by MRI Birdcage Coils
Chen, J.; Jin, J. M.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1210-1213; In English; See also 20050169243
Contract(s)/Grant(s): NSF ECE-94-57735; Copyright; Avail: Other Sources

Since 1985, birdcage coils have been widely used to generate radiofrequency (RF) pulses for magnetic resonance imaging (MRI) because of their capability to produce a highly homogeneous Bl-field over a large volume within the coil. This is true

even if the coil is loaded with a human body or a human head provided that the frequency of the B(sub 1)-field is low (less than 50 MHz). However, when the birdcage coils are employed for high frequency MRI, the interaction between tile electromagnetic (EM) field and the biological object to be imaged deteriorates the Bl-field homogeneity. Such a deterioration reduces the quality of MR images and causes difficulties for advanced MRI studies such as fimctional MRI and MR spectroscopy. Moreover, the EM interaction at high frequencies also leads to an increased electric field, thus, an increased specific energy absorption rate (SAR) in the biological object, causing concern over the possible adverse effects of Mill on human health. Recently, Jin et al. employed a numerical method to investigate the EM field interaction with the human head using an anatomically accurate three-dimensional (3D) model. The method used the biconjugate gradient (BCG) algorithm in combination with the fast Fourier transform (FFT) to solve a matrix equation resulting from the discretization of an integrodifferential equation representing the original physical problem. The method was suitable to model open MRI coils; however, it has difficulties to model coils with an RF shield, which is often used to reduce the unwanted interactions between the EM fields and the exterior structures. In this work, we employ the finite-difference time-domain (FDTD) method to study this problem. It is found that the FDTD method can effectively model the complex anatomical structure of the human head, the currents in the MRI coil, and the RF shield.
Author
Computation; Synthetic Aperture Radar; Human Body; Head (Anatomy); Magnetic Resonance; Imaging Techniques

20050169442 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Microstrip Reflectarray with Elements Having Variable Rotation Angles
Huang, John; Pogorzelski, Ronald J.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1280-1283; In English; See also 20050169243; Copyright; Avail: Other Sources

Two Ka-band, half-meter diameter, circularly polarized microstrip reflectarrays have been developed. One has identical square patches with variable-length phase delay lines. The other uses identical square patches and delay lines with variable element rotation angles. Although both antennas demonstrated excellent efficiencies, adequate bandwidths, and low average sidelobe and cross-pol levels, the one with variable rotation angles achieved superior overall performance. It is believed that these are electrically the largest microstrip reflectarrays (6924 elements with 42 dB gain) ever developed. It is also the first time that circular polarization has been actually demonstrated using microstrip patch elements. Recent advances in reflectarray technology include the following: An X-band 0.75 m diameter microstrip reflectarray using variable-length phase delay lines which demonstrated a relatively high efficiency of 70% with peak gain of 35 dB; a partial microstrip reflectarray with beam scanning capability; A 27 GHz 0.23m diameter microstrip reflectarray using variable-size patches which achieved a gain of 31 dB at an efficiency of 31%. All these reflectarrays have dual-linear and dual-circular polarization capabilities, but only linear polarizations were demonstrated.
Derived from text
Microstrip Antennas; Reflector Antennas; Rotation; Extremely High Frequencies; Circular Polarization

20050169443 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Super-Low-Mass Spaceborne SAR Array Concepts
Huang, J.; Lou,M.; Caro, E.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1288-1291; In English; See also 20050169243; Copyright; Avail: Other Sources

For Earth remote sensing applications, a synthetic aperture radar (SAR) typically employs an antenna with a fairly long along-track aperture in order to achieve the desired performance. At orbital velocities, the antenna along-track dimension is driven by a careful trade off between resolution, swath width, and available data rate and is independent of wavelength. 10 to 20 m long antennas have been flown or proposed in previous spaceborne SAR designs. To maintain an acceptable electrical flatness across this long aperture, very massive antenna support structures, weighing several hundred kilograms or more, have been used to date. For example, the fixed-beam L-band SeaSat antenna, which used a microstrip array with honeycomb substrate, had a mass of 250 Kg (including deployment mechanism). The beam-scanning L/C/X-band shuttle-based SIR-C antenna has a mass of l,800 Kg. These massive antenna systems generally require a launch vehicle with large stowage volume and heavy-payload-lift capability. To achieve good launch volume efficiency and to reduce payload weight, three super-low-mass array concepts are proposed and described here. With these new concepts, the mass of the future Earth remote sensing SAR antennas is expected to be less than 100 Kg.
Author
Synthetic Aperture Radar; Remote Sensing; Weight Reduction; Swath Width; Seasat Satellites; Honeycomb Structures; Antenna Design

20050169446 Malibu Research Associates, Inc., Calabasas, CA, USA

Design of a Feed-Reflector Configuration to Optimize Performance in the Presence of Large Central Blockage

Oliver, Leslie; Gonzalez, Daniel; Rengarajan, Sembiam; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1382-1385; In English; See also 20050169243; Copyright; Avail: Other Sources

In the case of an existing antenna system, an additional antenna may be required for an auxiliary application. Once a primary system has been designed and developed, available area is at a premium, for applications such as on a spacecraft. Commonly, auxiliary antenna systems would not be considered due to large blockage resulting from existing hardware. It is preferred that the blockage be kept to a minimum in order to minimize the deleterious effects on the gain and sidelobe level of the antenna. Normally, the size and blockage of the auxiliary system are constrained by the parameters of the primary system and are not variable. In a typical reflector antenna configuration, the feed illuminates the reflector with a given edge taper. This type of reflector illumination results in the majority of the energy in the central region, where the blockage effects are the greatest. In the case where large central blockage is unavoidable it would be desirable to have a feed illumination pattern that maximizes illumination in the outer periphery of the reflector and minimizes that in the central region; i.e. a doughnut or toroidal shaped pattern is required.

Derived from text

Antenna Design; Reflector Antennas; Sidelobes

20050169447 Hughes Space and Communications Co., Los Angeles, CA, USA

On the Peak-to-Edge Directivity Performance of a Shaped Reflector Generating a Circular Spot Beam

McCleary, J. C.; Ramanujam, P.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1386-1389; In English; See also 20050169243; Copyright; Avail: Other Sources

The edge-of-coverage directivity is an important figure of merit for a shaped beam antenna. In direct broadcast satellite applications the peak directivity is also an important parameter because of regulatory requirements. In antenna designs, the peak-to-edge ratio of the directivity performance is an indication of the quality of the antenna design. This is especially true in applications where the antenna is optimized for a uniform gain requirement over the coverage area. For simple pencil beams generated by unshaped parabolic reflectors, the peak-to-edge performance for optimum gain performance is about 4.5 dB, depending on the edge taper and the F/D ratio of the reflector. The edge of coverage performance can be improved by using a larger reflector and shaping the reflector to improve the 'gain-area' product. For very large reflector apertures the improvement in the edge-of-coverage directivity is associated with a reduction in the peak directivity and the peak-to-edge ratio. This paper summarizes the results on a set of numerical experiments on the peak-to-edge performance of a shaped reflector antenna for a circular spot beam, as a function of the aperture size. Some of the results are interesting and are contrary to the original notion the authors had that any improvement in the edge-of-coverage directivity is always associated with a reduction in the peak directivity. An attempt has been made to generalize the results so that they can be applied to circular beams of arbitrary size generated from a reflector of arbitrary size.

Author

Performance Prediction; Reflector Antennas; Circular Polarization; Pencil Beams

20050169449 University of Southern California, Los Angeles, CA, USA

Generalized Classical Axially-Symmetric Dual-Reflector Antennas

Moreira, Fernando J. S.; Prata, Aluizio, Jr.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1402-1405; In English; See also 20050169243; Copyright; Avail: Other Sources

Classical axially-symmetric Cassegrain and Gregorian reflectors are widely used in high-gain antenna applications. The main disadvantage of these configurations is the subreflector blockage, which causes a number of deleterious effects. However, this problem can be reduced by decreasing the main-reflector radiation toward the subreflector. This may be accomplished either by shaping both reflectors or by using alternative classical configurations. This work considers the second option by presenting, in an unified way, generalized classical axially-symmetric configurations that prevent, from a Geometrical Optics (GO) stand point, the main-reflector scattered energy from striking the subreflector surface. Starting from initial design variables, closed-form expressions are derived for the relevant surface parameters, as well as for the corresponding aperture field distributions. These expressions can be used as effective design tools to determine the final antenna geometry, or even to establish an initial configuration for a shaping procedure.

Author

Reflector Antennas; Axisymmetric Bodies; Geometrical Optics; Design Analysis; Blocking

20050169452 Prodelin Corp., Conover, NC, USA

Design and Development of Linear and Circular Polarized C-Band Offset Gregorian Reflector Antenna for VSAT Application

Moheb, H.; Robinson, C.; Moldovan, N.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1410-1413; In English; See also 20050169243; Copyright; Avail: Other Sources

Recent advances in communication satellite industry have made it possible to utilize smaller antennas in two-way communications networks, commonly known as VSAT (very small aperture terminal) networks. These typically range in aperture size from 60cms to 4.5m. It is now possible to build a system with antennas having significantly less gain than the conventional 3.8m reflector antenna satisfying the 2 deg. satellite spacing. However, the most driving criteria is to meet the FCC, ITU and similar sidelobe requirements which call for off-main beam radiation to satisfy 29-25 log(theta) envelope for antennas having D/lambda less than 50. For frequency re-use satellites radiation for cross-polarized components frequently have to be controlled to better than 30dB cross-polarization in the 1dB contour. A conventional solution is to use an offset reflector antenna with large focal to diameter ratio (f/d) in order of 1.1 or larger. However, the design and manufacturing of reflector support structure, shipping, and installation costs of such antennas do not allow the full realization of compactness, and possible cost reductions in the communication system. Prodelin has developed an offset Gregorian reflector antenna with main reflector diameter of 2.4m, f/d ratio of 0.6, and RF performance which is designed to meet FCC sidelobe specifications, and ASIASAT, and Eutelsat Standard-M cross-polarization requirements.

Author

C Band; Design Analysis; Development; Circular Polarization; Gregorian Antennas; Reflector Antennas

20050169453 Victoria Univ., British Columbia, Canada

Septum Polarizer Design for Antenna Feeds Produced by Casting

Bornemann, Jens; Amari, Smain; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1422-1425; In English; See also 20050169243; Copyright; Avail: Other Sources

The original septum polarizer design by Chert and Tsandoulas has found many applications, and some modifications. As is obvious from these references, a fair amount of numerical modelling procedures is required to reliably estimate the component's performance with respect to return loss, isolation and axial ratio. Consequently, previous design guidelines have been developed under conditions which simplify the analysis procedure. Those are constant housing dimensions, a constant thickness of the septum, and the noticable absence of any matching elements at the two rectangular waveguide input ports. Only recently has a varying septum thickness been considered in order to keep the overall design short. In practice, however, many septum polarizer components are manufactured by casting. A parameter inherent to this production process is the draft angle, which leads to a linear reduction of housing dimensions with component length and which has been neglected in many polarizer designs over the years. With 25 dB return-loss/isolation and 0.5 dB axial-ratio specifications, however, the draft angle can no longer be neglected, since a slight increase in, e.g., septum thickness can already result in a considerable performance degradation. Therefore, this paper takes the casting manufacturing process fully into account. Moreover, a matching transformers are incorporated under the same restrictions.

Author

Septum; Polarizers; Design Analysis; Antenna Feeds

20050169454 La Sapienza Univ., Rome, Italy

Attractive Features of Leaky-Wave Antennas Based on Ferrite-Loaded Open Waveguides

Baccarelli, P.; DiNallo, C.; Frezza, F.; Galli, A.; Lampariello, P.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1442-1445; In English; See also 20050169243; Copyright; Avail: Other Sources

complete investigation is presented as regards the performances of a class of leaky-wave antennas which are electronically scannable by varying either frequency or magnetization. The basic topology is derivable from that one of a laterally-open rectangular guide, loaded with a transversely-magnetized ferrite rod. It is seen that the characterization of the radiation properties may suitably be achieved by considering a leaky-wave approach also for this kind of structures. A parametric analysis is then developed, based on an innovative transverse resonance technique, expressly extended to nonreciprocal structures. The phase and leakage constants are derived as functions of the involved physical quantities, thus identifying immediately those conditions that may really be useful in the applications. The relevant radiation patterns are then computed with both rigorous and approximate techniques. It is finally shown that, even with simple isotropic sources, such a topology

can present various interesting distinctive features (structural simplicity, wide forward/backward angular beam scannings, etc.).
Author
Ferrites; Waveguides; Antenna Radiation Patterns

20050169455 Siena Univ., Italy
High-Frequency Description of the Kirchhoff-Type Modal Coupling between Open Ended Waveguides
Mioc, F.; Capolino, F.; Sabbadini, M.; Maci, S.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1434-1437; In English; See also 20050169243; Copyright; Avail: Other Sources

The Kirchhoff-type aperture integration (AI) is the simplest way to calculate the radiation from an open-ended waveguide (OEW). Recently, a rigorous equivalence between the field predicted by AI and that radiated by the Physical Optics (PO) wall-current was demonstrated, in which the PO currents are defined as that associated to the unperturbed mode. By using this equivalence, a method for asymptotically reducing the AI into a line integration (LI) of incremental diffraction coefficients along the waveguide edge was presented. A LI representation of the aperture field is well suited for introducing a fringe contribution as provided by the Physical Theory of Diffraction (PTD) or by the Incremental Theory of Diffraction (ITD). In this paper, the equivalence between PO and AI is extended to evaluate the coupling between two OEWs of arbitrary cross-section. Furthermore, a Kirchhoff-type coupling coefficient is derived in terms of a double line integration of incremental coupling coefficients. This may provide a useful tool when the mutual impedance of two modal distributions has to be calculated in the framework of a Method of Moments (MoM) procedure which is formulated in terms of mode-shaped basis functions.
Derived from text
Waveguides; High Frequencies; Kirchhoff Law; Coupled Modes; Apertures

20050169456 Commonwealth Scientific and Industrial Research Organization, Epping, Australia
Cutoff and Bandwidth Characteristics of a Circular Coaxial Waveguide with Four Symmetrically Placed Double Ridges
Zhang, Henry Z.; James, Graeme L.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1454-1457; In English; See also 20050169243; Copyright; Avail: Other Sources

A dielectric-cone-loaded, hybrid-mode feed horn was developed recently for broadband applications. Using the mode-matching method, the analysis showed that the bandwidth of this feed horn is extremely broad, and it can be excited by using a coaxial waveguide for dual-band applications, as shown in Fig. 1. However, the limited bandwidth of the exciting coaxial waveguide inhibits the full potential of the horn to be realised. In order to couple the incoming/outgoing waves from the wideband horn without sacrificing its broad dual-band capability, we propose a coaxial waveguide with four symmetrically placed double ridges, as shown. The cutoff and bandwidth characteristics of the proposed structure are analysed using the modified Ritz-Galerkin method, and the results are compared with those obtained using the finite-element method.
Author
Bandwidth; Waveguides; Circular Plates; Dielectrics; Cones

20050169458 Tokyo Inst. of Tech., Tokyo, Japan
Frequency Characteristics of Alternating-Phase Single-Layer Slotted Waveguide Array with Reduced Narrow Walls
Kimura, Yuichi; Hirokawa, Jiro; Ando, Makoto; Goto, Naohisa; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1450-1453; In English; See also 20050169243; Copyright; Avail: Other Sources

There are strong demands for high gain and mass produceable planar arrays in millimeter wave. These include high speed wireless LAN, automotive collision avoidance radar and various types of millimeter-wave subscriber radio systems. However the planar arrays reported in the literature adopt the microstrip or triplate lines as the feeder, which inherently suffer from serious loss in millimeter-wave frequency. On the other hand, the transmission loss is so negligible for the waveguide that a slotted waveguide array antenna is a leading candidate for high-gain fiat antenna in millimeter-wave frequency. Two types of single-layer slotted waveguide array antenna are shown; the one is cophase type and the other is alternating-phase one. The former has already achieved a high efficiency and a high-gain performance in micro-wave frequency, but is slightly degraded in millimeter-wave frequency due to the incomplete contact between slot plate and groove structure electrically. The electric contact is not important in the latter because no total currents flow across them. Furthermore, all the side-wails can be removed in principle at the center frequency. This reduced side-walls structure is expected to have higher-efficiency than co-phase

feeding type because reduction of side-walls reduces the loss as well as cost for fabrication. But the distance between null points of guided standing wave and slots varies according to frequency change. This results in narrow antenna bandwidth. In this paper, characteristics of single-layer waveguides is surveyed in terms of efficiency and mass produceability. Secondly, bandwidth is evaluated for reduced side-walls antennas.
Author
Frequencies; Slot Antennas; Waveguide Antennas; Antenna Arrays; Fabrication; Walls

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*.

20050165771 National Inst. of Information and Communications Technology, Japan
Review of the National Institute of Information and Communications Technology, Volume 50, Nos. 3/4
September/December 2004; ISSN 1349-3191; 142 pp.; In Japanese; See also 20050165772 - 20050165784; Copyright; Avail: Other Sources

The following topics are discussed: The Single Molecule Nanometry for the Bio-supermolecule Research; Mechanisms of Dynein Functions as Information Processing Devices; Live Cell Imaging by Fluorescence Microscopy; Genome-wide Analysis of Gene Functions; Visual Information and Eye Movement Control in Human Cerebral Cortex; Measurement of Brain Activity by Near Infrared Light; Controlling Intermolecular Interactions using Nano-Structural Molecules; Single Molecular Electronics; Development of Molecular-Beam Apparatus with Spray-jet Technique; Fabrication and Characterization of Nanometer-size Structures Consisting of Organic Molecules; Nanoelectronics Architectures; Design Infrastructure of Large-scale Single-flux-quantum Logic Circuit; and As-grown Growth of MgB2 Thin Films and Fabrication of Josephson Junctions
Derived from text
Data Processing; Imaging Techniques; Information Systems; Molecular Electronics; Molecular Interactions; Near Infrared Radiation; Visual Perception; Logic Circuits; Microscopy

20050165774 National Inst. of Information and Communications Technology, Japan
Design Infrastructure of Large-scale Single-flux-quantum Logic Circuit
Terai, Hirotaka; Wang, Zhen; Review of the National Institute of Information and Communications Technology, Volume 50, Nos. 3/4; September/December 2004, pp. 125-133; In Japanese; See also 20050165771; Copyright; Avail: Other Sources

Single-flux-quantum (SFQ) circuit is a quantum effect device operating by controlling the wave nature of electron. The energy required for the control of SFQ motion is quite low, which enables high-speed logic operation with low power consumption. We have construct- ed design environment of the large-scale SFQ circuit to apply high-end router in the back-bone network. We have so far succeeded to demonstrate the perfect operation of the network switch circuit consisting of more than 5000 Josephson junctions at 30 GHz, showing the availability of our design methodology of large-scale SFQ circuits.
Author
Logic Circuits; Design Analysis; Josephson Junctions; Energy Consumption

20050165778 National Inst. of Information and Communications Technology, Japan
Nanoelectronics Architectures
Peper, Ferdinand; Lee, Jia; Adachi, Susumu; Isokawa, Teijiro; Takada, Yousuke; Matsui, Nobuyuki; Mashiko, Shinro; Review of the National Institute of Information and Communications Technology, Volume 50, Nos. 3/4; September/December 2004, pp. 113-123; In Japanese; See also 20050165771; Copyright; Avail: Other Sources

The ongoing miniaturization of electronics will eventually lead to logic devices and wires with feature sizes of the order of nanometers. These elements need to be organized in an architecture that is suitable to the strict requirements ruling the nanoworld. Key issues to be addressed are (1) how to manufacture nanocircuits, given that current techniques like optical lithography will be impracticable for nanometer scales, (2) how to reduce the substantial heat dissipation associated with the high integration densities, and (3) how to deal with the errors that are to occur with absolute certainty in the manufacturing

and operation of nano- electronics? In this paper we sketch our research efforts in designing architectures meeting these requirements.
Author
Nanotechnology; Electronics; Circuits; Miniaturization; Lithography

20050165779 National Inst. of Information and Communications Technology, Japan
As-grown Growth of MgB2 Thin Films and Fabrication of Josephson Junctions
Shimakage, Hisashi; Wang, Zhen; Review of the National Institute of Information and Communications Technology, Volume 50, Nos. 3/4; September/December 2004, pp. 135-141; In Japanese; See also 20050165771; Copyright; Avail: Other Sources

The as-grown MgB2 made by co-evaporation and sputtering methods were deposited at low substrate temperatures. The critical temperatures were obtained to 35 K and 29 K, respectively. The deposition was achieved at substrate temperature below 300 C, which suggested that these methods are useful for multi-layer depositions. Using the MgB2 thin films, the MgB2/AIN/NbN tri-layer junctions were fabricated. The current voltage characteristics showed the Josephson tunneling currents and gap structures. The critical current density was over 1 kA/sq cm, and the critical current dependence on external magnetic fields showed the ideal modulation properties, which indicated the uniform Josephson currents.
Author
Josephson Junctions; Thin Films; Current Density; Electric Potential; Niobium Compounds; Magnetic Fields; Critical Temperature

20050165780 National Inst. of Information and Communications Technology, Japan
Single Molecular Electronics
Kubota, Tohru; Nagase, Takashi; Hsaegawa, Hiroyuki; Mashiko, Shinro; Review of the National Institute of Information and Communications Technology, Volume 50, Nos. 3/4; September/December 2004, pp. 85-94; In Japanese; See also 20050165771; Copyright; Avail: Other Sources

In recent years, nano-technology may lead to a new way to electronics and many novel electronic devices in the field of information and communications technology. One of these nano-devices, single electron tunneling device using small particles in their systems have been successfully prepared, high-density memory devices, high-speed low power switching devices, high-sensitive electrometer devices and others will be produced in near future. However these are not sufficient. Using an organic molecule as a coulomb island electrode, it is possible to use a potential ability of the molecules. In the present paper, we fabricate the some types of organic SET device, using organic and inorganic insulator, and ultra-narrow nano-gap electrodes, and investigate the electrical properties of these single electron tunneling devices with or without light irradiation. We are making effort to adding specific optical and electronic properties coming from individual organic molecules to our single electron tunneling devices.
Author
Electron Tunneling; Molecular Electronics; Molecules; Electrodes

20050167204 Massachusetts Univ., Amherst, MA USA
Proceedings of the 2004 Antenna Applications Symposium Held in Monticello, Illinois on September 15-17, 2004. Volume 1
Schaubert, Daniel; Sep. 2004; 251 pp.; In English
Contract(s)/Grant(s): ATESRD; F33615-02-D-1283
Report No.(s): AD-A431338; AFRL-SN-HS-TR-2005-016-VOL-1; No Copyright; Avail: CASI; A12, Hardcopy

The Proceedings of the 2004 Antenna Applications Symposium is a collection of state-of-the art papers relating to antenna arrays, millimeter wave antennas, simulation and measurment of antennas, integrated antennas, and antenna bandwidth and radiation inmprovements.
DTIC
Antenna Arrays; Antennas; Conferences

20050167205 Massachusetts Univ., Amherst, MA USA
Proceedings of the 2004 Antenna Applications Symposium Held in Monticello, Illinois on September 15-17, 2004. Volume 2
Schaubert, Daniel; Sep. 2004; 197 pp.; In English
Contract(s)/Grant(s): ATESRD; F33615-02-D-1283
Report No.(s): AD-A431339; AFRL-SN-HS-TR-2005-016-VOL-2; No Copyright; Avail: CASI; A09, Hardcopy

The Proceedings of the 2004 Antenna Applications Symposium is a collection of state-of-the art papers relating to antenna arrays, millimeter wave antennas, simulation and measurment of antennas, integrated antennas, and antenna bandwidth and radiation inmprovements.
DTIC
Antenna Arrays; Antennas; Conferences

20050167223 L-3 Communication Government Services, Inc., Rome, NY USA
RF MEMS Improvement Program
Cohen, Eliot D.; Mar. 2005; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-01-D-0053-0001; DARPA ORDER-M606; Proj-L015
Report No.(s): AD-A431552; AFRL-SN-RS-TR-2005-62; No Copyright; Avail: Defense Technical Information Center (DTIC)

The work performed under this task was in support of DARPA Special Projects Office (SPO) Micro Electro Mechanical Systems (MEMS) switch development efforts. The MEMS programs supported were developed and supervised by various DARPA/SPO program managers. During 2000 and early 2001, it became increasingly apparent that the RF MEMS switches and phase shifters being fabricated by all of the contractors working under various DARPA/SPO programs, that were directed toward using these components in various DoD system applications, suffered from various reliability problems which hampered their ability to function properly. In addition, no packages meeting DARPA's electrical and environmental system demands were available, at an acceptable cost, to house these devices.
DTIC
Microelectromechanical Systems; Radio Frequencies; Switches

20050167241 Army Research Lab., Adelphi, MD USA
Super-Resolution Image Reconstruction From Aliased FLIR Imagery
Young, S. S.; Driggers, Ronald G.; Dec. 2004; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431606; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper presents a super-resolution image reconstruction from a sequence of aliased imagery. The sub-pixel shifts (displacement) among the images are unknown due to uncontrolled natural jitter of the imager. A correlation method is utilized to estimate sub-pixel shifts between each low resolution aliased image with respect to a reference image. An error-energy reduction algorithm is derived to reconstruct the high-resolution alias-free output image by imposing the spatial domain constraint and the spatial frequency domain constraint in an iterative fashion to form the desired alias-free (super-resolved) image. The results of testing the proposed algorithm on the simulated low resolution FLIR (Forward-Looking Infrared) images and real world FLIR images are provided.
DTIC
Flir Detectors; Image Reconstruction; Imagery; Infrared Imagery; Infrared Instruments

20050167259 Rice Univ., Houston, TX USA
Investigation of High-Frequency Charge Dynamics in Nanoscale Structures
Rimberg, Alexander J.; Mar. 2005; 2 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0616
Report No.(s): AD-A431655; ARO-41668.1-EL; No Copyright; Avail: Defense Technical Information Center (DTIC)

This research has focused on use of a radio-frequency single-electron transistor (RF-SET) to detect the motion of individual electrons in nanostructures such as quantum dots (QDs). During the course of this research we have developed strongly coupled RF-SET/QD system and used them to detect individual electron tunneling events on the dot in a time scale as short as 1 mu s. We have also studied the effects of changes in junction resistance on RF-SET operation and by using reduced junction resistances have developed RF-SETs with improved sensitivity and linearity. We are currently extending these techniques to double quantity dot (DQD) systems, which we intend to use to measure the frequency-resolved back action of the RF-SET. Finally, we are investigating the use of microwave independence matching techniques to optimize the performance of our RF-SETs and minimize the time required for detection of individual electrons.
DTIC
Electrons; High Frequencies; Nanostructures (Devices); Radio Frequencies; Transistors

20050167261 Army Research Lab., Adelphi, MD USA

Acoustic Mortar Localization System - Results from OIF

Tenney, Stephen; Mays, Brian; Hillis, David; Tran-Luu, Duong; Houser, Jeffrey; Reiff, Christian; Dec. 2004; 3 pp.; In English; Original contains color illustrations

Report No.(s): AD-A431658; No Copyright; Avail: Defense Technical Information Center (DTIC)

The US Army Research Laboratory developed and deployed an acoustic mortar and rocket detection and locating device, in a little over two months. After receiving a direct request from Iraq, ARL merged components from a number of programs to enable the rapid fielding of this capability. As of mid 2004, four Unattended Transient Acoustic MASINT Systems (UTAMS) have been operated detecting mortar fire, rocket launches and IED's while displaying the localized results. Due to the typically high angle of flight of mortar fire, the acoustic signal of the launch can arrive at the array before the mortar impact. This can provide a short time for advance warning. Results were so successful that the Multi-National Corps Iraq (MNC-I) generated am Operational Needs Statement (ONS) , in addition CJTF76 has requested UTAMS units for Afghanistan. A portable Acoustic Mortar Detection System (AMDS) has also been developed in support of SOCOM. This version is lightweight, low-power, air deployable and automated for mortar launch detection.

DTIC

Acoustic Measurement; Arrays; Audio Equipment; Position (Location); Sound Detecting and Ranging

20050167264 Army Research Lab., Adelphi, MD USA

A Focal Plane Array Ladar System Using Chirped Amplitude Modulation

Stann, Barry; Aliberti, Keith; Dammann, John; Giza, Mark; Redman, Brian; Lawler, William; Simon, Debbie; Ruff, William; Dec. 2004; 3 pp.; In English; Original contains color illustrations

Report No.(s): AD-A431665; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Army Research Laboratory is researching system architectures and components required to build a focal plane array ladar system. In this paper we report on the development of the ladar and its imaging performance.

DTIC

Amplitude Modulation; Focal Plane Devices; Laser Range Finders; Optical Radar

20050167336 Air Force Research Lab., Kirkland AFB, NM USA

Evidence for Hole and Electron Trapping in Plasma Deposited ZrO(2) Thin Films

Chavez, J. R.; Devine, R. A.; Koltunski, L.; Oct. 2001; 4 pp.; In English

Report No.(s): AD-A431899; No Copyright; Avail: Defense Technical Information Center (DTIC)

We have observed electron and hole trapping phenomena in thin films of ZrO?sub 2! obtained by plasma assisted deposition. Limited thickness dependent measurements suggest that the holes are trapped uniformly through the film while the electrons trap at the ZrO?sub 2!/Si interface. Relaxation of the trapped holes occurs rapidly after removal of negative stress (^90% in 15 min), while electron relaxation postpositive stress occurs more slowly (^10% in 100min). Cycling between states of positive trapped charge and negative trapped charge by application of the appropriate stressing voltage was observed.

DTIC

Electron Plasma; Thin Films; Trapping

20050167338 Air Force Research Lab., Kirkland AFB, NM USA

Multi-Octave Spectral Imaging in the Infrared - A Newly Emerging Approach

LeVan, Paul D.; Maestas, Diana; Jan. 2002; 8 pp.; In English

Report No.(s): AD-A431905; No Copyright; Avail: Defense Technical Information Center (DTIC)

A new approach is described for obtaining spectral imagery over a broad range of infrared wavelengths, with high efficiency, and with a single grating element and focal plane array. The approach represents a simplification and mass reduction over the traditional approach involving multiple focal plane arrays, dispersing elements, and optical beamsplitters. The new approach has significant advantages for space-based hyperspectral imagers operating in the infrared over a broad range of wavelengths (e.g., MWIR & LWIR), where the reduction in cryo-cooled mass relative to the multi-channel approach translates into noteworthy savings in cryo-cooling requirements and launch costs. Overlapping grating orders are focused onto a multi-waveband focal plane array in order to create spectral images of a scene simultaneously in multiple wavelength regions. The blaze of the grating is chosen so that all spectral orders are dispersed with high grating efficiency. Such an approach extends the spectral range of dispersive spectrometers to several octaves of wavelength, while preserving the compact

packaging and cryogenic requirements of conventional (one octave) instruments. We conclude with a description of a ground-based demonstration of a dual-octave embodiment of the concept.
DTIC
Focal Plane Devices; Imagery; Imaging Techniques; Infrared Radiation; Octaves; Spectra

20050167361 Army Natick Soldier Center, Natick, MA USA
Wearable Electro-Textiles for Battlefield Awareness
Winterhalter, C. A.; Teverovsky, Justyna; Horowitz, Wendy; Sharma, Vikram; Lee, Kang; Dec. 2004; 3 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431955; No Copyright; Avail: Defense Technical Information Center (DTIC)

This summary describes efforts to develop wearable electronic textiles and connectors to support body worn networking, communications, and battlefield awareness for future service members of the U.S. Army. Products developed include textile-based Universal Serial Bus (USB) and radiating antenna, body conformal spiral bus, fastex connector, and universal snap fastener. All products have been tested and successfully demonstrated in a laboratory setting.
DTIC
Electric Connectors; Metal Fibers; Textiles

20050167381 Virginia Univ., Charlottesville, VA USA
Uncooled Infrared Detector Arrays With Electrostatically Levitated Sensing Elements
Blalock, T.; Reed, M.; Mar. 2005; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-00-1-0498
Report No.(s): AD-A431988; No Copyright; Avail: Defense Technical Information Center (DTIC)

The goals of this project were to develop the technologies necessary to implement a new, non-contacting infrared sensing element. As described in our proposal, the sensing element is to be suspended in tension with electrostatic forces within a pixel cavity. The creation of this structure has required the development of a number of MEMS fabrication techniques. We have also developed new circuit topologies to the novel sensing structure.
DTIC
Detection; Detectors; Electrostatic Charge; Infrared Detectors; Microelectromechanical Systems

20050167416 Army Research Lab., Aberdeen Proving Ground, MD USA
Dielectric Rotman Lens Alternatives for Broadband Multiple Beam Antennas in Multi-Function RF Applications
Kilic, O.; Dec. 2004; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A432071; No Copyright; Avail: Defense Technical Information Center (DTIC)

The U.S. Army Research Laboratory (ARL) is currently pursuing key technologies for the integration of a low-cost communications and radar system that allows performing multiple functionalities with a single system and an antenna. These radar and communication functions include target acquisition, combat identification, weapons guidance, secure point-to-point communications, active protection, networks for situational awareness, and signal intercept. Antennas capable of supporting multiple simultaneous beams that can be scanned over a wide range are desired as part of this objective. Furthermore, these objectives need to be satisfied over a broad band to support multiple functionalities. This paper discusses some of the developments on a printed Rotman lens design in order to achieve these objectives.
DTIC
Alternatives; Antennas; Broadband; Cameras; Dielectrics; Lenses; Multibeam Antennas; Radio Frequencies

20050167456 California Univ., Los Angeles, CA USA
Experimental and Numerical Determination of Micropropulsion Device Efficiencies at Low Reynolds Numbers
Ketsdever, Andrew D.; Clabough, Michael T.; Gimelshein, Sergey F.; Alexeenko, Alina; Sep. 2004; 47 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-2308
Report No.(s): AD-A432127; No Copyright; Avail: Defense Technical Information Center (DTIC)

The need for low thrust propulsion systems for maneuvers on micro- and nano-spacecraft is growing. Low thrust characteristics generally lead to low Reynolds number flows from propulsive devices that utilize nozzle expansions. Low Reynolds number flows of helium and nitrogen through a small conical nozzle and a thin-walled orifice have been investigated both numerically, using the Direct Simulation Monte Carlo technique, and experimentally, using a nano-Newton thrust stand.

For throat Reynolds number less than 100, the nozzle to orifice thrust ratio is less than unity; however, the corresponding ratio of specific impulse remains greater than one for the Reynolds number range from 0.02 to 200. Once the Direct Simulation Monte Carlo model results were verified using experimental thrust and mass flow data, the model was used to investigate the effects of geometrical variations on the conical nozzle's performance. At low Reynolds numbers, improvements to the specific impulse on the order of 4 to 8% were achieved through a combination of decreasing the nozzle length and increasing the nozzle expansion angle relative to the nominal experimental geometry.
DTIC
Efficiency; Low Reynolds Number; Low Thrust Propulsion; Microthrust; Propulsion System Configurations; Propulsion System Performance; Reynolds Number; Spacecraft Propulsion

20050167459 Army Research Lab., Adelphi, MD USA
Shielding Effectiveness Measurements Applied to Safety Assessment Predictions at Picatinny Arsenal
Tesny, Neal; Litz, Marc; Conrad, David; Dilks, Lillian; Apr. 2005; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A432130; ARL-TR-3481; No Copyright; Avail: Defense Technical Information Center (DTIC)

Shielding effectiveness for a screened work area in building 3208 of the Picatinny Arsenal has been measured using techniques and processes defined in MIL-STD 188-125-1. The measured frequency ranges go beyond the MIL-STD 10 MHz to 1 GHz, to include the frequency range of 1 to 10 GHz. The results of the measurements show that attenuation factors provided in the current configuration are sufficient to provide acceptable environmental and safety protection from high-power RF impulse sources radiated from within.
DTIC
Attenuation; Frequencies; Safety; Shielding

20050167734 Michigan Univ., Ann Arbor, MI USA
Relativistic Magnetron Priming Experiments and Theory
Gilgenbach, Ronald M.; Lau, Y. Y.; Mar. 2005; 36 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0089
Report No.(s): AD-A431947; AFRL-SR-AR-TR-05-0127; No Copyright; Avail: CASI; A03, Hardcopy

Microwave/RF priming experiments have been performed on the UM relativistic magnetron. The high power RF priming source (40 kV, non-relativistic magnetron) was obtained on-loan from the Air Force Research Lab. Microwave power output from the AFRL priming magnetron was input into one arm of the three-waveguide extraction system on the relativistic magnetron. The UM/Titan A6 relativistic magnetron was driven by MELBA-C; the ceramic insulator yields 10-8 Torr scale vacuum for quasi-hard-tube conditions. Microwave priming experiments showed mode-beating effects at power levels and frequency detuning consistent with Adler's equation. Effects of microwave priming on start-oscillation time and microwave pulselength were also characterized. Major breakthroughs in this research were the discovery and demonstration of two new magnetron priming techniques: magnetic priming and cathode priming. Magnetic priming was patented by UM (US patent No. 6,872,929).
DTIC
Magnetrons; Microwaves; Radio Frequencies; Oscillations

20050167822 NASA Langley Research Center, Hampton, VA, USA
New Active Remote-sensing Capabilities: Laser Ablation Spectrometer and Lidar Atmospheric Species Profile Measurements
DeYoung, R. J.; Bergstralh, J. T.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: With the anticipated development of high-capacity fission power and electric propulsion for deep-space missions, it will become possible to propose experiments that demand higher power than current technologies (e.g. radioisotope power sources) provide. Jupiter Icy Moons Orbiter (JIMO), the first mission in the Project Prometheus program, will explore the icy moons of Jupiter with a suite of high-capability experiments that take advantage of the high power levels (and indirectly, the high data rates) that fission power affords. This abstract describes two high-capability active-remote-sensing experiments that will be logical candidates for subsequent Prometheus-class missions.
Derived from text
Remote Sensing; Radar Measurement; Laser Applications; Electric Propulsion; Spectrometers; Atmospheric Composition; Fission

20050167882 NASA Langley Research Center, Hampton, VA, USA
Methods for Anticipating Problems with Electrical Wiring
Yost, William T., Inventor; Cramer, K. Elliott, Inventor; Perey, Daniel F., Inventor; January 04, 2005; 10 pp.; In English
Patent Info.: Filed 21 Apr. 2003; US-Patent-6,838,995; US-Patent-Appl-SN-421409; US-Patent-Appl-SN-376364; NASA-Case-LAR-16327-1; No Copyright; Avail: CASI; A02, Hardcopy

Passive and active methods for anticipating problems with electrical wiring are provided. An insulative material in contact with an electrical conductor has at least one impurity that is impregnated in the insulative material and/or disposed thereon. An environment around the electrical conductor is monitored for the presence or the level of the impurity(ies) emanating from the insulative material in the form of a gaseous effluent. An alarm signal is generated when a predetermined level of the gaseous effluent is detected.
Official Gazette of the U.S. Patent and Trademark Office
Wiring; Manufacturing

20050167890 Physics and Electronics Lab. TNO, The Hague, Netherlands
Torpedo Defence System Testbed: Functional Documentation, Part 1
Benders, F. P. A.; Kamstra, M.; Keus, D.; Krom, P. P. J.; vanVeldhoven, E. R.; December 2004; 151 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): A01/KM/625; TNO Proj. 015.29587
Report No.(s): FEL-04-A080-Pt-1; TD-2004-0177-Pt-1; Copyright; Avail: Other Sources

This report, contains the functional description of components that are modelled in the Torpedo Defence System Testbed (TDSTB). Each system modelled in the testbed is composed of several of these components. Systems (ships, torpedo's, decoys and jammers) can be modelled by combining the appropriate components. New systems can be created by replacing one or more of these components.
Author
Torpedoes; Defense Program; Computerized Simulation; Mathematical Models

20050167893 Physics and Electronics Lab. TNO, The Hague, Netherlands
Torpedo Defence System Testbed: User Manual
Kamstra, M.; Witberg, R. R.; December 2004; 33 pp.; In English
Contract(s)/Grant(s): A01/KM/625; TNO Proj. 015.29587
Report No.(s): TD-2004-0208; FEL-04-A086; Copyright; Avail: Other Sources

This report contains the installation and operating procedure for the Torpedo Defence System Testbed (TDSTB). Further, it describes the structure of the model, the relations between modelled objects, and the observers for output collection. This report enables a user with sufficient torpedo knowledge to operate the TDSTB.
Author
Torpedoes; User Manuals (Computer Programs); Computerized Simulation; Underwater Acoustics

20050167894 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands
Study 'Simulation for Ship Design'
vandenBerg, T. W.; Jansen, H.; Brasse, M.; Toxopeus, S. L.; January 2005; 86 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): A02/KM/185; TNO Proj. 015.32277
Report No.(s): TNO-DV1-2004 A138; TD-2004-0 167; Copyright; Avail: Other Sources

In naval Air-to-Air-Warfare, chaff and flares are used to seduce or distract missiles that threaten the ownship. Softkill is an additional and relatively cheap means in the defense against missiles at long range. The optimal defense policy is to create a maximum miss-distance between incoming missile and ownship. The control parameters that are available to effect such a scheme include launching times of submunitions and their respective launch directions. For fixed-mounted launchers the launch direction is influenced by the ship maneuver and wind velocity. The process of determining the optimal set of control values is called softkill scheduling (SKS).The maneuvering performance directly influences the SKS performance. Thus, in a reversed way, systematic study of a variety of optimal softkill scenarios may result in a desirable ship maneuver capability, which in turn can be used to specify maneuver performance requirements for future platforms. This type of usage of simulation models is called Simulation Based Design. The basic idea behind it is to support the design process with a combination of simulation models to derive design specifications. In this activity a case study is performed concerning the influence of ship

maneuverability on the effectiveness of chaff and flare SKS algorithms, using the High Level Architecture for combining simulation models.
Author
Ships; Computerized Simulation; Air to Air Missiles; Systems Engineering

20050168084 NASA Marshall Space Flight Center, Huntsville, AL, USA
Phase Modulator with Terahertz Optical Bandwidth Formed by Multi-Layered Dielectric Stack
Keys, Andrew S., Inventor; Fork, Richard L., Inventor; April 26, 2005; 9 pp.; In English
Patent Info.: Filed 6 Jun. 2001; US-Patent-6,885,779; US-Patent-Appl-SN-877801; NASA-Case-MFS-31565; No Copyright; Avail: CASI; A02, Hardcopy

An optical phase modulator includes a bandpass multilayer stack, formed by a plurality of dielectric layers, preferably of GaAs and AlAs, and having a transmission function related to the refractive index of the layers of the stack, for receiving an optical input signal to be phase modulated. A phase modulator device produces a nonmechanical change in the refractive index of each layer of the stack by, e.g., the injection of free carrier, to provide shifting of the transmission function so as to produce phase modulation of the optical input signal and to thereby produce a phase modulated output signal.
Official Gazette of the U.S. Patent and Trademark Office
Bandwidth; Dielectrics; Phase Modulation; Laminates; Optical Properties

20050168100 National Inst. of Standards and Technology, Gaithersburg, MD
Journal of Research of the National Institute of Standards and Technology, January-February 2005. Volume 110, No. 1
Feb. 28, 2005; 94 pp.; In English
Report No.(s): PB2005-105503; No Copyright; Avail: CASI; A05, Hardcopy

Contents include the following: Details of the 1998 Watt Balance Experiment Determining the Planck Constant; Re-Analysis of the Uncertainty of the 0.895 micro Diameter (NIST SRM (Trade Name) 1690) and the 0.269 micro Diameter (NIST SRM (Trade Name) 1691) Sphere Standards; Slip Correction Measurements of Certified PSL Nanoparticles Using a Nanometer Differential Mobility Analyzer (Nano-DMA) for Knudsen Number From 0. 5 to 83; Measurement of Workability of Fresh Concrete Using a Mixing Truck; and A Survey of Tables of Probability Distributions.
NTIS
Knudsen Flow; Nanoparticles; Spheres

20050168125 Rutherford Appleton Lab., Chilton
InGaAs Infra-red Detector Project
Seller, P.; Manolopoulos, S.; Read, P.; May 28, 2004; 12 pp.; In English
Report No.(s): PB2005-103056; RAL-TR-2004-015; Copyright; Avail: National Technical Information Service (NTIS)

This work was funded by the CCLRC Centre for Instrumentation. The proposal was to connect a commercial InGaAs linear photo diode array to existing CCLRC Xstrip readout chip and perform linear imaging over the InGaAs IR spectral range from 800 nm out to 1. 7 micrometers. The XDAS-10 electronics containing the Xstrip readout IC is a flexible and fast, charge measuring system that can be connected to any photo-diode array. Previously it has shown an advantage in the X-ray spectrum over other multiplexed readout ICs such as the Reticon devices. We have now demonstrate this advantage in the IR region with this quick trial. The array produced will provide unique capabilities for ultrafast spectroscopy for the CLF user community.
NTIS
Indium Gallium Arsenides; Infrared Detectors; Photodiodes

20050168165
11th IEEE International Pulsed Power Conference, Volume I
Cooperstein, Gerald, Editor; Vitkovitsky, Ihor, Editor; [1997]; 894 pp.; In English; 11th IEEE International Pulsed Power Conference, 29 Jun. - 2 Jul. 1997, Baltimore, MD, USA; See also 20050168166 - 20050168294
Report No.(s): IEEE-Catalog-97CH36127-Vol-1; LC-97-80047; Copyright; Avail: Other Sources

Topics covered include: Progress of Pulsed Power Commercial Applications in Japan, The Effect of Pulsed Electrical Fields on Biological Cells, Pulsed Power for Advanced Waste Water Remediation, Pulsed Corona for Gas and Water Treatment, High Energy Electron Beam Joining of Ceramic Components, Super-Power Generator of MM-Waves Driven by

Microsecond Sheet Beam, Window and Cavity Breakdown Caused by High Power Microwaves, and Compact 1mV, 10 Hz Pulser.
Author
Electric Fields; Electric Generators; High Energy Electrons; Pulse Generators; Coronas

20050168166 Academy of Sciences (Russia), Tomsk, Russia
Multi Gap Spark Switches
Kovalchuk, Boris M.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 59-67; In English; See also 20050168165; Copyright; Avail: Other Sources

The subject of the lecture was chosen due to following considerations. Most of people dealing with pulsed power at some moment of their activity were dealing with spark switches. In Russia, there do not exist switches produced by industry. My russian colleagues believe that the spark switch is a very simple device and produce it themselves when necessary. I think that our foreign colleagues are doing the same when the switches produced here by industry do not satisfy some given requirements. Therefore I hope between the Conference participants there exist people which have their own records in this area. A multi gap spark switch is not our invention, of course. There exist a lot of different switch designs, trigger schemes and so on. In the lecture, I will speak about the switches we have produced in previous years and also about the switches we are producing now.
Author
Sparks; Switches; Inventions; High Voltages

20050168168 California Univ., Irvine, CA, USA
Efficiency Limitations for the Plasma Opening Switch Operation
Krasik, Ya. E.; Bystritskii, V. M.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 275-280; In English; See also 20050168165; Copyright; Avail: Other Sources

15 years of extensive research on Plasma Opening Switches (POS) with nanosecond (NPOS) and microsecond (MPOS) time of the conduction phase were focused on the POS potential for the inertia-less current interrupter with inductive storage. It was shown that POS impedance, Zpos approx. = phi(sub (pos)/(Iu-It), (here Iu and It are the upstream and the downstream current at the load, respectively) and its rising rate strongly depend on the duration of the POS conduction phase, tau(sub c), and the current amplitude through the POS. For example, the maximum of NPOS impedance can reach several tens Ohms with dZpos/dt approx. = (5x10(exp 9) - 10(exp 10)Ohm/s in contrast with this the maximum of MPOS impedance does not exceed few of Ohms with dZpos/dt approx. - (5x10(exp 8) - 10(exp 9) Ohm/s. Also, for both NPOS and MPOS the decrease of the impedance with the increase of the conducted current amplitude was observed: with the same conduction of tau(sub c) approx. = 1 micron, MPOS impedance decrease from approx. = 15 Ohm to less than or = 1 Ohm for I(sub u) approx. = 100 kA and I(sub h) approx. = 1MA, respectively.
Derived from text
Effectiveness; Plasmas (Physics); Switches; Operations; Constraints

20050168170 Ioffe (A. F.) Physical-Technical Inst., Saint Petersburg, Russia
High Repetition Frequency Power Nanosecond Pulse Generation
Kardo-Sysoev, A. F.; Zazulin, S. V.; Efanov, V. M.; Lelikov, Y. S.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 420-424; In English; See also 20050168165; Copyright; Avail: Other Sources

New type of semiconductor opening switches - Drift Step Recovery Diodes (DSRD) gave a rise to a new generation of all solid state nanosecond pulsers with peak power up to hundred megawatts. The main advantages of this switches are: long life, very good time stability (low jitter), small sizes, and a respectively simple technology of manufacturing. They have a very important feature as well: the total length of both-plasma pumping and plasma removing cycles are several hundreds (100 - 300) nanoseconds even for high power pulse generation. After the end of the plasma removing cycle, DSRD is in an initial opening state and is ready for the next cycle. Generally speaking, it is possible to generate power pulses at megahertz pulse repetition rates. The presented work is devoted to this mode description.
Author
Semiconductors (Materials); Switches; High Frequencies; Pulse Rate

20050168172 Academy of Sciences (Russia), Moscow, Russia
Pulsed MHD power: State-of-the-art and prospects of development
Zeigamik, Vladimir; Novikov, Victor A.; Rickman, Victor Y.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 503-508; In English; See also 20050168165; Copyright; Avail: Other Sources

The paper presents a review of state-of-the-art in the pulsed MHD power systems and their separate components. Principal attention is given to enhancement of their performance and cost-effectiveness. General application fields of the pulsed MHD power systems are also considered.
Author
Magnetohydrodynamic Generators; Pulse Generators

20050168173 Tetra Corp., Albuquerque, NM, USA
Investigation of a High Voltage Vacuum Insulator for the DARHT Accelerator
Cravey, W. R.; Devlin, G. L.; Mayberry, C. S.; Downing, J. N.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 555-558; In English; See also 20050168165; Copyright; Avail: Other Sources

Tetra has optimized the design of the Microstack vacuum insulator based on previous Microstack results and a specific series of experiments at Tetra's facilities for operation on the DARHT accelerator. Over 30 insulators have been tested with variation in the ratio of insulator to conductor thickness, and various overhangs of the conducting rings relative to the insulator. The insulators were tested on Tetm's MegaMarx generator at electric field levels of greater than 200 kV/cm and pulse-widths of 2 us. A series of tests were conducted to quantify the voltage, flashover characteristics and the leakage current characteristics as a function of the ratio of the conductor overhang to insulation thickness.
Author
High Voltages; Insulators; Vacuum; Electric Fields; Design Analysis; Insulation; Electric Potential

20050168174 State Univ. of New York, Buffalo, NY, USA
Capacitors for High Power Electronics
Sarjeant, W. J.; MacDougall, F. W.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 603-609; In English; See also 20050168165; Copyright; Avail: Other Sources

Many different types of capacitors are available today, most being designed for mounting on circuit boards or other electronic equipment Generally these fall into the classes of ceramic, tantalum, electrolytic, or DC film capacitors. Larger sizes of capacitors are used in applications such as motor drives and kilowatt to multimegawatt average power, power conditioning equipment. These larger capacitors, operating to voltages in excess of 25 kilovolts, have traditionally been manufactured with paper or polypropylene films, or some combination therein, with or without a gas-excluding liquid impregnant This paper is focused on defining the technology issues for next
Author
Capacitors; Electronic Equipment; Circuit Boards; Electric Potential; Metal Films; Polypropylene

20050168175 Los Alamos National Lab., NM, USA
An Overview Of The Atlas Pulsed-Power Systems
Parsons, W. M.; Baldwin, C. C.; Ballard, E. O.; Bartsch, R. R.; Benage, J. F.; Bennett, G. A.; Bowman, D. W.; Cochrane, J. C.; Creager, J.; Davis, H. A., et al.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 673-678; In English; See also 20050168165; Copyright; Avail: Other Sources

Atlas is a facility being designed at Los Alamos National Laboratory (LANL) to perform high energy-density experiments in support of weapon-physics and basic research programs. It is designed to be an international user facility, providing experimental opportunities to researchers from national laboratories and academic institutions. For hydrodynamic experiments, it will be capable of achieving pressures exceeding 20-Mbar in a several cubic centimeters volume. With the development of a suitable opening switch, it will also be capable of producing soft x-rays. The 36-MJ capacitor bank will consist of 240-kV Marx modules arranged around a central target chamber. The Marx modules will be discharged through vertical triplate transmission lines to a parallel plate collector inside the target chamber. The capacitor bank is designed to deliver a peak current of 45 to 50 MA with a 4- to 5-microseconds risetime. The Marx modules are designed to be reconfigured to a 480-kV configuration for opening switch development. Predicted performance with a typical load is presented. Descriptions of the major subsystems are also presented.
Author
General Overviews; Modules; Pulse Modulation; Electric Power Transmission

20050168176 Stanford Univ., Stanford, CA, USA
Pulse Transformer R&D For NLC Klystron Pulse Modulator
Akemoto, M.; Gold, S.; Krasnykh, A.; Koontz, R.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 724-729; In English; See also 20050168165
Contract(s)/Grant(s): DE-AC03-76SF-00515; Copyright; Avail: Other Sources

We have studied a conventional pulse transformer for the NLC klystron pulse modulator. The transformer has been analyzed using a simplified lumped circuit model. It is found that a fast rise time requires low leakage inductance and low distributed capacitance and can be realized by reducing the number of secondary turns, but it produces larger pulse droop and requires a larger core size. After making a tradeoff among these parameters carefully, a conventional pulse transformer with a rise time of 250ns and a pulse droop of 3.6% has been designed and built. The transmission characteristics and pulse time-response were measured. The data were compared with the model. The agreement with the model was good when the measured values were used in the model simulation. The results of the high voltage tests using a klystron load are also presented.
Author
Klystrons; Transformers; Research and Development; Pulse Modulation; Linearity

20050168177 National Univ. of Defense Technology, Changsha, China
Space-Time Distribution Of Pulsed Magnetic Field Within Waveguide-Flanges Boundary
Zhang, Y. Z.; Li, W. Y.; Li, C. L.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 791-795; In English; See also 20050168165; Copyright; Avail: Other Sources

The Space--Time distribution of a pulsed magnetic field in the space within waveguid- flanges boundary was calculated by the use of nonuniform divided coil model and numerical method. The magnetic field line configuration was measured experimently by the patterned iron powder. The results of calculation and measurement were discussed and a problem that should be noticed in the operation design of intense pulsed electron beam accelerator was pointed out.
Author
Flanges; Waveguides; Space-Time Functions; Magnetic Field Configurations; Mathematical Models

20050168178 GNG Enterprises, Inc., Springfield, VA, USA
Simulation of Wire Array Implosions on High-Current Pulsed Power Generators
Golub, T. A.; Gondarenko, N. A.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 832-836; In English; See also 20050168165; Copyright; Avail: Other Sources

A dynamic model for wire array implosion, describing the single wire explosion starting from the solid state, has been developed and applied for simulation of the load on the PBFA-Z accelerator. Current through the single wire is calculated at each instant of time and used for 1D magneto-hydrodynamic simulation of wire dynamics. The model allows to estimate the time when individual wires merge into a plasma shell. Calculations for various number of wires, load diameter, wire array mass for the wire array loads have been performed for the PBFA-Z accelerator. Simulations show that with optimal mass ratio in inner and outer wire arrays, output radiation power for double wire array load could be increased in about a factor of two compared to single wire array configuration.
Author
Wire; Simulation; Electric Generators; Explosions; High Current

20050168180 Academy of Sciences (USSR), Novosibirsk, USSR
Super-power Generator of MN-waves Driven by Microsecond Sheet Beam
Agafonov, M. A.; Arzhannikov, A. V.; Ivanenko, V. G.; Kalinin, P. V.; Kuznetsov, S. A.; Sinitsky, S. L.; Ginzburg, N. S.; Peskov, N. Yu.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 121-126; In English; See also 20050168165; Copyright; Avail: Other Sources

Results of experimental investigations of a powerful mm-band FEM-oscillator driven by a sheet electron beam are presented. For mode selection a planar geometry Bragg resonator was used. Microsecond pulses at a wavelength of 4 mm and power of 200 MW corresponding to record energy per pulse of 200 J were generated. The possibility to increase the energy content of the millimetre wave pulse up to tens kilojoules is discussed.
Author
Electric Generators; Millimeter Waves; Electron Beams

20050168183 Kumamoto Univ., Japan
Wire induced flashover as a source of shock waves for destruction of solid materials
Lisitsyn, I. V.; Muraki, T.; Akiyama, H.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 208-213; In English; See also 20050168165; Copyright; Avail: Other Sources

Explosive wire induced surface flashover has been studied as a promising method for destruction of solid materials. An

experimental investigation of electric parameters in this type of discharge was carried out in order to optimize fuse parameters for maximum efficiency energy transfer into the shock wave. The maximum energy input into the discharge is up to 90 % of the energy stored in the capacitor bank compared to about 20 % if conventional surface flashover in water is utilized. Pressure measurements with calibrated pressure transducers indicated an energy transformation efficiency into shock waves in water of 40-50 % or about 90 % in both solid and liquid media.
Author
Wire; Explosives; Destruction; Shock Waves; Solid Phases

20050168186 Schneider Electronique, Grenoble, France
Dynamic Interactions between a Vacuum Arc and Circuit-breaker Walls
Rowe, Stephen William; Barrault, Michel; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 293-298; In English; See also 20050168165; Copyright; Avail: Other Sources

The spontaneous ignition of cathode spot arcs, on the walls/shield of high power vacuum circuit breakers, is illustrated. This is proposed as an explanation for abnormally high shield currents. Possible triggering mechanisms are discussed in relation to the interactions between the vacuum arc plasma and a fixed potential shield.
Author
Vacuum; Electric Arcs; Circuit Breakers; Electrodynamics; Plasma Interactions

20050168188 Saint Andrew's Univ., UK
Crossed-Field Secondary Emission Electron Source
Saveliev, Y. M.; Sibbett, W.; Parkes, D. M.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 340-345; In English; See also 20050168165; Copyright; Avail: Other Sources

A novel crossed-field secondary-emission (CFSE) electron source that is capable of producing high current tubular electron beams is described. This new electron source is based on the mechanism of secondary emission multiplication of electron current in a magnetron-like device having smooth cylindrical electrodes. The input electron current may be as low as a few mA. The multiplication process starts at the negative slope of an applied voltage pulse. After initiation, the current is extracted from the diode region with no regard to the voltage pulse shape and as a consequence, the CFSE electron source can operate in a long pulse mode. At the diode voltage of approx.40kV for a diode gap of ~6mm, the output current reaches a value of more than 100A. A further increase of current up to 1 kA is feasible.
Author
Crossed Fields; Electric Potential; Electrodes; Electron Beams; Electron Energy; Electron Sources; High Current

20050168189 Los Alamos National Lab., NM, USA
Pegasus II Experiments and Plans for the Atlas Pulsed Power Facility
Shlachter, J. S.; Adams, P. J.; Atchison, W. L.; Bartsch, R. R.; Beage, J. F.; Cochrane, J. C.; Coulter, W. L.; Ekdahl, C. A.; Faehl, R. J.; Fulton, R. D.; Guzik, J., et al.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 361-365; In English; See also 20050168165; Copyright; Avail: Other Sources

Atlas will be a high-energy (36 MJ stored), high-power (approx. 10 TW) pulsed power driver for high energy-density experiments, with an emphasis on hydrodynamics. Scheduled for completion in late 1999, Atlas is designed to produce currents in the 40-50 MA range with a quarter-cycle time of 4-5 microseconds. It will drive implosions of heavy liners (typically 50 g) with implosion velocities exceeding 20 mm/microsecond. Under these conditions very high pressures and magnetic fields are produced. Shock pressures in the 50 Mbar range and pressures exceeding 10 Mbar in an adiabatic compression will be possible. By performing flux compression of a seed field, axial magnetic fields in the 2000 T range may be achieved. A variety of concepts have been identified for the first experimental campaigns on Atlas. These experiments include Rayleigh-Taylor instability studies, convergent (e.g., Bell-Plesset type) instability studies, material strength experiments at very high strain and strain rate, hydrodynamic flows m 3-dimensional geometries, equation of state measurements along the hugoniot and adiabats, transport and shock propagation in dense strongly-coupled plasmas, and atomic and condensed matter studies employing ultra-high magnetic fields. Experimental configurations, associated physics issues, and diagnostic strategies are all under investigation as the design of the Atlas facility proceeds. Near-term proof-of-principle experiments employing the smaller Pegasus II capacitor bank have been identified, and several of these experiments have now been performed. This paper discusses a number of recent Pegasus II experiments and identifies several areas of research presently planned on Atlas.
Author
Convergence; Strongly Coupled Plasmas; Magnetic Field Configurations; Hydrodynamics; Condensed Matter Physics; Strain Rate; Mechanical Properties

20050168190 Los Alamos National Lab., NM, USA

Isentropic Compression of Argon

Veeser, L. R.; Ekdahl, C. A.; Oona, H.; Rodriquez, P. J.; Solem, J. C.; Younger, S. M.; Lewis, W.; Turley, W. D.; Bykov, A. L.; Aseeva, V. V., et al.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 384-389; In English; See also 20050168165; Copyright; Avail: Other Sources

We are studying the transition of argon from an insulator to a conductor by compressing the frozen gas isentropically to pressures at which neighboring atomic orbitals overlap sufficiently to allow some electron motion between atoms. Argon and the other rare gases have closed electron shells and therefore remain monatomic, even when they solidify. Their simple structure makes it likely that any measured change in conductivity is due to changes in the atomic structure, not in molecular configuration. As the crystal is compressed the band gap closes, allowing increased conductivity. We have begun research to determine the conductivity at high pressures, and it is our intention to determine the compression at which the crystal becomes a metal. Details of the equation-of-state calculations will be given by Kress and Collins, paper P2-1 of this conference. Here we describe the experimental techniques. To make the compression as easy as possible (and to simplify the equation-of-state calculations) it is important to keep the sample from heating. Ideally the compression would occur slowly, for example in a diamond anvil cell. However that method cannot attain the pressures of 500 to 700 GPa, or higher, estimated to be necessary for metalization of argon, and the samples would be too small to allow simple, direct methods of measuring their bulk properties, such as the conductivity. Shock compression using explosives or gas guns is often used to get to the pressure range we need, but shock heating greatly reduces the compression. We have chosen instead to do the compression isentropically in an MC-1 flux compression generator _.

Derived from text

Argon; Conductors; Insulators; High Pressure; Gas Pressure; Explosives; Energy Gaps (Solid State); Electron Mobility; Rare Gases

20050168191 Texas Technological Univ., Lubbock, TX, USA

Evaluation of a Russian SOS Diode for use in a Compact Modulator System

Dickens, J.; Kristiansen, M.; Giesselmann, M.; Kim, J. G.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 414-419; In English; See also 20050168165; Copyright; Avail: Other Sources

A Russian Power Modulator, which is based on a diode that has been touted as a high power solid state opening switch (SOS) was characterized and tested. The diode has characteristics similar to those of a step-recovery diode, except that the reverse current density is 10-100 times larger than in US manufactured diodes. The modulator has a DC input voltage of 600 V and produces pulse of 150 kV amplitude and 25 ns half width into a 350 ohm load. The maximum pulse repetition rate is 100 Hz. The limit is given by thermal limitations and can be increased through the use of more effective cooling methods. The pumping system for this modulator uses ferrite cores in the magnetic circuit to minimize losses at high transition frequencies. Measurements of the output voltage, current, power and energy transfer efficiency have been made. In addition, the basic pulse forming circuit was separately build, tested and modeled.

Author

Power Efficiency; Modulators; Pulse Amplitude; Pulse Repetition Rate; Solid State; Switches; Energy Transfer; High Frequencies

20050168192 Tokyo Inst. of Tech., Yokahama, Japan

Diagnostics of Pulsed Ion Beams and Ablation Plumes exhausted from Targets Irradiated by Ion Beams

Kasuya, K.; Ido, D.; Okayama, H.; Ebine, T.; Funatsu, M.; Watanabe, M.; Yasuike, K.; Miyamoto, S.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 436-441; In English; See also 20050168165; Copyright; Avail: Other Sources

Three kinds of experimental results are shown here, With a pinhole camera, we tried to measure the micro-divergence angle of ion beams. A CCD element was then tested as an end plate of a Thomson parabola analyzer. This element was directly irradiated by ion beams to produce electric signals associated with the beams. We also built a cryogenic target which was cooled by liquid nitrogen, and the ice-covered target was irradiated by proton beams to measure the concerned ablation processes.

Author

Ion Beams; Plumes; Targets; Liquid Nitrogen; Diagnosis; Cryogenics; Divergence; Irradiation

20050168195 Academy of Sciences (Russia), Tomsk, Russia

Fast primary energy storage based on linear transformer scheme

Bastrikov, A. N.; Kim, A. A.; Kovalchuk, B. M.; Kumpjak, E. V.; Loginov, S. V.; Manylov, V. I.; Visir, V. A.; Yakovlev, V. P.; Etlicher B.; Chuvatin, A., et al.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 489-502; In English; See also 20050168165; Copyright; Avail: Other Sources

The concept of the primary storage based on linear transformer scheme is well known for many years. The main advantage of the scheme is the ground potential on the capacitor bodies during the shot, allowing to exclude the total output voltage insulation of the highest stages, and to trigger all the stages simultaneously by using an external trigger pulse. The problem was to build a fast linear transformer driver (LTD), providing both high efficiency of energy transfer into the secondary turn and the current rise time below approx. 1 micron, because of relatively high inductance of the caps and the switches.

Derived from text

Energy Storage; Energy Transfer; Switches

20050168196 Texas Technological Univ., Lubbock, TX, USA

A Subnanosecond High Voltage Pulser for the Investigation of Dielectric Breakdown

Mankowski, J.; Dickens, J.; Kristiansen, M.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 549-554; In English; See also 20050168165; Copyright; Avail: Other Sources

A high voltage, sub-nanosecond pulser is designed and built for the purposes of investigating dielectric breakdown. The requirement for the pulser is a voltage pulse of several hundred kilovolts, pulsewidth less than a few nanoseconds, and a risetime \h400 psec. This is achieved by using pulse sharpening techniques on the output of a 500 kV Marx bank. Originally designed to stimulate a lightning strike, the voltage waveform from the Marx generator has a slow decay time of tens of microseconds. In order to obtain a more desirable pulse, the Marx bank is modified. By removing a lumped-element resistor a higher peak output voltage with a faster risetime can be obtained. Circuit simulations have shown the capability of achieving an 800 kV output in less than 40 nsec to a charging (pulse forming) line. The 50 ohm impedance, oil-filled, pulse forming line consists of a peaking gap and pulse slicing gap. The peaking gap decreases the risetime of the applied pulse down to about 300 psec. The pulse slicing gap is included to short the voltage applied to the delay line and test chamber.

Author

Pulse Generators; Dielectrics; Delay Lines; High Voltages; Impedance; Resistors

20050168197 Ohio State Univ., Columbus, OH, USA

A New Category of High-Voltage Pulser Based on Dynamic Plasma Techniques

Turchi, P. J.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 585-590; In English; See also 20050168165; Copyright; Avail: Other Sources

High-speed plasmas generated by low-impedance, pulsed electrical sources are used to displace and compress magnetic flux in a variety of arrangements involving multiturn coils.The output impedance of power from these coils is much higher than the original source impedance, and the output pulse time is much shorter than the input pulse. Dynamic plasma techniques thus provide a new category of high-voltage pulser, capable of simultaneously achieving voltage multiplication and pulsetime compression. Arrangements based on implosion, inverse-pinch and coaxial plasma-gun flows are discussed.

Author

Pulse Generators; High Voltages; Magnetic Flux; Coaxial Flow; Electric Potential; Impedance; Implosions

20050168198 North Star Research Inst., USA

Improvements In Pulse Transformer Performance Achieved Using Pulsed Reset Circuitry

Adler, R. J.; Stein, J.; Ashcraft, B.; Richter-Sand, R. J.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 616-620; In English; See also 20050168165

Contract(s)/Grant(s): DE-FG03-95ER-82040; Copyright; Avail: Other Sources

The pulse transformer is ubiquitous in pulsed power application circuits including radar modulator circuits, particle accelerator circuits, and pulsed plasma implantation circuits. Traditionally these devices have been reset using a DC current source connected to the system via a reset inductor. The power required to reset the system in this manner depends on the resistance of the wire, the convenience of the power supply voltage, the repetition rate, and the requirement for reproducibility. A pulsed reset circuit by contrast is only triggered when required, and it can be programmed to produce a reproducible reset independent of repetition rate. Most importantly, the pulsed reset leads to a decrease in magnetization current of order a factor

of 3 for some conditions materials. In low current applications, this leads to a significant increase in performance when compared to DC Reset.
Author
Circuits; Transformers; Pulse Modulation

20050168199 Sandia National Labs., Albuquerque, NM, USA
Inductive Voltage Adder (Iva) For Submillimeter Radius Electron Beam
Mazarakis, M. G.; Poukey, J. W.; Maenchen, J. E.; Rovang, D. C.; Menge, P. R.; Lash, J. S.; Smith, D. L.; Johnson, d. L.; Halbleib, J. A.; Cordova, S. R., et al.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 642-650; In English; See also 20050168165
Contract(s)/Grant(s): DE-AC04-94AL-85000; Copyright; Avail: Other Sources

We have already demonstrated the utility of inductive voltage adder accelerators for production of small-size electron beams. In our approach, the inductive voltage adder drives a magnetically immersed foilless diode to produce high-energy (10-20 MeV), high-brightness pencil electron beams. This concept was first demonstrated with the successful experiments which converted the linear induction accelerator RADLAC II into an IVA fitted with a small 1-cm radius cathode magnetically immersed foilless diode (RADLAC II/SMILE). We present here fu-st validations of extending this idea to ram-scale electron beams using the SABRE and HERMES-III inductive voltage adders as test beds. The SABRE experiments are already completed and have produced 30-kA, 9-MeV electron beams with envelope diameter of 1.5-mm FWHM. The HERMES-HIII experiments are currently underway.
Author
Electric Potential; Electron Beams; Submillimeter Waves; Inductors; Radii; Linear Accelerators

20050168200 Sumy State Univ., Sumy, Ukraine
A New Principle Of Acceleration Of High Power Pulses Of The Quasineutral Plasmas And Charged Particles
Kutish, Victor V.; Kosel, Peter B.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 667-672; In English; See also 20050168165; Copyright; Avail: Other Sources

A new concept is developed and discussed for the acceleration of charged particles and plasma beams. It is based on the use of an arrangement of orthogonal vortex electric and magnetic fields located in planes which are transverse to the longitudinal axis of the accelerator and are periodically reversed in those planes to produce an EH-undulated field pattern. A number of novel characteristic physical effects of this system have been modeled by theoretical methods based on single particle and self-consistant analysis and those results are presented here.
Author
Charged Particles; Acceleration (Physics); Plasmas (Physics); Electromagnetic Fields

20050168201 Academy of Sciences (Russia), Tomsk, Russia
Syrinx Project: Design Of The Gsi, A 640 Kj Inductive Energy Storage Generator
Avrillaud, G.; Lassalle, F.; Bayol, F.; Foussat, A.; Kovcs, F.; Lample, R.; Leon, J. F.; Mechenin, J.; Monjaux, P.; Morell, A., et al.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 679-686; In English; See also 20050168165; Copyright; Avail: Other Sources

The research module GSI, a 640 kJ inductive energy storage generator, is one of the two prototype candidate to bring the future MAG3 z-pinch load driver into operation. The GSI is made of 4 capacitor banks, a water transmission line, a vacuum storage line and a plasma opening switch. Results of parametrical circuit simulations that have been performed on SABER and SCREAMER to chose its electrical features are given. Also, design details of each element and schedules are presented.
Author
Electric Generators; Electric Energy Storage

20050168202 Academy of Sciences (Russia), Tomsk, Russia
High-Power Ultrawideband Electromagnetic Radiation Generator
Andreev, A.; Bayanov, I.; Efremov, A. M.; Koshelev, V. I.; Kovalchuk, b. M.; Sukbushin, K. N.; Vizir, V. A.; Zurin, V. B.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 730-735; In English; See also 20050168165; Copyright; Avail: Other Sources

High-power ultrawideband electromagnetic pulse generator construction consisting of a bipolar pulse generator and a transmitting antenna is described. Electromagnetic pulse radiation characteristics when exciting a transmitting antenna by the

pulses with the voltage U approximately equal to plus or minus 100 kV, duration tau approximately equal to 3.5 ns, and pulse rate 100 Hz are presented.
Author
Electromagnetic Radiation; Electric Generators; High Voltages

20050168203 Academy of Sciences (USSR), Tomsk, USSR
Numerical Simulation Of Efficient 1.5 Ghz Vircator
Korovin, S. D.; Pegel, I. V.; Polevin, S. D.; Tarakanov, V. P.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 736-741; In English; See also 20050168165; Copyright; Avail: Other Sources

Results of 3D time-dependent numerical simulations of powerful microwave device with virtual cathode and electron beam premodulation are presented. The source does not require external magnetic field and is capable of frequency tuning of approximately 20%.
Author
Cathodes; Three Dimensional Models; Numerical Analysis; Simulation

20050168204 New Mexico Univ., Albuquerque, NM, USA
An Ultrawideband Photonic Crystal Antenna
Agi, K.; Mojahedi, M.; Malloy, K. J.; Schamiloglu, E.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 753-758; In English; See also 20050168165
Contract(s)/Grant(s): DAAH04-96-1-0439; Copyright; Avail: Other Sources

We present the development of a novel ultrawideband antenna structure that uses photonic crystals as a substrate to reflect the energy normally trapped within a substrate into free space. Photonic crystals are three-dimensional periodic structures that exhibit spatial three dimensional filter properties. In order to achieve an ultrawideband photonic crystal, two photonic crystals with different periodicities are stacked in tandem. The stop band of the photonic crystal is used as a distributed reflector of a short pulse that is generated at the surface of the crystal by photoconductively switched planar antennas.
Author
Crystals; Photonics; Antenna Design; Broadband

20050168205 Texas Technological Univ., Lubbock, TX, USA
Diode Polarity Experiments On A Coaxial Vircator
Woolverton, Kevin; Kristiansen, M.; Hatfield, L. L.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 759-764; In English; See also 20050168165; Copyright; Avail: Other Sources

A study on the interaction dynamics of a positively and negatively pulsed coaxial vircator is being performed at Texas Tech University. MAGIC, a 2.5D particle-in-cell code, is used to simulate the different geometries. The simulations performed indicate an increase in efficiency by approximately a factor of 2 for the negatively pulsed system compared to the positively pulsed system. Simulations are also performed to better understand the influencing factors of the systems. This paper describes the experimental results which are performed on a coaxial vircator with diode voltages from 400-500 kV at diode currents of 40-50 kA with pulse durations of approximately 50 nsec. Results that are given include microwave power, efficiency, spectral content and a possible explanation for the results.
Author
Cathodes; Diodes; Polarity; Oscillators

20050168206 All-Russian Scientific Research Inst. of Experimental Physics, Nizhni Novgorod, Russia
Powerful Electron Accelerator 'Covcheg': Status, Parameters And Physical Experiments
Babkin, A. L.; Chelpanov, V. I.; Dubinov, A. E.; Dubinov, E. E.; Hizhnyakov, A. A.; Konovalov, I. V.; Komilov, V. G.; Selemir, V. D.; Zhdanov, V. S.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 765-769; In English; See also 20050168165
Contract(s)/Grant(s): RFFI Proj. 96-02-17047a; Copyright; Avail: Other Sources

Experimental results of investigations accelerator 'COVCHEG' are presented. Possible working regimes of the accelerator are described. Microwave generators of vircator type with grid and plasma anodes, multibeam relativistic TWT are presented.'COVCHEG' facility is a multifunctional system intended to research and develop of powerful microwave generator excited with electron beams. Schematic drawing of the installation is shown.'COVCHEG' installation consist of capacity storage on the basis of four Marx generators GIN-5001 with full energy up to 80 kJ at the voltage of 350 kV, inductive

storage (it is coaxial transmitting line in direct feeding regime of diode) with inductance up to 1microH, the plasma open switch, magnetically insulated diode, anode unit, microwave generator.
Author
Electron Accelerators; Electric Generators

20050168207 Academy of Sciences (USSR), Moscow, USSR
Using of Two-Beams Cathode for Formation of REB with Supershort Front for High-Power MW Generators
Galstjan, E. A.; Kazanskiy, L. N.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 780-785; In English; See also 20050168165; Copyright; Avail: Other Sources

For studying of a REB front influence on the MW pulse duration, it is suggested to use a two-beams field explosive cathode as a source of the REB with very short front duration (1 ns or less). For this purpose, the secondary beam is delayed for the front duration of the primary beam by means of some discharger (gaseous or dielectric surface). The primary beam is captured by a collector and the secondary one is utilized in a MW generator. Calculations show that the secondary beam can carry up to 50% of the total current of the diode. In report we shell show the theoretical ground in details and discuss an experimental verification of this idea.
Author
Relativistic Electron Beams; Accumulators; Cathodes; Pulse Duration; Dischargers

20050168209 Naval Research Lab., Washington, DC, USA
System Study for a Possible Atlas Radiation Option
Commisso, R. J.; Boller, J. R.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 808-814; In English; See also 20050168165; Copyright; Avail: Other Sources

In this paper, we analyze design options for implementing a fuse and a plasma opening switch on the Atlas generator for applications involving radiation production from a Z pinch. Transmission line circuit models of Atlas have been developed that include physics-based electrical models for the opening switches and Z pinch. The kinetic energy of the Atlas imploding Z pinch is calculated for the various design options. The results suggest that the fuse option is inefficient. The plasma opening switch option shows promise, but has scaling issues. This work points out the importance of appropriate values for current limiting resistors when altering the Atlas circuit. These analyses are not complete, but are a starting point from which these design options can be pursued furrier.
Author
Design Analysis; Transmission Lines; Kinetic Energy; Plasmas (Physics); Switches; Implosions

20050168210 Los Alamos National Lab., NM, USA
Determining the Temperature and Density Distributions from a Z-Pinch Radiation Source
Matuska, W.; Lee, H.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 826-831; In English; See also 20050168165; Copyright; Avail: Other Sources

High temperature radiation sources exceeding one hundred eV can be produced via z-pinches using currently available pulsed power. The usual approach to compare the z-pinch simulation and experimental data is to convert the radiation output at the source, whose temperature and density distributions are computed from the 2-D MHD code, into simulated data such as a spectrometer reading. This conversion process involves a radiation transfer calculation through the axially symmetric source, assuming local thermodynamic equilibrium (LTE), and folding the radiation that reaches the detector with the frequency-dependent response function. In this paper we propose a different approach by which we can determine the temperature and density distributions of the radiation source directly from the spatially resolved spectral data. This unfolding process is reliable and unambiguous for the ideal case where LTE holds and the source is axially symmetric. In reality, imperfect LTE and axial symmetry will introduce inaccuracies into the unfolded distributions. We use a parameter optimization routine to find the temperature and density distributions that best fit the data. We know from our past experience that the radiation source resulting from the implosion of a thin foil does not exhibit good axial symmetry. However, recent experiments carried out at Sandia National Laboratory using multiple wire arrays were very promising to achieve reasonably good symmetry. For these experiments our method will provide a valuable diagnostic tool.
Author
Local Thermodynamic Equilibrium; Density Distribution; Temperature Distribution; High Temperature; Radiation Sources; Magnetohydrodynamics; Emission Spectra; Zeta Pinch

20050168211 Troitsk Inst. for Innovation and Thermonuclear Research, Troitsk, Russia

Investigation of Initial Stage Foam Liner Implosion of Angara-5-1

Grabovskii, E. V.; Branitskii, A. v.; Fedulov, M. V.; Frolov, I. N.; Nedoseev, S. L.; Oleinik, G. M.; Smirnov, V. P.; Zurin, M. V.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 837-842; In English; See also 20050168165 Contract(s)/Grant(s): AN-7566; AS-7509; Copyright; Avail: Other Sources

The experiment on the 22mm liner implosion on Angara-5-1 (4 5 MA, 90 ns) have been accomplished. The foam preionization by imploding low density gas corona and exploded wires has been investigated. It was found the foam-plasma transition by current pulse without preionization accompanied by sharp azimuthal nonuniformities. The implosion of rare gas corona onto a foam liner improved significantly the uniformity when specific corona mass m(sub c) with diameter 55 mm was of 0.05M1. However the soft X-ray yield in double liner scheme was not increase in comparison with gas-puff-foam liner combination investigated in previous research. The first experiment on currentless preionization by soft X-ray radiation of exploded wires have been performed. The improving of azimuthal uniformity and stability was observed.

Author

Exploding Wires; Implosions; Foams; Linings; Rarefied Gases; Coronas

20050168212 Forschungszentrum Karlsruhe G.m.b.H., Karlsruhe, Germany

Industrial Applications of High Voltage Pulsed Power Techniques: Developments at Forschungszentrum Karlsruhe (FZK)

Bluhm, H.; Boehme, R.; Frey, W.; Giese, H.; Hoppe, P.; Kessler, G.; Mueller, G.; Neubert, N.; Rusch, D.; Schultheiss, C.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 1-12; In English; See also 20050168165; Copyright; Avail: Other Sources

A broad research and development program has been started at Forschungszentrum Karlsruhe (FZK) to exploit the potential of high voltage pulsed power techniques for industrial applications. All applications are based on the release of an appreciable amount of energy in matter within a very short time interval. Large area thin films are produced on organic foils to improve the water vapor barrier with the help of pulsed electron beam ablation using arrays of channel spark devices. We use large area (\g 1000 sq cm), medium energy (\h 150 keV) pulsed electron beams of up to 40 microsecond pulse duration for surface treatment in combination with deposition techniques to create corrosion and wear resistant surface layers. Other applications utilize the direct pulsed energy release of the high voltage discharge in matter. A cost effective process for the production of large quantities of nanopowder is the explosive electrical discharge through a thin wire. Pulsed discharges in solid materials can lead to fragmentation. This techniques is used in various configurations to fragment concrete as well as electrical appliances for recycling and to grind glass, minerals, etc.

Author

High Voltages; Electric Pulses

20050168213 Nagaoka Technological Univ., Niigata, Japan

Progress of Pulsed Power Commercial Applications in Japan

Yatsui, Kiyoshi; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 13-24; In English; See also 20050168165; Copyright; Avail: Other Sources

A great progress has been achieved in pulsed power technology and its applications in Japan, not only in universities but in industries. At Nagaoka Univ. of Technology, efforts have been carried out on the development of pulsed power technology and the applications in materials science, laser engineering, or inertial confinement fusion. Various kinds of pulsed power generators have been developed such as inductive voltage adder, quickly chargeable Blumlein PFL, and magnetic pulse compressor. In addition to the first demonstration of quick preparation of thin films by an intense pulsed ion-beam ablation plasma (ion beam evaporation), synthesis of ultrafine nanosize powders has been succeeded by rapid cooling of the plasma with the ambient gas molecules. At Kumamoto Univ., R&D of high rep-rate pulsed power generator and its applications have been done on pollution control, rock fraction, railgun, and UV and ozone production. At Himeji Inst. of Tech., experimental studies are carried out on surface modification by the irradiation of pulsed ion beam on targets. Nanostructured crystallites of or amorphous layer of Ni alloy were demonstrated. At Nichicon Capacitor Co. Ltd, various types of pulsed power machines have been developed using step-up transformer, inverter or induction accelerator.

Author

Pulse Generators; Electric Pulses; Research and Development; Japan; Electric Power Supplies

20050168218 Academy of Sciences (Russia), Saint Petersburg, Russia

The Multi-mega-joule Capacitive Energy Stores for Generating Pulses with Large Current Integral

Fridman, B. E.; Rutberg, G.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 509-518; In English; See also 20050168165; Copyright; Avail: Other Sources

The problems of the design multi-mega-joule and multi-mega-ampere capacitive energy stores for generating pulses with large current integral are considered. The essence of these problems is described on an example of E7-25 type Capacitive Energy Store of Institute of Problems of Electrophysics of RAS. The E7-25 energy store was tested and it generated the 10 MA current pulse with current integral up to 5x10(exp 9) A(sup 2)s.

Author

Capacitance; Electrophysics; High Voltages; Pulse Duration; Low Voltage

20050168221 Ohio State Univ., Columbus, OH, USA

Application of Pulsed Power Technology in Non-thermal Food Processing and System Optimization

Qiu, xiangxiao; Tuhela, Laura; Zhang, Q. Howard; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 85-90; In English; See also 20050168165; Copyright; Avail: Other Sources

A pilot plant scale pulsed electric field (PEF) continuous processing system was integrated with an aseptic packaging machine to test and demonstrate the efficacy of PEF technology as a non-thermal food processing method. Major components includes a 40,000 V/17 MWp high voltage pulse generator and a set of multiple stages co-field PEF treatment chambers. Fluid foods could be processed at 50 approx. 150 L/h flow rate and packed aseptically into 200 ml plastic cup containers. System design was discussed and the microbial inactivation effect of lifts integrated PEF system was validated by microbially-enhanced orange juice (MEOJ) tests. The studies on PEF treated, aseptically packaged fresh orange juice indicated that this technology has the potential to extend the product shelf life.

Author

Pulse Generators; Food Processing; Electric Fields; Storage Stability; Service Life; High Voltages

20050168223 Sandia National Labs., Albuquerque, NM, USA

High Energy Electron Beam Joining of Ceramic Components

Turman, B. N.; Glass, S. Jill; Halbleib, John A.; Voth, Thomas E.; Gerstle, Frank P.; Yang, Pin; McKenzie, Bonnie; Clifford, Jerry R.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 115-120; In English; See also 20050168165; Copyright; Avail: Other Sources

High strength, hermetic braze joints between ceramic components have been produced using high energy electron beams. With a penetration depth into a typical ceramic ofapprox. 1 cm for a 10 MeV electron beam, this method provides the capability for rapid, transient brazing operations where temperature control of critical components is essential. The method deposits energy directly into a buried joint, allowing otherwise inaccessible interfaces to be brazed. Because of transient heating, higher thermal conductivity, lower heat capacity, and lower melting temperature of braze metals relative to the ceramic materials, a pulsed high power beam can melt a braze metal without producing excessive ceramic temperatures. We have demonstrated the feasibility of this process related to ceramic coupons as well as ceramic and glass tubes. The transient thermal response was predicted, using as input the energy absorption predicted from the coupled electron-photon transport analysis. The joining experiments were conducted with an RF Linac accelerator at 10-13 MV. 'Ihe repetition rate of the pulsed beam was varied between 8 and 120 Hz, the average beam current was varied between 8 and 120 microamps, and the power was varied up to 1.5 kW. These beam parameters gave a beam power density between 0.2 to 2 kW/sq cm. The duration of the joining runs varied from 5 to 600 sec. Joining experiments have provided high strength between alumina - alumina and alumina- cermet joints in cylindrical geometry. These joints provided good hermetic seals. A series of tests was conducted to determine the minimum beam power and exposure time for producing a hermetic seal.

Author

High Energy Electrons; Electron Beams; Ceramics; Hermetic Seals; Joints (Junctions)

20050168224 Texas Technological Univ., Lubbock, TX, USA

Window and Cavity Breakdown Caused by High Power Microwaves

Neuber, A.; Dickens, J.; Hemmert, D.; Krompholz, H.; Hatfield, L. L.; Kristiansen, M.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 135-140; In English; See also 20050168165; Copyright; Avail: Other Sources

Physical mechanisms leading to microwave breakdown on windows and in cavities are investigated for power levels on the order of 100 MW at 2.85 GHz. The test stand uses a 3 MW magnetron coupled to an S-band traveling wave resonator.

Various configurations of dielectric windows are investigated. In a standard pillbox geometry with a pressure of less than 10(exp -8) tort, surface discharges on an alumina window and multipactor-like discharges starting at the waveguide edges occur simultaneously. To clarify physical mechanisms, window breakdown with purely tangential electrical microwave fields is investigated for special geometries. Other configurations, such as air filled two window setups, relevant for vacuum-air interfaces, can be investigated as well. Diagnostics include the measurement of incident/reflected power, measurement of local microwave fields, discharge luminosity, and x-ray emission. All quantities are recorded with 0.2 to 1 ns resolution. In addition, a framing camera with gating times of 5 ns is used. Based on the experimental results, methods to increase the power density which can be transmitted through windows, such as surface coatings and window profiles, will be investigated as well.
Author
Microwaves; Breakdown; Cavities; Electric Power

20050168225 Academy of Sciences (Russia), Tomsk, Russia
Enhancement of the Electric Strength of Vacuum Insulation by Pulsed Electron Beam Treatment
Batrakov, A. V.; McDaniel, D. H.; Nazarov, D. S.; Ozur, G. E.; Popov, S. A.; Proskurovsky, D. I.; Rotshtein, V. P.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 519-524; In English; See also 20050168165
Contract(s)/Grant(s): SNL-AL-1102; Copyright; Avail: Other Sources

The paper presents the results of a study of the pulsed electric strength of millimeter vacuum gaps with stainless-steel electrodes pre-irradiated with a low-energy, high-current electron beam. With 250-kV, 40-ns pulses, the breakdown strength approx. 2.2 MV/cm has been achieved. The possibility to use the pulsed electron-beam irradiation for treating the parts of the Saturn system with a view to diminishing current leakage is discussed.
Author
Electron Beams; Insulation; Millimeter Waves; Vacuum; Electrodes

20050168226 Old Dominion Univ., Norfolk, VA, USA
Improving of Electrical Vacuum Insulation Between Electro-Grade Graphite Electrodes
Allen, R. J.; Schoenbach, K. H.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 531-536; In English; See also 20050168165; Copyright; Avail: Other Sources

The results of surface modification of electro-grade graphite-electrodes by pulsed high current electron beam with kinetic energy 200 - 500 keV, current density 100 - 2000 A/sq cm, pulse duration 300 ns to increase pulsed electrical insulation of vacuum gaps between these graphite electrodes are considered. An explanation of increasing of electrical insulation due to surface modification is suggested.
Author
Electrical Insulation; Graphite; Pulse Duration; Vacuum; Kinetic Energy; Current Density

20050168227 Academy of Sciences (Russia), Tomsk, Russia
Improved Electrical Insulation of Vacuum Gaps Utilizing SiO(x) Coatings
Vaisburd, David; Tverdokhlebov, Sergey; Tukhfatulin, Timmure; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 543-548; In English; See also 20050168165; Copyright; Avail: Other Sources

Thin film coatings have been applied to metal electrodes in vacuum to increase the breakdown voltage. Through careful cleaning and polishing of uncoated stainless steel electrodes a breakdown field \g50MV/m was obtained with a uniform field over a 1sq cm cathode area. When coated with 2microns of SiO(x) the field emission current was reduced by up to at least three orders of magnitude and the breakdown field was increased to \g100MV/m in every case. Recent improvements in the cleaning procedure of the metal surface have resulted in an increase of the breakdown strength to more than 140MV/m which is the largest field known to have been measured over a large area cathode.
Author
Thin Films; Coatings; Electrical Insulation; Electrodes; Vacuum; Electric Potential

20050168228 Primex Physics International Co., San Leandro, CA, USA
Vacuum Insulator Coating Development
Roth, I. S.; Sincerny, P. S.; Mandelcom, L.; Mendelsohn, M.; Smith, D.; Engel, T. G.; Schlitt, L.; Cooke, C. M.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 537-542; In English; See also 20050168165; Copyright; Avail: Other Sources

We discuss the electrical and mechanical requirements for vacuum insulators in high peak power generators. To increase

the lifetime of these insulators, we have developed a coating called Dendresist. This coating has extended the insulator lifetime on the PITHON, DM2, CASINO, and Double-EAGLE pulse generators. We describe its development, and compare its electrical and mechanical strength to that of other candidate coatings and materials used for vacuum insulators. We discuss the mechanism for discharges through the bulk of the insulator ('worm-holes'), and how to eliminate these failures using thicker insulating rings.
Author
Insulation; Coating; Electric Generators; Pulse Generators; Vacuum

20050168229 Texas Technological Univ., Lubbock, TX, USA
High-Power Critical Electron Emission from Dielectric Induced by Injection of High-Current-Density Electron Beam
Mankowski, J.; Dickens, J.; Kristiansen, M.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 549-554; In English; See also 20050168165; Copyright; Avail: Other Sources

High-current-density electron beams of nanosecond pulse duration are applied for charge injection into various dielectrics to induce the critical electron emission from dielectric into vacuum. It is shown that critical electron emission induced by high-current-density injection of electrons arises in the form of gigantic single pulse, which is of peak value of 10-1000 A and delayed from injection one for 1-20 ns. Delay time depends on the current density of electron beam being injected. The direct experimental evidence is obtained for intense generation of free electrons and holes in subsurface layer of a dielectric due to Poole--Frenkel effect and impact ionization of traps in high electric field. And this process is considered to be the first main reason for the transition of the ordinary low-current-density electron emission to the high-power critical one. The last is not uniform and always accompanied by point explosions on the dielectric surface and ejections of ion plasmas from these points into vacuum. And these explosions are considered as the second main reason for the transition of the ordinary electron emission to the critical one. So the last is explosion electron emission of dielectrics (EEED). If the electron current to the emitting centers on the dielectric surface is maintained at the needed value then the critical electron emission always causes the vacuum discharge between the dielectric surface and metallic collector. The mechanism of EEED is discussed using the computer simulation of the basic processes.
Author
Current Density; High Current; Dielectrics; Pulse Duration; Vacuum; Electron Emission; Injection

20050168230 Academy of Sciences of the Ukraine, Ukraine
A New Electrode Unit for Operating in Liquids with High Specific Conductivity
Vovk, I. T.; Dubovenko, K. V.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 559-565; In English; See also 20050168165; Copyright; Avail: Other Sources

Breakdown in water with high electric conductivity has been investigated with the use of an electrode unit which allows to form layers of low specific conductivity water around the high-potential electrode point. The influence of the layer parameters on the electric field strength distribution and breakdown development has been studied with numerical simulation and experimental methods of oscillography and optical registration. The electric field strength increasing and reducing of the breakdown time is shown to be obtained in the electrode unit proposed.
Author
Electrodes; Liquids; Low Conductivity; Electric Field Strength; Electrical Resistivity

20050168231 All-Russian Scientific Research Inst. of Experimental Physics, Nizhni Novgorod, Russia
Study of High-Energy Liner Compression in HEL-1 Experiment
Chernyshev, V. K.; Mokhov, V. N.; Buzin, V. N.; Burenkov, O. M.; Buijko, A. M.; Vakhrushev, V. V.; Garanin, S. F.; Grinevich, B. E.; Gorbachev, Y. N.; Demidov, V. A.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 566-572; In English; See also 20050168165; Copyright; Avail: Other Sources

High-power facilities able to deliver into the load tens mega-amperes of current for microseconds are applied now world wide to solve a whole set of scientific and applied issues. Now more and more energy and power are required from these facilities. By now several stationary machines have been created such as Pegasus-II (with the energy more than 1 MJ), Shiva-Star (up to 9 MJ), new Atlas facility (for 25 MJ) is in the process of construction and the idea of creating Jupiter (for approx. 100 MJ). Large experience in creation of single action explosive magnetic generators - EMG has been accumulated. VNIIEF has created EMG which can deliver more than 200 MA of current into the load with the full magnetic energy more than 100 MJ. Stationary facilities are more expensive than EMG, but they enable many experiments to be conducted, because the cost of one shot with a stationary machine is less than EMG cost. However, with the increase of energy, released in one

shot on a stationary machine the cost of disposable elements increases, so the cost for one shot increases faster than the energy increases. It is estimated that if the energy of a shot is about 100 MJ (this is equivalent to the explosion of about 25 kg of trotyl), the cost of one shot may exceed the cost of EMG. That is why the use of high-energy EMG is very reasonable not only because the stationary facilities of required energy and power have not been yet created, but for the purpose of saving money now and in future. The experiments with high-energy liners are interesting in terms of DT-gas compression, to clarify such issues as liner flight stability, substance strength impact on growth of perturbations, interactions between the cylindrical liner end and walls, parameters of substances under high pressures and other. The present paper describes arrangement and the results of the first joint experiment between VNIIEF and LANL with EMG of 1 m diameter and a non-evaporating liner. The experiment took place in August 22, 1996. The goal of the experiment was to accelerate magnetically cylindrical relatively thin aluminum liner and to get kinetic energy 20 MJ or more. As the energy source for the experimental device we chose 5-module DEMG of 1000 mm diameter, many times tested in the experiments for rigid and liner loads. This EMG can store more energy than any other EMG created at VNIIEF. The physical scheme of the liner unit was chosen so that the growth of disturbances would have less influence on the liner shape during flight, especially on the liner's inner surface. The shape of glade plane on which liner slides during flight and the way of contact liner with walls were chosen on the ground of 2-d calculations, proceeded from the necessity to ensure electrical contact during the liner flight.
Author
High Pressure; Kinetic Energy; Electric Generators; Linings; Evaporation; Accumulations

20050168232 Los Alamos National Lab., NM, USA
The Ranchero Explosive Pulsed Power System
Goforth, James H.; Atchison, Walter L.; Bartram, Donald E.; Fowler, C. Maxwell; Goettee, Jeffrey D.; Herrera, Dennis H.; King, James C.; Lopez, Emmanuel A.; Martinez, Ernesto C.; Oona, Henn; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 573-578; In English; See also 20050168165; Copyright; Avail: Other Sources

We are currently developing a high explosive pulsed power system concept that we call Ranchero. Ranchero systems consist of series-parallel combinations of simultaneously initiated coaxial magnetic flux compression generators, and are intended to operate in the range from 50 MA to a few hundred MA currents. One example of a Ranchero system is shown in Fig. 1. The coaxial modules lend themselves to extracting the current output either from one end or along the generator midplane. We have previously published design considerations related to the different module configurations/ and in this paper we concentrate on the system that we will use for our first imploding liner tests, a single module with end output. The module is 1.4-m long and expands the armature by a factor of two to reach the 30-cm OD stator. Our first heavy liner implosion experiments will be conducted in the range of 40-50 MA currents. Electrical tests, to date, have employed high explosive (HE) charges 43-cm long. We have performed tests and related 1D MHD calculations at the 45-MA current level with small loads. From these results, we determine that we can deliver currents of approximately 50 MA to loads of 8 nH.
Derived from text
Magnetohydrodynamics; Magnetic Flux; Modules; Stators; Implosions

20050168233 Phillips Lab., Kirtland AFB, NM, USA
Explosive Pulsed Power Experiments at the Phillips Laboratory
Lehr, M.; Baca, G.; Chama, D.; Hackett, K.; Hussey, T.; Kiuttu, J.; Shiffler, D.; Graham, J.; Sommars, W.; Coffey, S.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 579-584; In English; See also 20050168165; Copyright; Avail: Other Sources

The application of pulsed power technology to advanced mission scenarios increasingly involves achieving higher peak power and energy while shrinking the deployment package. The inherent high energy density of explosives make them an obvious candidate for applications requiring extremely compact, single shot pulsed power drivers. However, explosive flux compression generators tend to be rather slow, low impedance, high current devices, while the loads of interest typically present a relatively high impedance and require short, high voltage pulses. In this paper, the results of experiments involving helical explosive generators and pulse shaping/impedance matching systems are discussed.
Author
High Voltages; Explosives; Deployment; High Current; Impedance

20050168234 Lawrence Livermore National Lab., Livermore, CA, USA
Upgrades to the LLNL Flash X-Ray Induction Linear Accelerator (FXR)
Scarpetti, Raymond D.; Boyd, John K.; Earley, Gregory G.; Griffin, Kenneth L.; Kerr, Roderick G.; Kihara, Ronald; Ong, Mike M.; Zentler, Jan-Mark; Back, Norman L.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 597-602; In English; See also 20050168165; Copyright; Avail: Other Sources

The FXR is an induction linear accelerator used for flash radiography at the Lawrence Livermore National Laboratory's Site 300 Test Facility. The FXR was originally completed in 1982 and has been in continuous use as a radiographic tool. At that time the FXR produced a 17 MeV, 2.2 kA burst of electrons for a duration of 65 ns. An upgrade of the FXR was recently completed. The purpose of this upgrade was to improve the performance of the FXR by increasing the energy of the electron injector from 1.2 MeV to 2.5 MeV and the beam current from 2.2 kA to 3 kA, improving the magnetic transport system by redesigning the solenoidal transport focus coils, reducing the rf coupling of the electron beam to the accelerator cells, md by adding additional beam diagnostics. We will describe the injector upgrades and performance, as well as our efforts to tune the accelerator by minimizing beam corkscrew motion and the impact of Beam Breakup Instability on beam centroid motion throughout the beam line as the current is increased to 3 kA.
Author
Linear Accelerators; Radiography; Electrons; Radio Frequencies; X Rays; Beam Currents

20050168235 Oxford Univ., Oxford, UK
The Frequency Response Of Transmission Line(Cable)Transformers
Smith, P. W.; Rossi, J. O.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 610-615; In English; See also 20050168165; Copyright; Avail: Other Sources

Interest in transmission line transformers (TLT's) as pulse transformers is continuing to grow as it becomes clear that these devices have several important advantages over conventional wound transformers. This paper describes the work that has been carried at Oxford to produce models by which the frequency response of both linear and wound TLT structures can be predicted. Although different types of TLT's are used as voltage transformers, current transformers, pulse isolation transformers and pulse inversion transformers this paper deals exclusively with transformers with voltage gain. In particular, the paper considers the frequency response of these transformers at low frequencies. It is shown that very low frequency operation is possible and this has important implications for pulse transformers required to transform pulses with long flat tops.
Author
Frequency Response; Transformers; Transmission Lines; Communication Cables; Mathematical Models

20050168236 Megapulse, Inc., Bedford, MA, USA
Pulse Generator for Ion Implantation
Johannessen, Paul R.; Roland, William F.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 198-202; In English; See also 20050168165; Copyright; Avail: Other Sources

Plasma Source ION Implantation (PSII) requires a high-power pulse generator (megawatts average power and peak pulse power of over 5 MVA) that is efficient, very reliable and robust. The robustness is required because plasma is this disagreeable 'ethereal' stuff that likes to arc, spit and sputter. Because operator, equipment and vacuum failures occur, the modulator must be very tolerant to every possible insult, and then some. Megapulse, Inc. has developed a solid-state, high-power modulator that meets all these requirements. By combining soft switching with magnetic pulse compression, an extremely reliable, robust and efficient modulator is obtained. Presently, this technique is used in high-power Loran-C transmitters. These transmitters have been installed throughout the world.
Author
Ion Implantation; Pulse Generators; Solid State; Modulators

20050168237 Primex Physics International Co., San Leandro, CA, USA
Compact 1MV, 10 Hz pulser
Hammon, J.; Lam, S. K.; Drury, D.; Ingram, M.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 147-152; In English; See also 20050168165; Copyright; Avail: Other Sources

A compact repetitive driver has been developed and demonstrated at PI which produces 120 ns, 1 MV pulses into 800 Ohm at up to 10 Hz repetition rate. The system operates in a burst mode with typical burst durations of 100 pulses, with bursts separated by 5 minutes. Longer bursts can be fired, if bursts are separated by longer 'cool-down' times. The output pulse has a rise time of 40 ns, and is flat to within +/- 7%. The pulser is contained in a cylindrical housing 25 inches in diameter and 60 inches long. System controls and the high voltage power supply are contained in a standard 19 inch rack 72 inches high.
Author
Pulse Generators; Fabrication; Design Analysis

20050168240 TZN Forschungs- und Entwicklungszentrum Unterluess G.m.b.H., Germany

Pulsed Power Technologies for Commercial Material Reduction and Crushing Applications

Hofmann, J.; Weise, H. G. G.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 203-207; In English; See also 20050168165; Copyright; Avail: Other Sources

An overview on the activities of TZN in the development of commercial pulsed power systems for material reduction and crushing applications is given. Up to now several test facilities have been setup. Experimental and theoretical investigations have been performed as described order to optimize the interaction process of electrothermally generated shock waves with brittle material i.e. minerals, concrete and rocks as well as basic material for semiconducting wafer production. A pulsed power technology demonstrator for reduction of reinforced concrete plates with a weight of several tons each is just under final start up at TZN. Its setup and some results of the first phase of operation are given.

Author

Minerals; Crushing; Composite Materials; Pulse Generators

20050168243 Kirov (S. M.) Tomsk Polytechnic Inst., USSR

Electropulse Technology of Material Destruction and Boring

Boev, S.; Vajov, V.; Levchenko, B.; Jgun, D.; Muratov, V.; Peltsman, S.; Adam, A.; Uemura, K.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 220-225; In English; See also 20050168165; Copyright; Avail: Other Sources

The fact that the dielectric strength of liquids is higher than that is for dielectric solids at the times of voltage duration less than 1 microsecond was founded at Tomsk Polytechnic University at the end of the fiftieth. The breakdown voltage is dependent on the time of voltage acts (time of voltage increasing till the coupon breakdown) for several materials. It can be seen that the dielectric strength of transformer oil and tap water is higher than that is for quartz, marble and sandstone to the left of volt-time characteristics crossing. In the condition, a sample of dielectric solid is placed in between two electrodes and the short high voltage is applied, it is possible to avoid the surface discharge and the breakdown is occurred inside the solid. Short electric pulse makes the discharge channel in the solid between electrodes, placed on the fiat surface of the solid, immersed in the liquid. The phenomena of discharge channel penetration in the solid under the liquid was suggested to use for the solids destruction and rock boring. The priority of this method was established in 1959.

Author (revised)

Electric Pulses; Destruction; Boring Machines; Disintegration

20050168245 Texas Univ., Austin, TX, USA

A Generalized Goodness Function and Quality Factors of Advanced Electrical Machines for Hypervelocity Accelerators

Driga, M. D.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 231-240; In English; See also 20050168165

Contract(s)/Grant(s): DAAH04-96-0-0197; Copyright; Avail: Other Sources

A system of goodness functions and quality indicators for exploring the relative merits of pulsed electrical machines or electromagnetic accelerators will have to be based on a rigorous theoretical foundation, both from electromechanical and electrodynamical points of view. For electromechanical aspects, the general theory of electrical machines, together with Kron's tensorial formulations for transient and pulsed conversion lead to a quality indication as a 'goodness factor' or 'goodness function' generalized from steady state to pulsed electrical machines and, further, to systems of machines (rotating power supply, self-excitation system, accelerator). By using Maxwell's equations for moving media and the notion of flux derivative, three different formulations for electromagnetic forces in electrical machines are introduced and interrelated leading to an assessment for the electromagnetic recoil and for the distribution of forces in air core and iron care advanced machines and electromagnetic accelerators.

Author

Maxwell Equation; Electric Equipment; Hypervelocity Guns; Q Factors

20050168246 TZN Forschungs- und Entwicklungszentrum Unterluess G.m.b.H., Germany

Setup and Performance of a Capacitive 300kJ Pulsed Power Supply System for ETC-GUN Investigations

Weise, H. G. G.; Wisken, H. G.; Berg, A.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 250-255; In English; See also 20050168165; Copyright; Avail: Other Sources

Due to the electrical power supply requirements of electrothermal chemical guns in terms of pulse duration and shape as

well as voltage, current and power magnitudes sophisticated pulsed power supply systems are necessary. Two capacitive 300 kJ pulsed power supply systems have been designed, setup, tested and installed in Sweden by TZN under contract on FMV in order to support the Swedish ETC-Gun programme. Each capacitor bank consists of four 75 kJ units. Triggered vacuum switches, crowbar diode circuits and adjustable inductors with six inductance values are connected to each high voltage discharge capacitor. The design of the capacitors enables an operation at either 11 kV or 22 kV at full energy. A load bypass switch as well as overvoltage varistors are installed in the output terminal of each system. Computer control systems with consequent fibre optic signal transmissions provide a reliable and safe operation of the systems. Each unit can be charged to a different voltage during the charging process. Simultaneous and sequential fining of the units is provided. Both systems are installed in a 20 feet ISO container each providing the entire infrastructure. The computer control system is designed to operate both systems together in order to double the features of the systems. After giving the specifications the design and the technical solutions are described. A number of test results is presented which demonstrate the performance complexity of the system. Author

Power Supplies; Fabrication; Design Analysis; Performance Tests; Pulse Generators; Pulse Duration

20050168248 Centre National de la Recherche Scientifique, Palaiseau, France

A composite POS: First proof-of-principle results from GIT-12

Chuvatin, A. S.; Kim, A. A.; Kokshenev, V. A.; Kovalchuk, B. M.; Kurmaev, N. E.; Loginov, S. V.; Fursov, F. I.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 261-268; In English; See also 20050168165

Contract(s)/Grant(s): DGA-328/PMI/AC; SNL-AS-9715; Copyright; Avail: Other Sources

Experiments with the microsecond Plasma Opening Switch (POS) were carried out on the GIT- 12 installation at the conduction current level of 3 MA. In this series an attempt to increase both the critical charge responsible for the conduction phase and the POS voltage was undertaken. The necessity of such improvement is conditioned by the difficulties of application of existing POS technology for construction of a new, multi-MA class IES driver. The experiments were inspired by several phenomenological ideas and theoretical results described as the main background philosophy of this work. Possible improvement of the POS operation is predicted if using the following technique: 1) optimization of the plasma injection length in order to increase the critical charge by keeping the initial plasma density at minimum possible level; 2) use of the initial plasma density gradient in the direction from the load to the generator in order to decouple the plasma densities responsible for the conduction and opening times; 3) use of the controlled plasma motion during the conduction phase for abrupt enhancement of the magnetic field prior to the opening phase. A Composite POS satisfying these conditions and consisting of initially prepared MHD and Hall parts was applied. The first, mainly proof-of-principle results from C-POS operation on GIT-12 are reported.

Author

Switches; Plasma Control; Electric Potential; Numerical Analysis

20050168249 Maxwell Technologies, Inc., San Diego, CA, USA

Conduction time/current limitation on the Defense Special Weapons Agency decade module 1

Thompson, John R.; Rauch, John E.; Goyer, John R.; Kortbawi, David; Ottinger, Paul F.; Weber, Bruce V.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 269-274; In English; See also 20050168165; Copyright; Avail: Other Sources

The Defense Special Weapons Agency's DECADE radiation effects simulator design consists of 16 separate pulsed power modules each driving individual bremsstrahlung diodes. DECADE is required to produce a dose in a near field test plane of 20 krad (Si) with 2: l uniformity over 10,000 sq cm, as well as meeting several other specifications. Each DECADE module utilizes a plasma opening switch (POS) in the final stage of pulse compression. DECADE Module-I (DMI), the first full scale module tested, is capable of delivering up to 1.8 MA in 300 ns to the POS. Power delivery to the load is dependent on the POS and load coupling performance. During testing the DMI performance level was found to be nearly a factor of two below that required to meet the DECADE dose specification. A DECADE Assessment Program was initiated to evaluate and assess the likelihood of achieving the original design specification based on the performance of a single module. The Assessment Program, with emphasis on diagnostics, was coordinated by scientists from Maxwell Technologies, the Naval Research Laboratory, and Primex/Physics International and included involvement by other collaborators throughout the pulsed power community. This paper describes the results of a study addressing the observed degradation in dose with increased POS conduction current and/or conduction time.

Author

Time Dependence; Current Density; Radiation Effects; Pulse Compression

20050168250 Russian Research Centre Kurchatov Inst., Moscow, Russian Federation

New Repetitive POS Electron Accelerator for Open Air Electron Beam Injection

Dolgachev, Georgi; Nitishinsky, Mikhail S.; Ushakov, Andrey G.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 281-286; In English; See also 20050168165; Copyright; Avail: Other Sources

RPOS technology recently developed in Kurchatov Institute may be useful for a wide range of pulsed power parameters. RS-20 concept represents 2-3 MV 10-100 kW range for radiation treatment; new repetitive POS generators were proposed for over than 5 MV switching voltage and 200-300 kW beam for high dose/dose rate production. Some technical approaches allow to increase wall-plug beam efficiency up to 50-70%. Other applications requiring high dose rate may use a relatively compact RPOS generator for electron beam irradiation at 500-800 keV. This compact concept may reach very high peak dose rate in e-mode to obtain sterilization dose as a function of dose rate for radiation testing. The electron repetitive accelerator used RPOS technology has 8 El/shot energy capacity, 120 kA - drive current amplitude, 500-800 kV and 100 ns diode pulse, 0.5-1 El/shot in e-beam. A specially designed window capable of operating in multi-shot regime is created on a base of carbon. The generator is planned to have 1-2 kGy/puise and a peak dose rate to 2x104 MGy/s. RPOS was made coaxial using a standard repetitive plasma gun technology with central cathode and lifetime of more than 10 6 shots.

Author

Electron Accelerators; Electron Beams; Beam Injection

20050168251 Technische Hogeschool, Delft, Netherlands

Experimental Results Obtained with the 1 MA Resonant Series Counterpulse Opening Switch System, Developed at TNO

vanDijk, Edwin; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 287-292; In English; See also 20050168165

Contract(s)/Grant(s): NL-2628; Copyright; Avail: Other Sources

At the Pulse Physics Laboratory, research is being performed to develop a counterpulse technique for the controlled interruption of very high currents in inductive storage pulsed power systems. Presently, a repetitive mechanical high current opening switch is applied to commutate current to an inductive load (for example a rail accelerator) from a storage inductor charged by a homopolar generator. To increase the current level the mechanical switch is able to interrupt, the application of a counterpulse technique and a separate closing switch looks promising. Otherwise, the arc that would occur between the contacts of the switch during opening and closing at high currents (mega-ampere level), would severely damage the contacts. To prevent the damage caused by arcing, the current must be reduced to zero or a low level before opening the switch. To be able to achieve this, the resonant series counterpulse circuit has been proposed. The circuit incorporates units consisting of a capacitor bank of electrolytic capacitors with parallel connected diodes and a thyristor connected in series. Upon command, these units will create a resonant counterpulse current through the opening switch. The current through the switch then reduces to zero and the switch is opened without damaging the contacts. The units have been designed to generate currents up to 50 kA. By placing several units in parallel, higher counterpulse currents can be generated. This paper presents experimental results of the parallel operation of eight units.

Author

Railgun Accelerators; Electric Pulses; Switches; Electric Power Supplies

20050168252 Erlangen-Nuernberg Univ., Erlangen, Germany

Sealed-off Pseudospark Switches for Pulsed Power

Frank, K.; Bickes, C.; Ernst, U.; Iberler, M.; Meier, J.; Prucker, U.; Schlaug, M.; Schwab, J.; Urban, J.; Hoffmann, D. H. H.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 299-307; In English; See also 20050168165

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There is worldwide not only a considerable demand on replacement of commercial high power switches, but also on development of new devices for higher requirements in lifetime and charge transfer. This is always valid despite of considerable progress in solid-state switch development. Since more than 10 years it is the specific goal of pseudospark switch development at Erlangen to construct high-power 'sealed-off' pseudospark switches (PSS) for pulsed power application. To realize this ambitious goal it is very important to combine fundamental research and new technologies in material science and process engineering. The pseudospark as low pressure gas discharge is characterized by its unique combination of a low E/N-hollow cathode discharge with a high E/N-glow discharge within the gap. Meanwhile there is a quite better understanding of the interaction of both discharge types. This has led to the actual model of four successive different phases of the discharge ending in a 'superdense glow'-to-arc-transition at high peak currents (\h 10 kA). At lower peak currents the PSS performance is hampered by the appearance of sudden changes in impedance and/or quenching. The most important parameters which

control the physical processes were investigated with respect to avoid these effects. This is especially an indispensable condition for applications which demand for a high dynamic range of operation. In parallel two novel trigger systems have been developed for the use in 'sealed-off' devices. In principle both systems are based on surface discharges, using semiconductors or high dielectric materials. The latter produces an electron beam which allows to operate the trigger in vacuum, too. Lifetime is the key question for any successful application. Large efforts have been done to improve lifetime by replacement of refractory metal electrodes by semiconductor (SIC) electrodes. In a different approach multichannel configurations were studied and first prototype of a radial multichannel switch were tested with a real load.
Author
Electric Pulses; Glow Discharges; Switches

20050168255 English Electric Valve Co. Ltd., Chelmsford, UK
A New Gas Discharge Switch for Discharging High Energy Capacitor Banks
Pirrie, C. A.; Roberts, C. A.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 334-339; In English; See also 20050168165; Copyright; Avail: Other Sources

The performance of a new type of high voltage gas-discharge switch is described. The switch is intended primarily for discharging high energy capacitor banks such as may be used in laser fusion and plasma experiments. The switch is capable of holding off high voltage with very high reliability against prefires, or self-commutation events. Other features are: high peak current capabiliW with a large coulombic transfer per pulse, a large dynamic range, ease of triggering and long shot life. These characteristics are substantiated by tests carried out in a purpose-built capacitor bank facility, which will also be briefly described. The test equipment has been designed to operate the switch with a hold-off voltage of 30kV, and produce a near critically-damped current pulse of 80kA with a coulombic content of 37 coulombs, at a shot-rate of 1 per minute. A lifetest under these conditions has been carried out, and the switch has successfully completed over 5000 shots without any prefires. At this point the lifetest was halted, although the switch was still operational. Other general switch characteristics such as firing delay, jitter, anode fall time and trigger requirements will also be described.
Author
Switches; Gas Discharges; Capacitors; Electric Pulses; Electric Energy Storage

20050168256 Forschungszentrum Karlsruhe G.m.b.H., Karlsruhe, Germany
Low-Profile High-Voltage Compact Gas Switch
Frey, W.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 322-327; In English; See also 20050168165; Copyright; Avail: Other Sources

This paper discusses the development and testing of a low-profile, high-voltage, spark-gap switch designed to be closely coupled with other components into an integrated high-energy pulsed-power source. The switch is designed to operate at 100 kV using SF6 gas pressurized to less than 0.7 MPa. The volume of the switch cavity region is less than 1.5 cu cm, and the field stress along the gas-dielectric interface is as high as 130 kV/cm. The dielectric switch body has a low profile that is only 1-cm tall at its greatest extent and nominally 2-mm thick over most of its area. This design achieves a very low inductance of less than 5 nH, but results in field stresses exceeding 500 kV/cm in the dielectric material. Field modeling was done to determine the appropriate shape for the highly stressed insulator and electrodes, and special manufacturing techniques were employed to mitigate the usual mechanisms that induce breakdown and failure in solid dielectrics. Static breakdown tests verified that the switch operates satisfactorily at 100 kV levels. The unit has been characterized with different shaped electrodes having nominal gap spacings of 2.0, 2.5, and 3.0 mm. The relationship between self-break voltage and operating pressure agrees well with published data on gas properties, accounting for the field enhancements of the electrode shapes being used. Capacitor discharge tests in a low inductance test fixture exhibited peak currents up to 25 kA with characteristic frequencies of the ringdown circuit ranging from 10 to 20 MHz. The ringdown waveforms and scaling of measured parameters agree well with circuit modeling of the switch and test fixture. Repetitive operation has been demonstrated at moderate rep-rates up to 15 Hz, limited by the power supply being used. Preliminary tests to evaluate lifetime of the compact switch assembly have been encouraging. In one case, after more than 7,000 high-current ringdown tests with approximately 30 C of total charge transferred, the switch continued to operate satisfactorily with no apparent tracking or deterioration of the insulator.
Author
High Voltages; Switches; Spark Gaps; Pulse Generators; Electric Pulses

20050168257 Oxford Univ., Oxford, UK

High Power, Pulsed Soliton Generation at Radio and Microwave Frequencies

Brown, M. P.; Smith, P. W.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 346-354; In English; See also 20050168165; Copyright; Avail: Other Sources

It is well known that the nonlinear-dispersive system, described by the Korteweg de Vries equation, will convert a pulse into an array of solitons. Work exploiting this effect is well advanced in the optical field using nonlinear optical materials. In contrast comparatively little work has been done in the area of high voltage electronics using nonlinear dielectric materials, due mainly to the lack of suitable materials. This paper reviews the theory and experimental techniques required to produce a high power pulse of RF or microwave radiation at MW power levels, using a high voltage soliton generator. To generate the solitons a pulse is fed onto a transmission line which is periodically loaded with a nonlinear ceramic dielectric in the paraelectric phase. The combination of the nonlinearity and dispersion in the line cause the pulse to break up into an array of solitons. The highest frequency solitons generated so far have been produced using a predominately strontium titanate ceramic and operating the transmission line immersed in liquid nitrogen. The work to be presented will include details of the properties and production of the nonlinear materials used, the construction of the transmission lines, the electrical diagnostics and the numerical modelling used to optimize the experiment.

Author

Transmission Lines; Microwave Frequencies; Radio Frequencies; High Voltages; Dielectrics; Voltage Generators

20050168258 National Univ. of Defense Technology, Changsha, China

81-7M-01-A Two-Beams Accelerator

Shen, L. G.; Li, C. L.; Liu, Y. G.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 355-360; In English; See also 20050168165; Copyright; Avail: Other Sources

We report a two-beams accelerator (named 81-7M-01-A) with one Marx generator operating one 6ohm-water Blumlein line and another 40ohm oil Blumlein line at the same time by the use of a magnetic flux coupling isolator to generate two electron beams with different ranges of beam currents. The electron energies and the amplitudes of beam currents may be adjusted respectively in quite large ranges. The functions of this accelerator are equal to that of the operation of two sets of IREBA with different impedances at the same time. In this paper, the operation machan_m of the accelerator is outlined, the design method is put forward, and the experiment results axe presented. The design parameters are in good agreement with the experiment results. The performances of this accelerator are quite well.

Author

Beam Currents; Electron Accelerators; Electron Beams; Electron Energy

20050168259 Los Alamos National Lab., NM, USA

Megabar Liner Experiments on Pegasus II

Lee, H.; Bartsch, R. R.; Bowers, R. L.; Anderson, W.; Atchison, W. L.; Chrien, R. E.; Cochrane, J.; Oona, H.; Platts, D.; Rich, M., et al.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 366-371; In English; See also 20050168165; Copyright; Avail: Other Sources

Using pulsed power to implode a liner onto a target can produce high shock pressures for many interesting application experiments. With the Pegasus II facility in Los Alamos, a detailed theoretical analysis has indicated that the highest attainable pressure is around 2 Mbar for a best designed aluminum liner. Recently, an interesting composite liner design has been proposed which can boost the shock pressure performance by a factor 4 over the aluminum liner. This liner design was adopted in the first megabar (Megarbar-1) liner experiment carried out on Pegasus last year to verify the design concept and to compare the effect of Rayleigh-Taylor instabilities on liner integrity with the code simulations. We present briefly the physical explanation why the composite liner provides the best shock pressure performance. The theoretical modeling and performance of Megabar-1 liner are discussed. Also presented are the first experimental results and the liner design modification for our next experiment.

Author

Linings; Performance Prediction; High Pressure; Implosions; Aluminum

20050168260 Los Alamos National Lab., NM, USA

Evaluation of Magneto Rayleigh-Taylor Mode Growth Using Comparisons of 2D Calculations with Radiographic Data

Atchison, W. L.; Faehl, R. J.; Reinovsky, R. E.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 372-377; In English; See also 20050168165; Copyright; Avail: Other Sources

Experiments being conducted at the Los Alamos National Laboratory Pegasus facility are examining stability issues for driving an aluminum liner with a pulsed magnetic field. The Pegasus facility provides a current of 5 to 8 Megamperes to compress a cylindrical liner. Liners of various size and thickness are used, depending on the specific experimental objectives. In several of these experiments, the outer surface clearly develops perturbations in the mass distribution. These perturbations are strongest when the aluminum is suspected to have melted and in some cases partially vaporized. A series of specific experiments was designed to examine the growth rate of these instabilities. These experiments involved machining a sine wave onto the outer surface of the liner to seed a given wavelength. Two-dimensional MHD calculations, using the measured current profile, were performed to model the behavior of the liner under magnetic field compression. These predictions were made with a 2D Eulerian code complete with a Steinberg-Guinan strength model. The results of these calculations will be discussed in this paper. The density contours at specific times will be compared with the processed radiography.
Author
Linings; Aluminum; Magnetohydrodynamics; Vaporizing; Sine Waves; Radiography; Magnetic Fields

20050168261 Los Alamos National Lab., NM, USA
HEL-1: A DEMG Based Demonstration of Solid Liner Implosions at 100 MA
Reinovsky, R. E.; Anderson, B. G.; Clark, D. A.; Ekdahl, C. A.; Faehl, R. J.; Goforth, J. H.; Lindemuth, I. R.; Petersen, T. L.; Sheehey, P. T.; Tabaka, L. J.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 378-383; In English; See also 20050168165; Copyright; Avail: Other Sources

In August 1997, the Los Alamos National Laboratory (LANL) and the All-Russian Scientific Research Institute of Experimental Physics (VNIIEF) conducted a joint experiment in Sarov, Russia to demonstrate the feasibility of applying explosive pulsed power technology to implode large scale, high velocity cylindrical liners. Kilogram mass metal liners imploding at velocities of 5-25 km/sec are useful scientific tools for producing high energy density environments, ultra high pressure shocks, and for the rapid compression of plasmas. To explore the issues associated with the design, operation and diagnosis of such implosions,VNIIEF and LANL designed and executed an practical demonstration experiment in which a liner of approximately 1 kilogram mass was accelerated to 5-10 km/sec while undergoing a convergence of about 4:1. The scientific objectives of the experiment were three-fold. First to explore the limits of very large, explosive, pulse power system delivering about 100 MA as drivers for accelerating solid density imploding liners to kinetic energies of 25 MJ or greater. Second to evaluate the behavior of single material (aluminum) liners imploding at 5-10 km/sec velocities by comparing experimental data with 1-D and 2 D numerical simulations. Third, to evaluate the condition of the selected liner at radial convergence of 4 and a final radius of 6 cm. A liner of such parameters could be used as a driver for equation of state measurements at megabar pressures or as a driver for a future experiment in which a magnetized fusion plasma would be compressed to approach ignition conditions.
Author
Linings; Implosions; High Pressure; Convergence; Plasmas (Physics); Equations of State

20050168262 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Stuttgart, Germany
PFNs Switched with Stacked SCRs at 20 kV, 500 J, and 100 Hz Rep-Rate
Renz, G.; Holzschuh, F.; Zeyfang, E.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 390-395; In English; See also 20050168165; Copyright; Avail: Other Sources

Recent innovations in high power stacked SCRs, employed for switching high voltage- and high di/dt current pulses, show applications in high power laser systems. The use of stacked SCRs opens the field for the replacement of thyratrons or spark gaps by high current thyristors (HCTs). At the DLR, the development of a pulsed, high power CO2-1aser (electron beam sustained) with an average output power of more than 15 kW has recently been accomplished. The operation of the electron beam sustained CO2-1aser system has been done by the use of a cold cathode electron beam accelerator (transformer 1:10, 200 kV). This paper will present the experimental results of a stack of 8 SCRs (HCT 2003-45: forward blocking voltage 4.5 kV, ABB Research Laboratory) used as the electrical switch for the electron beam accelerator of the high power CO2-1aser. The requirements for the switch of the electron beam accelerator are: 20 kV loading voltage, 500 J stored PFN pulse energy, time dependent electron beam accelerator load from kohms to a few 100ohms, 2-10 microseconds pulse duration, bursts of a couple hundred pulses, and 100 Hz repetition rate. Two seven-section PFNs were connected in parallel to generate a 2-10 microsecond long pulse into two different test loads R(sub load): 1) ohmic load and 2) and 3) dynamic electron beam accelerator load.
Author
Electric Potential; Transformers; Dynamic Loads; Electron Beams; High Power Lasers; High Voltages; High Current; Thyristors

20050168263 Army Research Lab., Adelphi, MD, USA

Hig Peak Current Burst Repetitive Operation of a 125mm Thyristor

Podlesak, T. F.; Singh, H.; Schneider, S.; Behr, S.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 396-404; In English; See also 20050168165; Copyright; Avail: Other Sources

Repetitive operation of symmetric 125-mm thyristors has been demonstrated under burst conditions consistent with some electric gun applications. The thyristor was produced by Silicon Power Corp. and utilizes a unique compact package that provides for double-sided cooling with a thermal resistance from junction to sink of 0.0033 K/W. Single shot testing 1 was performed using a 10-m-ohm pulse-forming network with a total capacitance of 21 mF into a matched load to determine operational limits. Computer simulations of the temporal behavior of the device using actual current pulse shapes were consistent with the experimental results. The device operated in a satisfactory manner at 120 kA peak current. Repetition rate testing was performed under burst conditions with large voltage reversals at the end of the pulse. A 26-m-ohm PFN with total capacitance of 14 mF charged to 3 kV with a stored energy of 63 kJ was initially operated into a mismatched load of 13 m-ohm. This provided a peak forward current of 75 kA and transferred charge of 45.4 C and a peak reverse current of 2.5 kA and 0.029 C residual charge. At the end of the pulse a negative voltage spike of -1.8 kV of 12 microseconds duration was generated with -0.86 kV remaining on the network. Since no deleterious effects were observed, all additional tests were performed with a shorted load. The pulse amplitude was 111 kA (64.5 C) with a di/dt of 800 A/microsecond. At the end of the pulse, a negative pulse of -4.2 kV of 13 microseconds duration was generated with -2.3 kV remaining on the network. A peak reverse current of -5.5 kA (0.049 C) with a di/dt of -600 A/microsecond and 21 microseconds duration was observed. Pulse bursts were generated at 6 pulses per minute (PPM) for 10 pulses, and at 12 PPM for 5 pulses. Recovery characteristics were typical of normal recovery, with no evidence of heating effects. No deleterious effects were observed. Failure occurred at a forward current di/dt of 1062 A/microsecond and a reverse current di/dt of 812 A/microsecond. A device design with involute gate structure has been developed and reliable operation with di/dt's in excess of 1 kA/microsecond and higher current levels is anticipated.

Author

Thyristors; Electric Potential; Loads (Forces); Pulse Amplitude; Thermal Resistance; Capacitance; Bursts

20050168265 Ioffe (A. F.) Physical-Technical Inst., Saint Petersburg, Russia

Mega and Gigawatts-ranges, Repetitive Mode Semiconductor Closing and Opening Switches

Grekhov, I.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 425-429; In English; See also 20050168165; Copyright; Avail: Other Sources

Reversely switching dynistor (RSD) turns on simultaneously and uniformly over semiconductor wafer area. Therefore single RSD can switch 2 - 3x10(exp 5) A at pulse duration 5 - 30x10(exp -5) s. High power all solid-state switch on the base of RSDs stack with 80 mm silicon wafer diameter was tested at LLNL at 155 kA, 21 kV, 500 ps pulse width.Megamperesrange all solid-state switch is available now. Proton implantation technique was used to get the perfect dynamic parameters of RSDs used in pulse generators for many areas - laser pumping, waste water and industrial gases cleaning etc. 40 J per pulse, 250 Hz, 30 kV water cleaning pulser based on ONE RSD was tested at SUI, AL. New type of diode recovery process - inverse recovery - was designed for gigawatt-range nanosecond opening switches. Due to special diode structure plasma concentration during recovery process decreases to zero first at n(+)n and then plasma front moves to p(+)n junction. This process give an opportunity to combine fast pulse risetime with high pulse power. Gigawatt-range nanosecond pulse generators with several hundred Hz reprate can be designed on the base of this process. Topics of this presentation are novel semiconductor devices which are capable to switch very high electric power in micro and nanosecond ranges and discussion of the main principles of pulse generators designed on the base of these devices.

Author

Semiconductor Devices; Switches; Closed Cycles; Open Circuit Voltage; Solid State; Pulse Duration

20050168270 Sandia National Labs., Albuquerque, NM, USA

Design and Performance of the Z Magnetically-Insulated Transmission Lines

Stygar, W. A.; Spielman, R. B.; Allshouse, G. O.; Deeney, C.; Humphreys, D. R.; Ives, H. C.; Long, F. W.; Martin, T. H.; Matzen, M. K.; McDaniel, D. H., et al.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 591-596; In English; See also 20050168165

Contract(s)/Grant(s): DE-AC04-94AL-85000; Copyright; Avail: Other Sources

We have designed and tested a 10-nH 1.5-m-radius vacuum section for the Z accelerator. The vacuum section consists of four vacuum flares, four conical 1.3-m-radius magnetically-insulated transmission lines, a 7.6-cm-radius 12-post double-post-hole convolute which connects the four outer MITLs in parallel, and a 5-cm-long inner MITL which connects the

output of the convolute to a z-pinch load. IVORY and ELECTRO calculations were performed to minimize the inductance of the vacuum flares with the constraint that there be no significant electron emission from the insulator-stack grading rings. Iterative TLCODE calculations were performed to minimize the inductance of the outer MITLs with the constraint that the MITL electron-flow-current fraction be \h 7% at peak current. The TLCODE simulations assume a 2.5 cm/microsecond MITL-cathode-plasma expansion velocity. The design limits the electron dose to the outer-MITL anodes to 50 J/g to prevent the formation of an anode plasma. The TLCODE results were confirmed by SCREAMER, TRIFL, TWOQUICK, IVORY, and LASNEX simulations. For the 'IT,CODE, SCREAMER, and TRIFL calculations, we assume that after magnetic insulation is established, the electron-flow current launched in the outer MITLs is lost at the convolute. This assumption has been validated by 3-D QUICKSILVER simulations for load impedances \h 0.36 ohms. LASNEX calculations suggest that the ohmic resistance of the pinch and conduction-current-induced energy loss to the MITL electrodes can be neglected in Z-power-flow modeling that is accurate to first order. To date, the Z vacuum section has been tested on 100 shots. We have demonstrated we can deliver a 100-ns rise-time 20-MA current pulse to the baseline z-pinch load. We have produced a 1.9-MJ x-ray yield; the project goal was 1.5 MJ. We can reproduce the peak M1TL current to within +/-1.6%. Power-flow measurements indicate the vacuum section performs as expected until peak current. Afterward, measurements and simulation results diverge. TLCODE calculations indicate elimination of this discrepancy may increase by 20% the kinetic energy delivered to the pinch. Author

Transmission Lines; Energy Dissipation; Flow Measurement; Insulators; Kinetic Energy; Zeta Pinch; Vacuum; Inductance

20050168271 Lawrence Livermore National Lab., Livermore, CA, USA

Designs For A High Power Superconducting Delay Line

Chen, Yu Ju; Caporaso, G.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 621-626; In English; See also 20050168165

Contract(s)/Grant(s): W-7405-eng-48; Copyright; Avail: Other Sources

Potential designs for a high power superconducting delay line of approximately 10 microseconds duration are described. The transmitted signal should have low dispersion and little attenuation to recapture the original signal. Such demands cannot be met using conventional metal conductors. This paper outlines a proposal for a new transmission line design using low temperature superconducting material which meets system specifications. The 25OMEGA line is designed to carry pulsed signals with an approximate rise time of 8nsec and a maximum

Author

Delay Lines; Superconductors (Materials); Electrical Engineering; Power Lines

20050168272 Centre d'Etudes de Gramat, France

Syrinx Project:First Results on a 160 kJ, 700ns Fast Marx Module

Lassalle, F.; Avrillaud, G.; Bayol, F.; Cassany, B.; Foussat, A.; Kovacs, F.; Lample, R.; Leon, J. F.; Monjaux, P.; Morell, A., et al.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 627-635; In English; See also 20050168165; Copyright; Avail: Other Sources

This work is part of technological developments carried out within SYRINX project in order to implement future multi megajoules drivers, using multi module Inductive Energy Storage (IES) concept. One of the two 640kJ IES modules developed for that purpose requires a compact, sub-microsecond MARX generator. This paper presents first results on a 10 stages, one capacitor per stage Marx module whose parameters are as follows : 90kV charging voltage, 160kJ stored energy, 670nH internal inductance, 470kA peak current, and a 700ns current risetime. Specific capacitors, gas switches and connections have been developed in the scope to reach stringent requirements in terms of low inductance value, high current switching, voltage insulation and reliability. Performances of those components and of the complete Marx including erection process and voltage and current diagnostics for various loads (short circuit, 0.5 ohm and 2.1 ohm resistances) are presented. Those results are correlated with numerical simulations using the circuit analysis code PSPICE.

Author

Electric Networks; Modules; Electric Generators

20050168273 Bolder Technologies Corp., Golden, CO, USA

Ultrafast Pulse Discharge and Recharge Capabilities of Thin-Metal Film Battery Technology

Nelson, Robert F.; Rinehart, Richard; Varley, Sean; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 636-641; In English; See also 20050168165; Copyright; Avail: Other Sources

BOLDER Technologies Corporation has developed an ultrathin-plate, valve-regulated, lead-acid battery technology that

is, in essence, a high specific energy electrochemical supercapacitor. Because of its unique construction comprised of extremely thin plates (0.010', 0.25mm or less in thickness) with very high active surface areas, the BOLDER cell has the capability to deliver extremely high discharge currents, in either a continuous or pulsed duty cycle. Heavy-duty, high-contact area current collectors also contribute to the ability to deliver high discharge currents (estimated at up to 1000A for the 2V/1.2Ah single cell). The same characteristics permit full recharges following complete discharges in as little as 2-4 minutes. The cell also has extremely fast response characteristics and, due to its construction, will experience minimal voltage-time waveform distortion due to inductive effects. It has been demonstrated that the technology is scaleable to smaller and larger cell sizes and it can be configured in prismatic as well as spiral-wound envelopes. These performance attributes and design flexibility make TMF technology very well suited for high-current pulsed-power applications, superior to other battery systems and comparable to supercapacitors, all with high specific energy and at a relatively low cost.
Author
Lead Acid Batteries; Technology Utilization; Metal Films; Thin Plates; Pulse Duration; Electric Discharges; Recharging

20050168274 Nagaoka Univ. of Technology, Nagaoka, Japan
Behaviors Of Excitation Discharge On Excimer Laser In Non-Uniform Gas Density Distribution
Imada, Go; Yatsui, Kiyoshi; Sato, Yasuo; Yoshida, Hiroyuki; Masuda, Wataru; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 651-656; In English; See also 20050168165; Copyright; Avail: Other Sources

In excimer lasers, the excitation discharge causes various instabilities in subsequent discharge which collapse the highly-repetitive operation. The present study inquires into the effects of the gas density depletion on the excitation discharge instability eliminating the influences of the shock waves, the residual ions and the discharge products. We have found that the big density non-uniformity tends to induce the arc without the shocks, ions and products. The transition from glow to arc with respect to the non-uniformity occurs almost discontinuously. On the other hand, the second discharge on the double-pulse discharge in stable gas becomes arc in much smaller non-uniformity, where the transition occurs very slowly. Therefore, it can be suggested that the discharge instability is also caused by some factors other than gas density depletion.
Author
Excimer Lasers; Excitation; Gas Density; Nonuniformity; Density Distribution

20050168276 Academy of Sciences (Russia), Ekaterinburg, Russia
Subnanosecond High-Density Current Interruption In Sos Diodes
Lyubutin, S. K.; Mesyats, G. A.; Rukin, S. N.; Slovikovskii, B. G.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 663-666; In English; See also 20050168165; Copyright; Avail: Other Sources

An experimentally discovered phenomenon of the interruption of a high-density current in Semiconductor Opening Switches (SOS diodes) within subnanosecond time range has been investigated. Used in the experiment was an all-solid-state SOS-based pulse generator that was operated as a charging power source for an auxiliary energy compression stage. This stage incorporated a capacitive energy store, a magnetic switch, an inductive energy store, and a test SOS diode with a load connected in parallel to the latter: The forward pumping time for the SOS diode was determined by the duration of the pulse produced by the charging generator and was between 25 and 40 ns, the duration of the reverse pumping was about 10 ns. Under these conditions, the time of current interruption in the test SOS diode was 0.5-0.7 ns for the current density being several kiloamps per square centimeter. The voltage pulse across a load of resistance several hundreds of Ohms had a peak voltage up to 150 kV, the FWHM 2-3 ns, and the rise/fall time about 1 ns. The fact that the generator incorporated no gas switch made it possible to raise the pulse repetition rate, that was limited only by the thermal loading on the circuit components, to 5 kHz.
Author
Semiconductor Diodes; Electric Switches; Current Density; High Current

20050168278 Nagaoka Univ. of Technology, Nagaoka, Japan
High performance pulsed power generation system using a disk mhd generator driven by NPG system
Harada, Nob; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 480-488; In English; See also 20050168165; Copyright; Avail: Other Sources

We proposed Closed Cycle Disk MHD generator driven by Nonequilibrium Plasma Generator (NPG/CCDisk) system as an alternative for the application of portable high performance pulsed power supply which could be applied for geophysical research, geological survey, earthquake prediction and other commercial and experimental power supplies. Performance prediction and design study of a disk generator for NPG system were carried out. We found that in order to demonstrate higher

performance, detailed design of channel shape was necessary. So then design study was carried out based on the concept that local electron temperature is kept so as to locate the plasma in the stable regime. Typical enthalpy extraction of up to 40% and output power of 7.2MW with the thermal input of 18MWt were successfully expected. In order to confirm NPG/CCDisk concept, effects of combustion product of alumina particle and residual oxygen on generator performance were studied. Results showed that if alumina particle and oxygen concentration exceeded certain level, output power suddenly decreased. Fortunately, possible alumina particle and residual oxygen concentration at the typical NPG burning conditions were found to be well below each critical level of power degradation. The main principle of this NPG/CCDisk concept was confirmed. Finally we can conclude that this proposed system must provide reliable and durable high performance pulsed power supply. Author

Pulse Generators; Magnetohydrodynamic Generators; Plasma Generators; Closed Cycles

20050168279 Primex Physics International Co., San Leandro, CA, USA

Decade Quad Design And Testing Status

Sincerny, P.; Childers, K.; Korbawi, D.; Roth, I.; Stallings, C.; Riordan, J.; Hoffman, B.; Schlitt, L.; Myers, C.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 698-708; In English; See also 20050168165; Copyright; Avail: Other Sources

The Decade Quad (DQ) is a high power generator that will be built at Arnold Engineering Development Center (AEDC) in Tullahoma, Tennessee by the Defense Special Weapons Agency (DSWA). The DQ will consist of four independent command triggered pulsed power modules. The building at AEDC has been completed and has the capacity to accommodate up to four DQ machines for a total of 16 modules. Two full power modules (DM1 and DM2) have been built and tested to verify the Decade design at PRIMEX Physics International. Each module consists of a 570 kJ Marx generator that pulse charges a water transfer capacitor. The transfer capacitor discharges into a water output line through an array of six parallel triggered gas switches. The water output line then pulse charges the inductive store/opening switch pulse compression stage. When the opening switch opens, the inductive store discharges into an electron beam bremsstrahlung diode load. Two full power prototype modules have been built and tested into electron beam bremsstrahlung loads. Over 3500 machine shots have been taken on the two modules. The measured pulsed power and the radiation output performance from the single module has been used to predict the radiation output from the Decade Quad. The new machine will be capable of producing 16 krads(Si) over a 2250 square centimeters test area with a 47 ns radiation pulse width. A future upgrade of the Decade Quad is planned to provide the capability to drive imploding plasma radiation loads for soft (1-5 keV) x-ray production. A design sketch of the Decade Quad pulsed power configuration for driving a plasma radiation source has been completed. The Decade Quad circuit model has been coupled to an imploding load model to quantify the effects of the 1 x Ldot voltage on the pulsed power system and to estimate the kinetic energy delivered to the load. A range of implosion times and inductances were assessed to determine the optimum low risk design configuration.

Author

Electric Generators; Pulse Duration; Electric Power Transmission

20050168280 Sandia National Labs., Albuquerque, NM, USA

Pulsed Power Performance Of Pbfa Z

Speilman, R. B.; Stygar, W. A.; Seamen, J. F.; Long, F.; Ives, H.; Garcia, R.; Wagoner, T.; Struve, K. W.; Mostrom, M.; Smith, I., et al.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 709-714; In English; See also 20050168165 Contract(s)/Grant(s): DE-AC04-94AL-85000; Copyright; Avail: Other Sources

PBFA Z is a new 60-TW/5-MJ electrical driver located at Sandia National Laboratories. We use PBFA Z to drive z pinches. The pulsed power design of PBFA Z t is based on conventional single-pulse Marx generator, water-line pulse-forming technology used on the earlier Saturn 2 and PBFA II3 acceleraR_. PBFA Z stores 11.4 MJ in its 36 Marx generators, couples 5 MJ in a 60-TW/105-ns pulse to the output water transmission lines, and delivers 3.0 MJ and 50 TW of electrical energy to the z-pinch load. Depending on the initial load inductance and the implosion time, we attain peak currents of 16- 20 MA with a rise time of 105 ns. Current is fed to the z-pinch load through self magnetically insulated transmission lines (MITLs). Peak electric fields in the MITLs exceed 2 MV/cm. The current from the four independent conical-disk MITLs is combined together in a double post-hole vacuum convolute with an efficiency greater than 95%. We achieved x-ray powers of 200 TW and x-ray energies of 1.9 MJ from tungsten wire-array z-pinch loads.

Author

Electric Generators; Zeta Pinch; Pulse Generators

20050168281 Los Alamos National Lab., NM, USA

Design of the Atlas 240 kV Marx modules

Bowman, D. W.; Bennett, G.; Biehl, F.; Cochrane, J.; Gribble, R.; Griego, J.; Hicks, R.; Hinckley, W.; Hosack, K.; Kasik, R., et al.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 498-502; In English; See also 20050168165; Copyright; Avail: Other Sources

A prototype 240 kV, oil-insulated Marx module has been designed and constructed at the Los Alamos National Laboratory (LANL). the prototype will be used for testing and and certifying the design of the Marx module and certain components, including the closing switches, series resistor, and the capacitors themselves. The prototype will also be used to evaluate proposed mechanical systems designs. Information gained from the construction and testing of the 4-capacitor prototype will be folded into the design of the 16-capacitor maintenance unit.

Derived from text

Design Analysis; Construction; Modules; Oils; Insulated Structures

20050168282 Academy of Sciences (Russia), Tomsk, Russia

GIT 16: State of Project in 1995-1997

Kovalchuk, B. M.; Kokshenev, V. A.; Kim, A. A.; Kurmaev, N. E.; Loginov, S. V.; Fursov, F. I.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 715-723; In English; See also 20050168165; Copyright; Avail: Other Sources

High current pulsed power GIT16 driver was put into operation in 1992, consisting of 8 modules (GIT8). The machine was used for POS investigations at currents up to 4 MA and conduction times up to 1.5 I_s, and to drive the Z-pinch radiative loads. It was found that for reliable operation of the Marxes the damping resistors should be included into each module circuit in order to protect the storage capacitors. After the resistors were installed, the charge voltage was increased to 70 kV resulting in the same 4 MA, at the acceptable probability of the capacitor failure. In 1995 the investigations were performed in order to optimize the convolute between the POS and the Z-pinch load. It was found that during the energy was switched into the liner and the liner impedance increases, a breakdown near the POS (POS reclosure) could occur in spite of the fact that the convolute to this time is completely magnetically insulated by the load current. This breakdown develops in - 100 ns, and it's conductivity rises rapidly enough cutting the load from the generator. The POS-to-load convolute was optimized providing energy transfer into the load without of the POS reclosure. In 1996 next 4 modules were put into operation. For 12 modules in total, at 70 kV charge voltage the stored energy of the GIT12 is 5 M J, the current in the circuit reaches 6.7 MA in 1.7 ILLS. The POS experiments with extended switch length were performed on GIT12 in order to investigate the influence of the switch length and plasma distribution on the POS performance.

Derived from text

Capacitors; High Current; Energy Transfer; Electric Potential; Distribution Functions; Switches; Impedance

20050168283 Centre d'Etudes de Gramat, France

SYRINX Project: First Results With a 640 kj LTD Accelerator

Monjaux, P.; Huet, D.; Leon, J. F.; Kovacs, F.; Kim, A.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 687-697; In English; See also 20050168165; Copyright; Avail: Other Sources

This paper presents the first results achieved on a LTD module built at the CEG (France - DGA) in collaboration with the HCEI (Russia - Tomsk). The main purpose of this work is to evaluate the LTD concept in term of efficiency, cost, reliability, ... for applications to multimegajoule inductive storage generator. The concept of LTD (see talk O12-3,4) is based on an inductive voltage adder at the level of the capacitor. The size of components (capacitor, switch, magnetic core, ...) allows to obtain a very compact system running in air. The stage includes 2 capacitors HEAFELY (75kV - 5.651microF), 2 multichannel multigap coaxial switches (MMCS), a magnetic core in classical transformer steel and a cavity in oil. The vacuum line is modular stage by stage. The alignment and the electrical contact is obtained by inside compression rods. The short circuit load includes 4 current loops and a Rogowski coil. The charging circuit in air allows to charge 20 stages (40 capacitors). The trigger circuit is based on a MMCS with 40 ouput lines (for 40 switches). The dynamic premagnetizing generator drives 20 ouput lines (1.2kA, 60microseconds each). The results of experiments and numerical simulations on short circuit give: quarter period : 980ns, peak current : 930kA, 11.31microF, 35nH, 25mohms per stage. The first results on a 15 stages line on a POS show good behaviour of the interfaces during the opening. Those experiments must be completed by tests on more inductive load with a 20 stages line.

Author

Electric Generators; Accelerators; Multichannel Communication

20050168284 New Mexico Univ., Albuquerque, NM, USA

Implementation Of A Frequency-Agile, High Power Backward Wave Oscillator

Schamiloglu, E.; Abdallah, C. T.; Park, G. T.; Souvalian, V. S.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 742-746; In English; See also 20050168165; Copyright; Avail: Other Sources

Recent work at the University of New Mexico (UNM) has demonstrated how finite length effects in a high power vacuum backward wave oscillator (BWO) can be exploited to achieve frequency agility for constant beam and magnetic field parameters. This enhanced bandwidth is obtained through the axial displacement of the slow wave structure with respect to the cutoff neck 'inlet' to the electrodynamic system. This paper describes progress on the implementation of this automatic displacement to facilitate the incorporation of a robust controller, as proposed by Abdallah, et al. The purpose of this controller is to demonstrate a 'smart tube' where a variety of objectives, such as i) maximizing the frequency bandwidth for a given constant power output, ii) maximizing the radiated peak power at a given frequency, or iii) maximizing the beam-to-microwave power conversion efficiency, can be achieved automatically.

Author

Backward Waves; Frequency Hopping; Microwave Oscillators; Automatic Control

20050168285 New Mexico Univ., Albuquerque, NM, USA

A Cathode Mounted Plasma Prefill Source For High Power Microwave Experiments

Grabowski, C.; Gahl, J. M.; Schamiloglu, E.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 747-752; In English; See also 20050168165; Copyright; Avail: Other Sources

The introduction of a plasma into the slow-wave structure (SWS) of a backward wave oscillator (BWO) has been shown to increase microwave power output and generation efficiency, as well as provide several other benefits. Two methods of generating the plasmas are electron beam impact ionization of a background gas and prefilling through use of an external plasma source. It has been shown that optimally the plasma should be confined near the axis of the SWS, while the electron beam driving the device should be as close to the walls as possible. Previous plasma-filled BWO experiments used external plasma sources that were mounted in the microwave extraction region of the BWO, making use of the electron beam's guiding magnetic field to compress the plasma onto the axis as it enters the SWS. At the University of New Mexico a plasma source has been developed for the UNM Long-Pulse BWO Experiment which can be mounted upstream of the SWS, directly into the cathode stalk of the electron beam diode. This source utilizes a flashboard, similar to the kind used in plasma opening switches, to create the plasma. Plasma is injected directly onto the axis of the SWS, and since the source hardware has been removed from the extraction region, problems with coupling out the microwave power are eliminated, and the amount of plasma in this region is reduced. Data such as plasma density at different axial positions in the BWO without the electron beam will be presented, followed by a discussion on the changes in BWO performance when the experiment is fired with the addition of this plasma. Details of the novel plasma injection system will also be presented.

Author

Cathodes; Backward Waves; Microwave Oscillators; Plasmas (Physics)

20050168286 Academy of Sciences (USSR), Moscow, USSR

Double-Sided Relativistic Magnetron

Agafonov, A. V.; Krastelev, E. G.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 774-779; In English; See also 20050168165

Contract(s)/Grant(s): RFFI-96-02-19215a; Copyright; Avail: Other Sources

A new scheme of a symmetrically powered relativistic magnetron and several methods of localized electron flow forming in an interaction region are proposed to increase the efficiency of relativistic magnetrons (RM). As was reported for many experiments, the efficiency of RM is about 10 -- 30% and considerably lower than that of greater than or equal to 70% for the classic magnetrons. A very important reason is the effect of nonsymmetric feeding of power from one side of a magnetron, which is typical for experiments. One-sided powering leads to the axial drift of electrons, to the transformation of transverse velocities of electrons to a longitudinal one and to the generation of a parasitic electron beam which does not take part in energy exchange between electrons and waves at all. A special driver was designed for double-sided powering of RM. The proposed system is compact, rigid and capable of reliable operation at high repetition rates, which is advantageous for many applications. Several smooth-bore magnetrons were tested by means of computer simulations using PIC code KARAT. The results showed a difference between the dynamics of electron flow for one- and two-sided power feeding of the structure under test. It was shown that all electrons emitted from the cathode are captured inside the interaction region under the condition of proper choice of the electrostatic and/or external magnetic field distributions. This situation is practically impossible for a

one-sided magnetron. Design of a driver and computer simulation results are presented.
Author
Magnetrons; Relativistic Theory; Symmetry

20050168287 National Univ. of Defense Technology, Changsha, China
The Studies Of Hpm Frequency-Lock Technique Of Vco
Zhang, Y. Z.; Liu, J. L.; Li, c. L.; Chen, G. Q.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 786-790; In English; See also 20050168165; Copyright; Avail: Other Sources

A metal resonant cavity was used successfully to lock the HPM frequency from a VCO. The effects of the electron beam space charge and the energy extract slots on the cavity eigentreguenees were calculated. On the base of theoretical analyses and analogue tests, a length -adjustable small D/L ratio cavity and an annular intense electron beam VCO system were designed and pretty good results of VCO HPM frequency locking was obtained. The main frequency was stabiliTed at 4.12GHZ with 3db bandwidth less than or equal to 1%, even the electron beam current changed by 12.5%.
Author
Cathodes; Oscillations; Microwaves; Cavity Resonators; Frequencies

20050168288 Russian Federal Nuclear Center, Sarov, Russia
Progress in the Investigation of Magnetized Plasma Parameters in the Magnetic Compressure System (MAGO)
Chernyshev, V. K.; Volkov, G. I.; Dyomin, A. N.; Dolin, N.; Ivanov, V. A.; Korchagin, V. P.; Morozov, I. V.; Pak, S. V.; Skobelev, A. N.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 801-807; In English; See also 20050168165; Copyright; Avail: Other Sources

Works on the investigation of a magnetized plasma were commenced and developed in the framework of MAGO (magnetic compressuring) programme, that got its official status at VNIIEF in 1979 [1]. It was directed to the attainment of a thermonuclear ignition in dense targets (without the use of fissionable materials) by means of their eompressin8 by liners accelerated to high velocities by a magnetic field. The investigations of the magnetized plasma were focused on the production of a hot ionized low-density plasma pre-heated up to 0.2-1.5 KV and suitable for the subsequent adiabatic pressing by the liner up to thermonuclear temperatures. The development of a new type of the plasma chamber has formed the basis for a new area of the works, the calculated and theoretical justification of which has been performed by the theoretical Department sponsored by V.N.Mokhov; the experiments have been arranged and conducted at VNIIEF Electrophysical Department under the supervision of V.K.Chernyshev [21. This chamber has got the title gaseous ponderomotive unit (GPU) or gaseous PU, and the system designed for the study of dense targets has come to be known as a liner ponderomotive unit
Derived from text
Magnetic Fields; Plasmas (Physics); Ignition; High Temperature Plasmas; Fissionable Materials

20050168289 Yatsushiro National Coll. of Technology, Yatsushiro, Japan
Gas-Puff Z-Pinch Plasmas Driven by Inductive Energy Storage pulsed Power Generator
Murayama, Koichi; Shinkai, Toshinori; Katsuki, Sunao; Akiyama, Hidenori; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 815-820; In English; See also 20050168165; Copyright; Avail: Other Sources

ASO-II, an inductive energy storage pulsed power generator developed at Kumamoto University, is used as a power source for gas-puff z-pinch plasmas. The plasma characteristics are compared with those generated by a fast capacitive bank that supplies the same energy. Also, solid and mesh cathode electrodes are compared with respect to the pinch behavior. Using ASO-II in the case of solid cathode electrode, the plasma pinches uniformly and the spatial stability of hot spots is improved. The intensity of the soft x-rays increases a little. The behavior of the plasma pinch and the spatial stability of hot spots are improved by using the mesh cathode electrode, and the differences of experimental results between the fast bank and ASO-II become small.
Author
Cathodes; Electric Generators; Electrodes; Zeta Pinch; Capacitance; Energy Storage

20050168290 Kharkiv State Univ., Kharkiv, Ukraine
Generation of Powerful Pulses of X-Radiation in IREB-Dense Gas System
Chorny, V. V.; Dubina, V. M.; Dunaevsky, O. V.; Lomako, A. O.; Frolov, O. I.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 821-825; In English; See also 20050168165
Contract(s)/Grant(s): STCU-125; Copyright; Avail: Other Sources

The quest for perfect Bremsstrahlung targets feasible for rapidly expanding technology of high-power electron accelerators led the researchers of the seventies to the idea of applying thin metal foils placed into magnetic field. Further development of this trend led to the idea of intensive electron beams along the current carrying conductor B - gradient drift application. Usage of the background gas in the pressure range of some Torr in the drift chamber gives rise to charge and current neutralization of the beam, which provides effective transport of electron beams with currents considerably exceeding the Alfven limit. Azimuthal magnetic field provides multiple traversal of the thin targets by electrons which causes high increase of the beam energy deposition and of the soft part of Bremsstrahlung spectrum yield. The improved construction of the device enabled nearly 100 % of the diode-generated electron beam to be delivered to the target which consisted of two thin Tantalum foils placed like-V, and to create a high-effective Bremsstrahlung converter with enhanced yield of X-rays in 100 keV energy range. But such target devices are good for accelerators working in single-pulse regime, because after each pulse the foils are to be substituted.
Author
Bremsstrahlung; Targets; Electron Accelerators; Magnetohydrodynamic Waves; Relativistic Electron Beams; Electron Beams; Energy Transfer; Gas Density; Gas Pressure

20050168291 Institute of Fluid Physics, Chengdu, People's Republic of China
Pulsed Monoenergy X-Ray Source
Cheng, Nianan; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 843-844; In English; See also 20050168165; Copyright; Avail: Other Sources

In the paper a pulsed monoenergy x-ray source which consist of a water dielectric plane PFL and a cold cathode diode is described. The diffraction photograph of K(sub alpha) for copper is observed by applying the LiF crystal. When the copper anode is used, the rate of radiation measured at the detective position is about 6 x 10(exp 4)R/sec. Diffraction photographs of the K(sub alpha) for both copper and zinc are observed simultaneously when the brass anode is used.
Author
X Ray Sources; Dielectrics; Cold Cathodes; Diodes; Lithium Fluorides

20050168292 Kyushu Univ., Fukuoka, Japan
Soft X-ray emission from the gas-puff z-pinch plasma produced by an inductive pulsed power generator
Imasaka, K.; Hara, S.; Kawauchi, Y.; Kawazoe, K.; Suehiro, J.; Hara, M.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 845-850; In English; See also 20050168165; Copyright; Avail: Other Sources

Inductive pulsed power generator which has copper wire fuses used as an opening switch has been developed at Kyushu University for a power source of gas-puff z-pinch. The inductive pulsed power generator has a capacitor of 11vtF and 19.8kJ as a primary energy source and can supply a driving current with rising time of about 200ns to the gas-puff z-pinch plasma. Experiments with fast bank and inductive pulsed power methods are performed to investigate characteristics of gas-puff z-pinch plasmas. Obtained results show that the intensity of soft x-ray decreases gradually with a delay time which is the time difference between beginning of coil current from a gas-puff actuator and that of generator current in both methods. From the observation of hot spots recorded with two pin-hole cameras arranged at right angles each other, it is found that the hot spots tend to align on the central axis between electrodes with increase of rising rate of plasma current. Behavior of imploding cylindrical plasma depend on the rising rate of plasma current. Especially, sausage instability in the pinching plasma along the axis becomes predominant in case of higher rising rate of current by the inductive pulsed power method and the faster current leads to spatially confined distributions of hot spots appearance shot to shot.
Author
X Rays; Emission; Plasmas (Physics); Pulse Generators; Zeta Pinch

20050168293 All-Russian Scientific Research Inst. of Experimental Physics, Nizhni Novgorod, Russia
Electron Beam Behavior Investigation In Virtual Cathode Region
Alyokhin, B. V.; Voronin, V. V.; Voronov, S. L.; Kovalenko, O. I.; Pavlov, S. S.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 770-773; In English; See also 20050168165; Copyright; Avail: Other Sources

The present work experimentally studied the electron beam behavior in the virtual cathode formation region. A coaxial vacuum diode having a flat graphite cathode 30 mm in diameter served as the beam source. Electrons were injected into the cylindrical drift chamber through the wire anode. The accelerating voltage pulse amplitude was as high as approximately 270 kV, the beam current varied within 15 - 22 kA, its half-height duration being 20 ns. For the drift chamber used in experiments the injected beam was beyond the limit. Along with conventional diagnostics means a wire probe arranged in the anode plane

transverse to the beam was used in this work for the current measurement. The probe recorded both the forward beam current and the current of electrons reflected from the virtual cathode. There are given the results of recording X-ray radiation from the virtual cathode formation region using a pinhole camera. It has been noted that the beam homogeneity produces a great effect upon the radiation generation efficiency.
Author
Cathodes; Electron Beams; Virtual Reality

20050168294 Centre d'Etudes de Gramat, France
Reflex Diode Bremsstrahlung Improvement for Syrinx Project
Bonnet, P.; Porte, A.; Vie, M.; Nouvel, G.; Bedoch, J. P.; Ritter, S.; Terrissol, M.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 851-856; In English; See also 20050168165; Copyright; Avail: Other Sources

In the Bremsstrahlung field, the Reflex diode principle is a good way to increase the efficiency of low energy photons (\h 50 keV) compared with a thick converter. To reach our goal, we use both the numerical and experimental simulations. Our work conditions are low accelerating voltage domain (200 kV on average) and diode with thin gold foil and two cathodes which allow to improve component of soft transmitted X rays while working in backscattered geometry. The interest of gold converter is the possibility to obtain easily a thin foil with high atomic number material (thickness : some micrometers, area : 154 one). In order to define the optimal converter thickness, giving the best fit between production and attenuation of X-rays, some Monte Carlo numerical simulations have been achieved. The code used was specially improved to take reflex effect and fluorescence X rays into account. Some simulations with a PIC code allow to design the diode geometry and verify the reflex effect across thin foil. The geometry defined for Reflex diode includes two cathodes (one of them is photon transparent about 95%), which also allow doubling the current for the same anode surface. These previous computations concerning geometry and anode thickness permit to prepare experimentations on M.B.S. facility in view to optimize this Bremsstrahlung source type for SYRINX. The photonic spectrum, voltage and diode current were measured for each shot in order to compare them with various simulations.We are confident in the first results to increase the total fluence.
Author
Diodes; Bremsstrahlung; Photons; Numerical Analysis; X Rays; Experimentation

20050169244 C-CORE, Saint Johns, Newfoundland, Canada
Antenna and Ionospheric Propagation Analysis of Marconi's Experiment in Newfoundland
Saoudy, S. Ahmed; Sinha, Amit; Yan, Bing; Sinha, B. P.; Sinha, Amit; Yan, Bing; Sinha, B. P.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 588-591; In English; See also 20050169243; Copyright; Avail: Other Sources

The famous Marconi's transatlantic experiment from Cornwall, England to St. John's, Newfoundland proved the possibility of long distance wireless communication. Although Marconi's experiment was analyzed from the circuit theory point of view the antenna and ionospheric propagation side analyses were not done. In this work we address the later. During his experiment Marconi reported that he used signals of long wave length i.e. 1800 m. From his antenna design and the ionospheric conditions at that time, this work proves that other frequencies of 9.375 MHz and 12.5 MHz had much higher possibility of reception at the destination, St. John's, than his 0.166 MHz signal.
Author
Antenna Design; Wireless Communication; Ionospheric Propagation

20050169245 Quebec Univ., Verdun, Quebec, Canada
Temporal Variations of the Wideband Indoor Wireless Millimeter-Wave Channel
Marinier, P.; Delisle, G. Y.; Despins, C. L.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 592-601; In English; See also 20050169243
Contract(s)/Grant(s): NESRC-A-2176; Copyright; Avail: Other Sources

This paper reports on wideband measurements devoted to the study o/the influence of human presence on the dispersion characteristics of a wireless indoor channel operating around 30 GHz. Preliminary results show that under realistic propagation conditions, the total received multipath power and the RMS delay spread are only slightly affected by motion within a confined environment where the terminals are located.
Author
Temporal Distribution; Millimeter Waves; Multipath Transmission

20050169246 Turin Univ., Italy

Effects of the TE Cavity Modes in the Full Wave Analysis of Printed Patch Antennas

Vecchi, Giuseppe; Pirinoli, Paola; Orefice, mario; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 630-633; In English; See also 20050169243; Copyright; Avail: Other Sources

In the full-wave analysis of printed antennas, the magnetic-wall cavity modes are conveniently employed as basis functions in connection with the spectral-domain version of the Method of Moments. Often only TM modes are considered: here we investigate on the effect of the exclusion of TE modes for a general structure, and we give numerical results for annular patches, especially relevant in this context.

Author

Patch Antennas; Method of Moments; Cavities; Exclusion

20050169247 Turin Univ., Italy

'Static' Modes in the Full-Wave Analysis of Printed Antennas

Vecchi, Giuseppi; Matekovits, Ladislau; Pirinoli, Paola; Orefice, Mario; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 638-643; In English; See also 20050169243; Copyright; Avail: Other Sources

A novel approach is applied to the EFIE-MoM analysis of printed antennas, based on the eigenfunctions of suitably extracted singular, frequency-independent parts of the integral operator. These terms, called 'static modes', are entire-domain basis functions that extend and generalize the TM and TE modes of a magnetic-wall cavity to arbitrary geometries. General criteria allow to select those modes that efficiently represent the solution, including also 'attachment' modes that represent the feed structure discontinuities.

Author

Method of Moments; Printed Circuits; Antennas; Frequencies; Eigenvectors

20050169250 Heinrich-Hertz-Inst., Berlin, Germany

Low Phase Noise Microwave and Millimeter-Wave Generation and Transmission Using Optical Heterodyning

Braun, R.-P.; Grosskopf, G.; Rohde, D.; Schmidt, F.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 770-773; In English; See also 20050169243; Copyright; Avail: Other Sources

Error-free 140 Mbit/s transmission experiments with optically generated millimeter-waves at frequencies at 18 and 60-70 GHz are reported. The millimeter-wave signals depict quartz accuracy and low phase noise \h-80dBc/Hz (@lkHz). For bidirectional transmissions two millimeter-wave carriers one for the radio link to the mobile receiver (down link) and one for the uplink-millimeter-wave mixer in the base station are generated by optical heterodyning.

Author

Millimeter Waves; Noise Generators; Optical Heterodyning; Microwave Transmission; Low Noise

20050169251 Syracuse Univ., NY, USA

Multiple Sequence Matrix Pencil Analysis

Park, Sheeyun; Sarkar, Tapan K.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 788-791; In English; See also 20050169243; Copyright; Avail: Other Sources

Matrix Pencil is a well known technique used to fit data as a sum of complex exponentials. The technique estimates the poles of the system, then solves a least squares problem for the amplitudes of the poles. This paper details an extension of the Matrix Pencil technique to match poles simultaneously to several data sequences which should have the same poles but may have differing amplitudes, some of which may be zero, associated with the poles.

Author

Estimates; Matrices (Mathematics); Least Squares Method; Amplitudes

20050169255 Royal Military Coll. of Canada, Kingston, Ontario, Canada

A Dual Polarized Microstrip Ring Antenna with Good Isolation

Parker, G.; Antar, Y. M. M.; Ittipiboon, A.; Petosa, A.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 928-931; In English; See also 20050169243; Copyright; Avail: Other Sources

This paper presents the experimental results of two dual linearly polarized aperture coupled microstrip ring antennas

operating at 1.8 GHz. The use of multiple feeds has resulted in measured input isolation of -30 dB and cross pol. radiation levels of up to -25 dB down from the co-pol.
Author
Microstrip Antennas; Coupled Modes; Apertures

20050169256 Tsinghua Univ., Bejing, China
A Broadband Dual Frequency Microstrip Antenna
Yang, Fan; Zhang, Xue-Xia; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 960-963; In English; See also 20050169243; Copyright; Avail: Other Sources

new broadband dual frequency microstrip antenna is presented in this paper. Multiport network model is used for analysis. The experimental results are in reasonable agreement with the analysis. The impedance bandwidths of 290 MHz at 2.2 GHz and 230 MHz at 2.55 GHz are obtained with single feed pert and substrate thickness=3mm, E(sub r) =2.85. The polarized characterizations over these bands are also discussed.
Author
Microstrip Antennas; Broadband; Impedance; Bandwidth

20050169259 Michigan Univ., Ann Arbor, MI, USA
Numerical Simulation of Scattering from Rough Surfaces: A Wavelet-based Approach
Zahn, D.; Sabet, K. F.; Sarabandi, Kamal; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1100-1103; In English; See also 20050169243; Copyright; Avail: Other Sources

Haar and B-spline wavelet basis functions are applied to the Method of Moments (MoM) in order to speed up the Monte Carlo simulation of scattering from rough surfaces. Application of wavelet ha.sis functions in conjunction with imposed threshold levels produce sparse impedance matrices which are then solved efficiently using search routines such as the Conjugate Gradient method. These different threshold levels are imposed on matrix element values with respect to the element of largest magnitude in order to determine the accuracy versus computing speed criterion. Results are compared to previous results computed using a conventional pulse basis function and point matching as well a.s the existing theoretical solutions for rough surfaces. It is shown that wavelet basis functions provide substantial reductions in both memory requirements and computation time while providing very accurate results.
Author
Wavelet Analysis; Surface Roughness; Electromagnetic Scattering; Numerical Analysis; Simulation

20050169261 Ecole Polytechnique, Montreal, Quebec, Canada
A Printed Microwave Antenna for the Treatment of Heart Rhythm Disorders
Khebir, Ahmed; Chapelon, Pierre-Antoine; Savard, Pierre; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1194-1197; In English; See also 20050169243; Copyright; Avail: Other Sources

This paper presents a three-dimensional finite element approach to determine the dissipated power density in the heart chambers during a microwave ablation for the treatment of heart rhythm disorders. An example of a printed flexible antenna is included.
Author
Microwave Antennas; Finite Element Method; Ablation; Heart Rate

20050169265 NTT Wireless Communications Systems Labs., Kanagawa, Japan
A Planar Sector Antenna for Indoor High-Speed Wireless Communication Terminals
Uehara, Kazuhiro; Seki, Tomohiro; Kagoshima, Kenichi; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1352-1355; In English; See also 20050169243; Copyright; Avail: Other Sources

This paper shows a new methodology for realizing planar sector antennas. The sector antenna uses two kinds of beams formed by two kinds of antennas: planar 4-beam subarrays and planar single-beam subarrays. In order to equalize the antenna gains in all sectors, the beam shapes are carefully designed to offset the movement experienced by portable terminals. The 4-beam subarray is a multi-beam antenna integrated with a planar Butler matrix feeding circuit. The design method of the subarray and an evaluation of its characteristics in the 19 GHz band are discussed.
Derived from text
Planar Structures; Antenna Gain; Matrices (Circuits); Multibeam Antennas

20050169269 Pennsylvania Univ., Philadelphia, PA, USA

Fractionalization of the Curl Operator and Its Electromagnetic Application

Engheta, Nader; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1480-1483; In English; See also 20050169243; Copyright; Avail: Other Sources

Inspired by the concept of fractional derivatives and fractional integrals, we have been exploring the possibility of extending the idea of fractional derivatives/integrals to fractionalization of some other operators commonly used in electromagnetic problems. In particular, we have been investigating the fractionalization of the curl operator. As will be presented in this talk, such generalization leads to an interesting mathematical operation with potential applications in certain electromagnetic problems.

Derived from text

Operators (Mathematics); Curl (Vectors); Measure and Integration; Electromagnetism

20050169270 Kansas Univ., Lawrence, KS, USA

Convergence Considerations in Moment-Method Analysis of a Class of Microstrip Antennas

Chatterjee, D.; Plumb, R. G.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 602-605; In English; See also 20050169243; Copyright; Avail: Other Sources

Inclusion of the probe-to-patch attachment, mode current in the full-wave analysis of probe-fed microstrip antennas showed superior agreement with input impedance measurements. The attachment mode can be represented by the infinite eigenfunction or residue series, which are mutually different across the Stokes regions. In this paper it is shown that the residue series has better convergence properties and hence can be used to develop efficient moment-method algorithms for such antenna configurations.

Author

Convergence; Microstrip Antennas; Antenna Design; Eigenvectors; Impedance Measurement

20050169271 Michigan Univ., Ann Arbor, MI, USA

Patch Antennas on Ferromagnetic Substrates

Brown, Arik; Gong, Jian; Kempel, Leo; Volakis, John; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 606-609; In English; See also 20050169243; Copyright; Avail: Other Sources

Biased ferrite materials have been used for electromagnetic applications, particularly those involving printed microwave circuits. Their appeal is that their electrical properties can be easily changed with frequency. By varying the strength of the applied magnetic field, ferrites exhibit interesting characteristics, including non-reciprocal effects, frequency tuning by changing external biasing, polarization diversity using a single element, and various other useful properties.

Author

Patch Antennas; Ferromagnetic Materials; Microwave Circuits; Electrical Properties; Bias

20050169272 Tehran Univ., Tehran, Iran (Islamic Republic of)

Inclusion of Finite Substrate Effects in the Analysis of Printed Antennas and MIC's by the CGF Technique

Faraji-Dana, R.; Chow, Y. L.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 618-621; In English; See also 20050169243; Copyright; Avail: Other Sources

In MIC's and printed antennas the dielectric substrates always have finite extent. Rigorous analysis of the truncation effects requires the solution of an integral equation with MoM. This is usually numerically intense especially for 3-D structures. In this paper the truncation effects are incorporated directly in an approximate Green's function. The Characteristic Green's Function (CGF) technique is combined with the complex images method to derive the Green's function. The derived Green's function exhibits excellent agreement with the available rigorous MoM solution of the problem.

Author

Green's Functions; Substrates; Dielectrics; Eigenvectors

20050169273 Michigan Univ., Ann Arbor, MI, USA

Novel Class of Hierarchical Higher Order Tangential Vector Finite Elements for Electromagnetics

Andersen, Lars S.; Volakis, John L.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 648-651; In English; See also 20050169243; Copyright; Avail: Other Sources

Node based finite elements are not suitable for modeling the vector nature of electromagnetic fields. Tangential Vector Finite Elements (TVFE's) overcome most of the shortcomings of node based finite elements and for various element shapes,

several TVFE's of different orders have previously been presented. For a triangular element, this paper presents a novel class of hierarchical higher order TVFE's that differs significantly from traditional TVFE's. For a simple application, the paper demonstrates that the performance of one of these new TVFE's is equivalent to the performance of a traditional mixed order TVFE. However, the hierarchical nature of the new TVFE's may make them a better choice than traditional TVFE's.
Derived from text
Electromagnetic Fields; Finite Element Method; Electromagnetism; Vectors (Mathematics); Nodes (Standing Waves)

20050169275 Seoul National Univ., Korea, Republic of
Analysis of Arbitrary Shaped Cross-Sectional Discontinuity in Rectangular Waveguides Using FEM-BIM with Triangular Prism Elements
Park, Jonkuk; Nam, Sangwook; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 672-675; In English; See also 20050169243; Copyright; Avail: Other Sources

An arbitrary shaped cross-sectional discontinuity in rectangular waveguides is investigated using FEM-BIM with triangular prism elements, which is more effective than normal FEM, The volume of discontinuity is subdivided into a relatively small number of triangular prism elements and FEM is used to formulate the field distribution. On the other hand, the fields in the waveguide region are represented by BIM derived from the waveguide Green's function and boundary conditions. The proposed method is verified through the experiment for the circular iris in WR-90 waveguide.
Author
Rectangular Waveguides; Discontinuity; Boundary Conditions

20050169276 Sanders Lockheed Martin Co., Nashua, NH, USA
Flat-Topped Beams from a Uniform Amplitude Rectangular Aperture
Cleaveland, Bryan; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 686-689; In English; See also 20050169243; Copyright; Avail: Other Sources

A useful property of the x*y phase distribution has been discovered which allows a phased array with uniform amplitude taper to have a continuously programmable beamwidth, or zoom mode, based on a single parameter without need for optimization. It has applications for a broad area coverage mode for transmit arrays, or broad acquisition beams for arrays in satellite terminals and missile seekers. It is readily switchable with a pencil beam mode without excessively adding to the complexity of the beamsteering computer. Phased arrays are attractive for many applications because of their rapid beam scanning, flexibility and graceful degradation. Most phased array applications have been for forming high gain pencil beams, although some beam shaping has been done for csc^2 beams. Most applications requiring shaping of two-dimensional sector patterns have been satisfied using focal plane antenna systems.
Derived from text
Antenna Design; Apertures; Beams (Radiation); Degradation; Phased Arrays; High Gain

20050169277 Communications Research Centre, Ottawa, Ontario, Canada
Active Phased Array of Dielectric Resonator Antennas
Petosa, Aldo; Larose, Richard; Ittipiboon, Apisak; Cuhaci, Michel; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 690-693; In English; See also 20050169243; Copyright; Avail: Other Sources

A novel high gain, low profile active phased array is being developed with electronic beam steering capability in the azimuth plane. The radiating elements consist of multi-segment dielectric resonator antennas (DRAs) of rectangular cross-section, fed by a microstrip line. The array combines DRA technology with multi-layer printed technology. A 320 element array with integrated low noise amplifiers and four-bit digital phase shifters is under development. The array offers high gain, wide pattern bandwidths, and electronic beam steering capability.
Author
High Gain; Phased Arrays; Bandwidth; Antenna Arrays; Microstrip Transmission Lines; Dielectrics

20050169278 Communications Research Lab., Tokyo, Japan
Sequentially Rotated Phased Array Consisting of Higher Order Mode Elements
Tanaka, Masato; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 710-713; In English; See also 20050169243; Copyright; Avail: Other Sources

A circular or ring microstrip antenna with second or higher order mode excitation can form a conical pattern with the null

at broadside [1] and beam peak at an elevation angle of about 45 degrees, and can be effectively applied as an element of conformal land mobile phased arrays for satellite communication. However, higher order mode microstrip antennas have a serious problem concerning axial ratio characteristics. I proposed a method of designing a sequentially rotated array consisting of higher order mode elements in order to reduce axial ratio quality [2]. This sequentially rotated array requires the different rotation angle for different mode excitation, while the phase shift is independent of mode excitation. This paper describes the application of this sequentially rotated array to phased array consisting of higher order mode elements.
Derived from text
Rotation; Microstrip Antennas; Phased Arrays; Dipole Antennas; Phase Shift

20050169281 Naval Research Lab., Washington, DC, USA
Prospects For Low Drive Voltage LiNbO3 Broadband Modulators
Burns, W. K.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 759-761; In English; See also 20050169243; Copyright; Avail: Other Sources

Velocity matched traveling wave devices in LiNbO3 require the reduction of the microwave phase velocity so that it equals the optical phase velocity. Generally this is done by manipulating the geometric structure and layer thicknesses of the electrodes and buffer layers making up the coplanar electrode structure. Early velocity matched devices(I-3) tended to achieve velocity matching at the expense of impedance matching which in turn resulted in some degradation in performance. The difficulty in achieving simultaneous velocity and impedance matching arises from the high dielectric constant of LiNbO3(approx.35). Progress in overcoming this problem has come from two developments: First, the use of ridge waveguide structures(4) which use physical etching to remove the high dielectric constant LiNbO3 material, and thus add an additional degree of freedom in the design problem.
Derived from text
Lithium Niobates; Low Voltage; Microwaves; Phase Velocity; Electrodes; Design Analysis; Impedance Matching

20050169282 Bath Univ., Bath, UK
Computation of Propagation in Adiabatically Tapered Dielectric Structures Based on Eigenfunction Expansions: Application to (Active) Optical Devices
Causa, F.; Sarma, J.; Milani, M.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 762-765; In English; See also 20050169243; Copyright; Avail: Other Sources

There exists a vast amount of literature [1]-[5] on the methods for analysing the propagation of electromagnetic fields in longitudinally uniform waveguide structures which support what are referred to as the eigen-modes of the guide. The most common of these guides are the hollow (or partly dielectric filled) metal wall cylinders, and longitudinally uniform dielectric cylinders. The former type are categorized as closed while the latter as open waveguides. The totality of modes supported by dielectric waveguides consists of a set of discrete bound modes and a continuum of radiation modes, whereas for metal waveguides it consists of an infinite set of discrete modes which are similar to the bound modes of dielectric waveguides. Each such mode set is (mathematically) complete in the corresponding functional space. It should be noted that there are other fundamental differences in the modal properties of closed and open waveguides.
Derived from text
Electromagnetic Fields; Dielectric Waveguides; Eigenvectors; Waveguides; Dielectrics; Cylindrical Shells

20050169284 Bilkent Univ., Ankara, Turkey
Quantitative Comparison of Rooftop and RWG Basis Functions.
Gurel, Levent; Sendur, Ibrahim Kursat; Sertel, Kubilay; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 796-799; In English; See also 20050169243
Contract(s)/Grant(s): EEEAG-163; Copyright; Avail: Other Sources

Integral-equation solvers of computational electromagnetics rely on the representation of the unknown function in terms of some known basis functions (BFs). Among various possible entire-domain and subdomain BFs, piecewise linear function defined on rectangular subdomains (referred to as 'rooftops' or RTs) and triangular subdomains (and referred to as RWGs) are commonly used in the numerical solution ot the surface integral equations. The RT BF's are well-suited for the modeling of geometries that conform to Cartesian coordinates, whereas the RWG BFs are capable of modeling fiat-faced approximations of arbitrary geometries. Both basis functions can also be used in modeling unknown functions transformed from the real space to the parametric space of a curved surface. The RT and RWG basis functions have many common features: they are defined on two neighboring (touching) subdomains and the unknown is associated with the common edge between these two

subdomains; thus they are edge functions; on this common edge the normal component of the current is continuous and has a constant value; on the other edges, the current does not have a normal component; hence no line charges exist at the boundaries of the basis functions. In addition to the shapes of their subdomains, the two BFs also differ in the way they define the direction of the current: the RTs have the same direction (normal to the defining edge) at every point on the two rectangular subdomains, whereas the RWGs are 'vector' BFs in the sense that they do not have a constant direction at every point on the two triangular subdomains.
Derived from text
Computational Electromagnetics; Integral Equations

20050169285 Illinois Univ., Urbana, IL, USA
A Near-Resonance Decoupling Approach (NRDA) for Scattering Solution of 3D Near Resonant Structures
Lu, C. C.; Chew, W. C.; Ling, H.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 808-811; In English; See also 20050169243
Contract(s)/Grant(s): F49620-96-1-0025; DAAH04-93-G-0430; NSF ECS-93-02145; Copyright; Avail: Other Sources

In this paper, we propose an algorithm that applies the equivalence principle and the method of moments to study the multiple wave bounces in an open-ended cavity, and to reduce the iteration umber for an iterative solution of the problems. The idea is to apply the equivalence principle to separate the cavity region from the exterior region and solve the cavity problem by the method of moments with a direct solver. The interior and exterior solutions are coupled via a generalized admittance matrix called Y-matrix. As the cavity response is specified by the Y-matrix where multiple-bounce wave physics has already been incorporated, the iteration process for the exterior problem is free from having to account for multiple-bounce physics inside the cavity. Consequently, the iteration count for the exterior solution is greatly reduced. We call this method the near-resonant decoupling approach (NRDA) because it decouples the near-resonance in the cavity region from the exterior surface using the equivalence principle. It is a rigorous method and the only approximation is the result of the numerical implementation. In the following, we first describe the algorithm for a general problem. Then we will present some numerical simulation results.
Derived from text
Decoupling; Equivalence; Iterative Solution; Method of Moments; Electromagnetic Scattering

20050169289 Scientific and Research Inst. of Control and Measuring Systems, Nizhny Novgorod, Russia
Antenna System for Ariane S Booster
Shunin, Oleg A.; Tensin, Vladimir S.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 866-867; In English; See also 20050169243; Copyright; Avail: Other Sources

Antenna system includes 4 antenna units disposed under 90 deg from each other in the booster's nose cone cross section. The opposite antennas in each of 2 antenna pairs are connected by cables and power divider. L-band slotting antennas have the fibre-quartz-based material on a slot and a heat-reflecting coating placed on a titanium casing. The feed pin is attached to the casing by laser welding. Antenna provides good matching (about 20% frequency band within SWR=2.0). To. provide a uniform elevation pattern of the antenna parr the geometry of the antenna edges should be matched. This has been accomplished by means of X-band measurements using antenna and booster scale models. Optimized elevation pattern of the antenna pair has an interference form due to the large electrical sizes of the booster. Taking into account that the average pattern value should be within the space angle 5 deg (as the signal is reflecting from the limited area of the sea surface) the elevation pattern may be considered to be omnidirectional after matching the geometry of the antenna edges.
Author
Antenna Design; Ariane Launch Vehicle; Frequencies

20050169290 Hughes Space and Communications Co., Los Angeles, CA, USA
An Electrically Small Compact Minimum Scattering Shaped Reflector for a Large Beam
Werntz, Paul; Ramanujam, P.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 868-871; In English; See also 20050169243; Copyright; Avail: Other Sources

Shaped reflectors have found a wide variety of geostationary satellite applications in the last few years [1]. Relatively larger beam sizes are required for satellites operating from lower earth orbits. The larger beams allow the use of relatively smaller antenna sizes to obtain satisfactory gain performance. However, antennas generating larger coverage regions (larger than 30 degrees) are more susceptible to scattering from spacecraft structures and from feed blockage (if a reflector configuration is used). This scattering can be minimized by using a larger offset and a larger reflector size. One of the

interesting aspects of shaped reflectors is the possibility of using either converging or diverging solutions, shown in Fig l, to generate almost identical beam shapes[2]. Intuitively the converging solution appears to be less prone to scattering from adjacent structures and feed blockage, This paper describes an interesting example of a converging shaped reflector designed to generate a very large beam shape (\g40 degrees).
Derived from text
Reflectors; Geosynchronous Orbits; Synchronous Platforms; Scattering

20050169295 Cushcraft Corp., Manchester, NH, USA
The Cylindrical Omnidirectional Patch Antenna
Herscovici, Naftali; Sipus, Zvonimir; Kildal, Per-Simon; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 924-927; In English; See also 20050169243; Copyright; Avail: Other Sources

In recent years, the need for omnidirectional antennas for wireless applications increased considerably. The antennas are used in a variety of bands anywhere from 1.7 to 2.5 GHz, in different configurations which mainly differ in gain. The omnidirectionality is mostly obtained using back-to-back elements or simply using dipoles in different collinear-array configurations. The antenna proposed in this paper is a patch which was built in a cylindrical geometry rather than a planar one, and which generates an omnidirectional pattern in H-plane.
Author
Patch Antennas; Omnidirectional Antennas; Cylindrical Antennas

20050169296 Cranfield Univ., Cranfield, UK
A Stacked Annular-Ring Microstrip Patch Antenna
Al-Charchafchi, S. H.; WanAli, W. K.; Sinkeree, S.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 948-951; In English; See also 20050169243; Copyright; Avail: Other Sources

An experimental investigation is presented on the impedance bandwidth of an electromagnetically coupled, probe-fed stacked annular-ring microstrip patch antenna. A bandwidth of 12.6 % is achieved around a centre frequency of 2.38 GHz. Measurements on gain and radiation patterns are also presented. The antenna presented is suitable for use in planar and conformal arrays. It could find applications in the industrial, scientific and medical (ISM) frequency bands.
Author
Microstrip Antennas; Patch Antennas; Bandwidth; Antenna Radiation Patterns; Impedance Probes

20050169297 Amirkabir Univ. of Technology, Tehran, Iran (Islamic Republic of)
A Wide Band Dual-Polarized Microstrip Patch Antenna
Tavakoli, Ahad; Monajati, Alireza; Moini, Rouzbeh; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 956-959; In English; See also 20050169243; Copyright; Avail: Other Sources

Dual linear polarization with low cross polarization and high isolation has previously been reported using a cross shaped microstrip patch antenna. Here, by slightly deforming the shape of the patch, the bandwidth of the cross shaped structure is increased from 1.7 percent to 4.2 percent and the changes had minimal effect on radiation properties of the antenna. Segmentation, desegmentation and multiport network theory were used to predict the antenna characteristics such as resonant frequency, input impedance, scattering parameters, and radiation patterns of the antenna. Experimental results are in good agreement with theoretical calculations.
Author
Cross Polarization; Linear Polarization; Resonant Frequencies; Patch Antennas; Antenna Radiation Patterns; Impedance

20050169298 Office National d'Etudes et de Recherches Aerospatiales, France
FDTD Application to the Electrical Characterization of Materials by Solving an Inverse Problem
Grando, J.; Ferrieres, X.; Levesque, P.; Issac, F.; Alliot, J. C.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 974-977; In English; See also 20050169243; Copyright; Avail: Other Sources

We present a method in order to obtain the unknown permittivity _ and conductivity of a homogeneous object. The object is illuminated by an electromagnetic plane wave and we measure a set of near scattered fields with the EMIR (ElectroMagnetic InfraRed) method [1]. This experimental method is based on the use of photothermic film as a sensor to measure electromagnetic fields. With the field data available, we can formulate an inverse problem to evaluate the electrical

characteristics (epsilon, sigma) of the studied object. To solve the inverse problem, we use an iterative scheme based on a Finite Difference Time Domain method for the direct problem [2].
Derived from text
Finite Difference Time Domain Method; Electromagnetic Fields; Plane Waves; Infrared Radiation; Finite Difference Theory

20050169299 Ericsson Radio Systems A.B., Stockholm, Sweden
Comparisons of Measurements and FDTD Calculations of Mobile Phone Electromagnetic Far-Fields and Near-Fields
Siegbahn, Martin; Mazur, Sara; Tornevik, Christer; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 978-981; In English; See also 20050169243; Copyright; Avail: Other Sources

In recent years, substantial effort has been placed on investigations of the interaction between RF electromagnetic fields, emitted from hand-held mobile telephones, and the human user. Usually, dosimetric measurement systems incorporating liquid filled head phantoms are used to evaluate the nearfield characteristics, and free-space ranges or anechoic chambers for measurements of the far-field antenna radiation properties. However, due to the progress in the computer area, it is now possible to use numerical techniques for studying the electromagnetic fields radiated by a mobile phone. Above all, the FDTD method has offered a powerful approach in analyzing both the near-field and far-field situations with realistic body models [1],[2]. The aim of this study has been to compare the results from measurements and corresponding FDTD calculations of both the far-fields and near-fields emitted by mobile phones when the phone is standing free of surrounding objects and when it is placed in the close proximity of a head phantom.
Derived from text
Finite Difference Time Domain Method; Radio Frequencies; Electromagnetic Fields; Far Fields; Dosimeters

20050169300 Bristol Univ., UK
A New FDTD Model in the Study of Hollow Conducting Elliptical Waveguides and Cylindrical Cavity Resonator
Hao, Yang; Railton, Chris J.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 994-997; In English; See also 20050169243; Copyright; Avail: Other Sources

A new FDTD model is investigated to analyze electromagnetic wave propagation in a hollow conducting elliptical waveguide and a 3D cavity resonator using a Cartesian co-ordinate system. Modifications based on a nonorthogonal FDTD method are presented which are more efficient than general nonorthogonal FDTD schemes in terms of computer resources such as memory and CPU time.
Author
Electromagnetic Wave Transmission; Cartesian Coordinates; Finite Difference Time Domain Method; Waveguides; Finite Difference Theory

20050169301 Laval Univ., Sainte-Foye, Quebec, Canada
Adaptive Array Performance with Focussing Technique
Hefnawi, Mostafa; Delisle, Gilles Y.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1016-1019; In English; See also 20050169243; Copyright; Avail: Other Sources

Abstract-Adaptive array systems used for the rejection of multipath fading and additive interference in wideband indoor wireless communications require the addition of some frequency compensation methods in order to achieve adequate performance. The use of a focussing approach has been proposed as an alternative to the spectral decomposition technique to reduce the amount of data to be processed. This approach requires a preliminary estimation of the directions of arrival (DOA) of the signals using a fast acquisition technique such as the FFT. If these angles are inappropriately selected, our results show that the adaptive system performance is degraded. The focussing technique4s combined with the Constant Power Algorithm (CPA) to adjust the adaptation weights. Simulation and experimental results which show the behavior of the proposed algorithm are given.
Author
Adaptation; Algorithms; Antenna Arrays; Multipath Transmission; Data Reduction; Wideband Communication

20050169303 Lafayette Coll., Easton, PA, USA
Direction of Arrival Estimation Using Wavelet Based Beam-Space MUSIC
Jouny, Ismail I.; Amin, Moeness G.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1032-1035; In English; See also 20050169243; Copyright; Avail: Other Sources

Angle of arrival estimation using beam-space MUSIC is implemented by nonuniformly subbanding the spatial spectrum

of an antenna array using wavelet transform. The resulting spatial spectrum is thus composed of beam-space elements with dyadically proportional beamwidths. Wavelet based spatial filtering is compared with that of the DFT in the context of direction of arrival estimation (DOA) performance.
Author
Wavelet Analysis; Antenna Arrays; Spatial Filtering

20050169304 Communications Research Lab., Kawasaki, Japan
Adaptive Array Performance in the Presence of Spatially Spreaded Interference Signals
Zhang, Yimin; Yuan, Hao; Hirasawa, Kazuhiro; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1048-1051; In English; See also 20050169243; Copyright; Avail: Other Sources

In the recent decades, the adaptive array antenna technique has gained increasing interests. It is becoming an important means in mobile communication for the purposes of both suppressing co-channel interference signals and avoiding multipath fading to increase the communication capacity and improve communication quality. There are many reflecting and scattering waves in the actual land mobile communication environment, and they are considered to have some spatial spreading, or spatial angle profile. To obtain sufficient suppression of the undesired signals, an adaptive array needs enough degree-of-freedom (DOF) being greater than the number of undesired signals. However, it is not sufficient for a single DOF to suppress an undesired signal with spatial spreading. In this paper, the performance of an LMS adaptive array in the presence of spatially spreaded undesired signals is analyzed. It is made clear that the output SINR degrades as the spatial spread of the undesired signal increases. The relationship between the output SINR and the spread angle, the spatial signal correlation coefficient, is investigated.
Derived from text
Antenna Arrays; Electromagnetic Interference; Adaptive Control; Mathematical Models; Spatial Dependencies

20050169306 Michigan Univ., Ann Arbor, MI, USA
Tapered Slot Antennas on Thick Dielectric Substrates Using Micromachining Techniques
Muldavi, Jeremy B.; Ellis, Thomas J.; Rebeiz, Gabriel M.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1110-1113; In English; See also 20050169243
Contract(s)/Grant(s): DAAL04-94-G-0137; Copyright; Avail: Other Sources

Tapered Slot Antennas operating at 35 GHz were fabricated on thick (50 mils, 1.27 mm) low dielectric constant (E(sub r) = 2.2) substrate using micromachining techniques. Several periodic hole structures were machined into the substrate and the resulting antenna pattern measurements were compared. The micromachining of the substrate improves the antenna patterns. The mechanism of improvement is believed to be the reduction in the effective dielectric constant of the substrate. This work is being extended to 94 GHz for application in an imaging array.
Author
Slot Antennas; Imaging Techniques; Antenna Radiation Patterns; Micromachining

20050169307 NASA Lewis Research Center, Cleveland, OH, USA
Magnetic Field Distributions at Close Proximity of a Tapered Slot Antenna
Lee, Richard Q.; Simons, Rainee N.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1114-1117; In English; See also 20050169243; Copyright; Avail: Other Sources

The magnetic field distribution at close proximity of a linearly tapered slot antenna was measured for several frequencies ranging from 2.3 to 10.8 GHz. These results provide some insight into the radiation mechanism of this type of antenna.
Author
Magnetic Field Configurations; Antenna Radiation Patterns; Magnetic Fields; Slot Antennas

20050169308 TRW Space and Electronics Group, Redondo Beach, CA, USA
MMIC Compatible Slotline Antenna
Choung, Youn H.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1122-1125; In English; See also 20050169243; Copyright; Avail: Other Sources

EHF phased array antennas use MMIC amplifiers and phase shifters to alleviate size, power, and weight concerns. Incorporating these MMIC devices into an affordable phased array for practical applications is very challenging. As a first step, we have built and tested a MMIC compatible slotline antenna which can be used as a radiating element for a phased array. This paper presents the design of this slotline radiating element, which can be connected directly to the MMIC device,

avoiding complex interconnection in the transition region between the radiating element and the MMIC component.
Derived from text
Extremely High Frequencies; Phased Arrays; Microwave Circuits; Antenna Arrays

20050169309 Southern Methodist Univ., Dallas, TX, USA
Planar Leaky-Wave Microstrip Antenna
Lee, Choon Sae; Nalbandian, Vahakn; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1126-1129; In English; See also 20050169243; Copyright; Avail: Other Sources

In a single microstripline, the dominant mode is 'quasi' TEM, which is a non-radiating surface mode. The higher-order modes, however, become leaky when the propagation constant is less than that of the free-space wave number, k(sub 0). One of the simplest ways to realize a leaky-wave antenna is to use a regular microstripline properly excited by a coaxial probe. The major problems in this case are input impedance matching and suppression of surface-mode excitations. In the proposed antenna, a double-layer microstrip structure is used to facilitate the impedance variation at the feed. The field distribution at the feed location is altered to match the input impedance by varying the locations and widths of the metallic patches on the two layers. Once the input impedance is matched to a particular leaky-mode propagation, the surface modes will be likely to be suppressed because of impedance mismatch to all modes other than the intended leaky mode. Compared with other leaky-wave antennas, the proposed antenna is planar and can be easily implemented in an MMIC environment [I].
Derived from text
Propagation Modes; Microstrip Antennas; Waveguide Antennas; Excitation; Impedance Matching

20050169311 Michigan Univ., Ann Arbor, MI, USA
Electromagnetic Scattering from Targets above Rough Surfaces
Chiu, Tsenchieh; Sarabandi, Kamal; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1156-1159; In English; See also 20050169243; Copyright; Avail: Other Sources

In this paper, an analytical solution for predicting the near-field interaction between a scatterer and a rough surface is presented. This solution is derived using a novel technique based on the reciprocity theorem. This approach is extremely efficient, since only the current distribution of isolated scatterers are needed to evaluate the interaction in the far-field region. In specific, the second moments of the backscatter fields form a circular dielectric cylinder above a slightly rough surface with inhomogeneous dielectric profile are derived. The accuracy of the theoretical formulation is verified by conducting polarimetric backscatter measurements from a lossy dielectric cylinder above a slightly rough surface. Excellent agreement between the theoretical prediction and experimental results is obtained.
Author
Electromagnetic Scattering; Near Fields; Dielectrics; Current Distribution

20050169313 Illinois Univ., Urbana, IL, USA
A Comparison of the BCG-FFT and FD-TD Methods for the 3-D Human Head Absorption Problem
Forgy, E. A.; Chen, J.; Chew, W. C.; Jin, J. M.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1202-1205; In English; See also 20050169243; Copyright; Avail: Other Sources

There is a steadily increasing interest in modeling the interaction of electromagnetic (EM) radiation and complex biological tissues. The accurate modeling of near-field EM propagation has applications ranging from antenna design for wireless communications to MRI coil design for medical imaging applications. In this paper we present a comparison of two distinct methods that have proven to be of great value for solving highly inhomogeneous EM absorption problems. The biconjugate-gradient fast-Fourier-transform (BCG-FFT) method and the finite difference time-domain (FD-TD) method are both capable of solving the 3-D human head absorption problem [1,2]. However, the choice of methods will be shown to be dependent on the particular application.
Derived from text
Electromagnetic Radiation; Tissues (Biology); Finite Difference Theory; Imaging Techniques; Time Domain Analysis; Antenna Design

20050169316 Northwestern Univ., Evanston, IL, USA
High-Q Microcavity Ring and Disk Resonators: FDTD Analysis of Resonance and Coupling Characteristics
Hagness, Susan C.; Rafizadch, Deana; Ho, Seng-Tiong; Taflove, Allen; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1236-1239; In English; See also 20050169243
Contract(s)/Grant(s): F49620-96-1-0252; NSF ECS-92-18494; NSF ECS-95-02475; Copyright; Avail: Other Sources

Micron-size photonic and optoelectronic components can be designed and optimized using finite-difference time-domain (FDTD) solutions of Maxwell's equations. We have developed FDTD models to characterize key optical design parameters of passive microcavity ring and disk resonators proposed for VLSI-scale photonic integrated circuits (PIC's). This modeling is in sut)port of our ongoing experimental program wherein low-threshold lasers, mo(iulators, switches, and wavelength multiplexers are being fabricated.
Derived from text
Design Analysis; Fabrication; Integrated Circuits; Optical Equipment; Q Factors

20050169324 Yokohama National Univ., Japan
Handset Antennas Using Satellite Pack for Mobile Satellite Telephone
Arai, Hiroyuki; Hoshino, Hitoshi; Sato, Toshiaka; Otsu, Yuichi; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1340-1343; In English; See also 20050169243; Copyright; Avail: Other Sources

The Engineering Test Satellite-N (ETS-N) planned to be launched about 2002 in Japan will test S-band satellite mobile communications and broadcasting systems by using geostationary satellite. To realize satellite handy phone service and CD quality radio, it is required to develop a high-performance multi-beam satellite antenna of more than ten meters deployable reflector and innovative feed system, a high output power transponder with total power of 400 W, on board processor exchanging several hundreds channels of handy phone calls, and a compact high gain antenna for satellite handy phone terminal [1]. The baselines for terminal antenna design are as follows. (a) The frequencies are 2.6GHz for uplink and 2.5GHz for downlink. (b) The polarization is right-handed circular. (c) The dual mode antenna operation for cellular and satellite phone. (d) The antenna gain is about 2.5to approx.3.0 dBi. (e) The antenna does not track the satellite in orbit located about 140deg of east longitude, covering whole part of Japan. To satisfy the above requirements, this paper proposes a novel handy phone antenna concept called as 'satellite pack'. This deployable antenna design decreases SAR on human head and is less affected in its radiation pattern by the tissue. We presents the concept of satellite pack in the next section, and also make measurement to verify the effect of this antenna design using a phantom.
Derived from text
Satellite Antennas; Engineering Test Satellites; Mobile Communication Systems; Broadcasting; Multibeam Antennas; Transponders; Ultrahigh Frequencies; High Gain

20050169325 San Jose State Univ., CA, USA
Design of a High Isolation Dual-polarized Offset Parabolic Reflector
Mostafavi, Masoud; Lee, Greg; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1356-1359; In English; See also 20050169243; Copyright; Avail: Other Sources

This paper discusses the design of a dual-polarized reflector antenna with a gain of about 35 dBi, with side-lobe levels better than 20 dB, and with isolations between the vertical and horizontal polarizations greater than 50 dB. The transmit frequency was considered to be 29. l GHz and the receive frequency was considered to be 28.5 GHz.
Derived from text
Reflector Antennas; Antenna Design; Isolation; Parabolic Reflectors

20050169326 Calgary Univ., Alberta, Canada
A Compact Three Way Diversity with Low Near Back Fields
Johnston, R. H.; Levesque, L.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1364-1367; In English; See also 20050169243; Copyright; Avail: Other Sources

A compact three way diversity antenna is described. The composite antenna consists of two elemental loop antennas placed on a small ground plane at right angles to each other and the third elemental antenna is a top loaded monopole. The feed structures for the three elemental antennas are described. The performance of the antennas is presented with measured data on the near back electric fields of the loop antennas. T
Author
Loop Antennas; Monopoles; Electric Fields; Near Fields; Bandwidth; Energy Transfer

20050169328 TICRA A/S, Copenhagen, Denmark
Coverage Flexibility by Means of a Reconformable Subreflector
Viskum, Hans-Henrik; Clarricoats, P. J. B.; Crone, G. A. E.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1378-1381; In English; See also 20050169243
Contract(s)/Grant(s): ESA-9747/91/NL/LC; Copyright; Avail: Other Sources

The generally highly shaped service area for a satellite antenna may change during the planning or manufacturing of the spacecraft as well as during its in-orbit life time. This paper presents results showing the extent to which such changes can be accommodated by modifying the subreflector surface profile in a dual shaped antenna system. If coverage changes are identified before launch it may be possible to exchange the subreflector with a new, fixed one. If the changes occur later, the antenna may be adapted to the new requirements if the subreflector shape can be controlled, for example by using a bendable surface material that can be positioned by motor drives. The study shows that in some cases there is a potential for a significant improvement in the performance by modifying only the subreflector.
Author
Antenna Design; Satellite Antennas; Subreflectors

20050169331 Centro Studi e Laboratori Telecomunicazioni, Turin, Italy
Design and Breadboarding of a Compact and Tuningless Triplexer for Satellite Applications
Accatino, L.; Piovano, B.; Vercellino, G.; Ravanelli, R.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1418-1421; In English; See also 20050169243; Copyright; Avail: Other Sources

The component here described is a novel type of triplexer for telecommunication and telemetry channels, designed and fabricated in the frame of Eutelsat W24 program. This triplexer is composed of two transmit channels and one receive channel at Ku-band. All channels have been implemented as H-plane metal-insert filters, connected to the input guide through a stepped three-furcation. This configuration, which represents an innovation in the breadboard of such a type of components, has shown an excellent degree of mechanical compactness along with a very interesting electrical performance, without the need of any post-manufacturing tuning.
Author
Breadboard Models; Telecommunication; Telemetry; Electrical Properties; Communication Satellites

20050169332 Technical Univ. of Denmark, Lyngby, Denmark
A Waveguide Transverse Broad Wall Slot Radiating between Baffles
Dich, Mikael; Rengarajan, Sembiam R.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1438-1441; In English; See also 20050169243; Copyright; Avail: Other Sources

analysis of the self impedance of a waveguide-fed transverse slots radiating between baffles is presented. The region exterior to the slot is treated as a parallel plate (PP) waveguide which radiates into half space through an aperture in an infinite ground plane. The slot problem is analyzed using a set of integral equations which are solved numerically using the method of moments. The results can be used in previously published design procedures for waveguide-fed series slot arrays. The theoretical results will be validated using network measurements.
Author
Waveguides; Slots; Impedance; Apertures; Integral Equations

20050169333 Gebze Inst. of Tech., Turkey
Slot Bridges in Coaxial Waveguides: Characteristics and their Optimization
Yashina, N. P.; Tuchkin, Y. A.; Karacuha, E.; Dikmen, F.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1458-1461; In English; See also 20050169243; Copyright; Avail: Other Sources

Analytical and numerical approaches for detailed and precise analysis of such devices as antenna feeder lines, filters and diplexers are of considerable importance in modern antenna system design. Such approaches, above all, have to guarantee high accuracy of numerical results. That means, at first, that the method have to be able to provide the solution of a relevant boundary value problem (BVP) for Maxwell equations without any a priori simplifications. Secondly, the numerical process must be stable concerning round off errors, thus the numerical algorithm has to be well conditioned. The approach for analyzing the diffraction and spectral characteristics of slot bridges (SB) in coaxial waveguides suggested here in is just of such a kind: it is rigorous in mathematical aspects.
Derived from text
Waveguides; Slots; Antenna Design; Maxwell Equation; Boundary Value Problems; Systems Engineering

20050169334 California Univ., Los Angeles, CA, USA
Phase Retrieval Antenna Diagnostics for Bi-Polar Planar Near-Field Antenna Measurements
Yaccarino, Robert G.; Rahmat-Samii, Yahya; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1472-1475; In English; See also 20050169243; Copyright; Avail: Other Sources

Phase retrieval methods have just recently evolved into a practical and accurate means for recovering phase information from phaseless near-field antenna measurements [1-3]. The appeal of phaseless near-field measurements is due to, for example, the inability to accurately measure phase at high frequencies or the prohibitive cost of vector measurement equipment. A phase retrieval algorithm for bi-polar planar near-field measurements has recently been proposed, implemented, and successfully demonstrated using measured bipolar near-field data [1]. In this paper, focus is turned to the antenna diagnostics problem. Measurement results are presented for a waveguide-fed slot array antenna in which an anomaly has been imposed on the aperture distribution. The phase retrieval algorithm reported in [1] is then applied, with no a priori knowledge of the imposed anomaly, and results are compared to the case when the phase is retained in the conventional near-field data processing.
Derived from text
Bipolarity; Planar Structures; Near Fields; Slot Antennas; Antenna Arrays; High Frequencies

20050169335 Waterloo Univ., Ontario, Canada
Waveguide Modal Analysis of Single and Stacked Probe-Fed Microstrip Antennas with Circular Geometries
Shen, Zhongxiang; MacPhie, Robert H.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 598-601; In English; See also 20050169243; Copyright; Avail: Other Sources

The microstrip patch antenna has become one of the most widely used antennas today because of its many desirable features. There has been considerable research work reported in the past for single and stacked circular and annular-ring microstrip antennas [1]-[5]. In most published works, the coaxial feed line is approximately modeled by an idealized probe current source; this is inadequate in correctly predicting the input impedance when the thickness of the substrate is greater than 0.02A0, where)_0 is the wavelength in free-space. This paper presents a waveguide modal analysis of single and stacked microstrip antennas with circular geometries. Considered in this paper are single and stacked circular, annular-ring, and annular-ring-loaded circular microstrip antennas fed by an off-centered coaxial Line. Both the substrate and superstrate are assumed to be uniaxially anisotropic. The waveguide modal analysis is realized by introducing a large cylindrical wall to enclose the patch antenna. The effects of the feeding probe and the finite thickness of patches are rigorously taken into account in the analysis. Moreover, it is ‘also an efficient technique since the complicated multilayered microstrip antenna problem is simply treated as a waveguide junction cascading problem, which can be efficiently solved by the modal expansion method. Numerical results for the input impedance of single and stacked circular and annular-ring-loaded circular microstrip antennas are compared with experimental data measured by others. Good agreement is achieved.
Derived from text
Microstrip Antennas; Patch Antennas; Waveguides; Predictions; Impedance

20050169336 NASA Langley Research Center, Hampton, VA, USA
Analysis of Stub Loaded Microstrip Patch Antennas
Bailey, M. C.; Deshpande, M. D.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 610-613; In English; See also 20050169243; Copyright; Avail: Other Sources

A microstrip patch antenna fed by a coaxial probe and reactively loaded by a open circuited microstrip line has been used previously to produce circular polarization[l] and also as a building block for a series fed microstrip patch array [2]. Rectangular and circular patch antennas loaded with a microstrip stub were previously analyzed using the generalized Thevenin theorem [2,3]. In the Thevenin theorem approach, the mutual coupling between the patch current and the surface current on the stub was not taken into account. Also, the Thevenin theorem approach neglects continuity of current at the patch-stub junction. The approach in this present paper includes the coupling between the patch and stub currents as well as continuity at the patch-stub junction.
Author
Patch Antennas; Microstrip Antennas; Circular Polarization; Microstrip Transmission Lines

20050169337 Indian Inst. of Tech., Bombay, India
Improved Linear Transmission Line Model for Rectangular, Circular and Triangular Microstrip Antennas
Babu, Sarath; Singh, Iqbal; Kumar, Girish; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 614-617; In English; See also 20050169243; Copyright; Avail: Other Sources

Linear Transmission Line (LTL) model had been reported for calculating the admittance of a linearly polarized arbitrary shaped patch antenna with symmetrical geometry and constant thickness [1,2]. In this method, the patch is divided into very small sections along the feed axis length and the width for each section is calculated. However, when this model was simulated and compared for various reported results on rectangular microstrip antennas (RMSA) [3,4] and circular microstrip antennas

(CMSA) [5,6], error of around 10% was observed. In this paper, we propose the following modifications for the reported LTL model. a) The effective dimensions of the antennas are used instead of physical dimensions to account for the fringing fields. b) The effective permittivity expression is used to account for the dispersion effect [7]. c) The characteristic impedance equation was modified to account for the dispersion effect [7]. d) The effect of probe inductance is taken into account [8]. After incorporating these modifications, the analysis has been carried out for RMSA, CMSA and Equilateral Triangular Mierostrip Antenna (ETMSA), shown in Fig 1.
Derived from text
Microstrip Antennas; Transmission Lines; Electrical Impedance; Inductance; Patch Antennas

20050169338 Texas A&M Univ., College Station, TX, USA
Analysis of a Patch Antenna Coupled to a Transmission Line
Yang, Yao-Chou; Chung, Shyh-Jong; Yu, Cheng-Chek; Chang, Kai; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 622-625; In English; See also 20050169243; Copyright; Avail: Other Sources

An analysis is developed on a patch antenna coupled to a transmission line. The coupling port is placed on the same side and the opposite side of the feeding end. A transmission line method is used to model the circuit. Experimental results are presented to verify the simulated results. Whether the coupling port is placed on the same side or the opposite side of the feeding end, the coupled power levels from the patch to the transmission line are almost the same. The coupling characteristics as a function of the gap and length variations are also identical for these two configurations.
Author
Patch Antennas; Transmission Lines; Antenna Design

20050169339 Universidad Politecnica de Madrid, Madrid, Spain
Generalized Scattering Matrix Computation of the Transition: Microstrip Line-Rectangular Waveguide, as a Building Block for the Analysis of Multilayer Microstrip Circuits and Antennas
Encinar, Jose A.; Wan, Changhua; Mosing, Juan R.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 626-629; In English; See also 20050169243
Contract(s)/Grant(s): TI95-0137-C02-01; Copyright; Avail: Other Sources

The coupling between a microstrip line and a rectangular aperture on its ground plane, plays and important role in the design of planar microwave circuits and antennas, including aperture-coupled microstrip lines [1], multilayer printed antennas [2] and arrays[3]. In previous works the transition microstrip line-aperture was used as building block, but it was only represented by an equivalent admittance [2]. Also, the aperture-coupled microstrip lines were represented by a 2x2 scattering matrix [1], but there is not a general matrix representation for the transition microstrip line-aperture. The computation of Generalized Scattering Matrix (GSM) for the transition microstrip line-rectangular waveguide is presented in this work. This GSM is used as building block for the analysis of multilayer printed structures. It can be cascaded with the same but opposed GSM to obtain the scattering matrix of aperture-coupled microstrip lines. Also it will be cascaded with other GSM's to analyze different structures, as a printed slot antenna and aperture-coupled microstrip arrays.
Derived from text
Apertures; Microstrip Transmission Lines; Microwave Circuits; Rectangular Waveguides; Microstrip Antennas; Electrical Impedance

20050169340 SPARE-Metrology Lab., Senigallia, Italy
Chebyshev Space Domain Green's Functions Closed Form for Microstrip Circuits
Marchetti, S.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 634-637; In English; See also 20050169243; Copyright; Avail: Other Sources

The demand for microstrip, adaptive, multibeam and more complex antennas geometries for microwave and millimeter wave applications has increasingly required fast and accurate analyses in the space domain. The frequency and space domain integral equations solved by the method of moments is suitable to this purpose. However the pertaining Green's functions are available analytically only in a transformed domain. During the last years several efforts have been made for inverse transforming the Sommerfeld integrals that express the Green's functions for microstrip geometries in the space domain. The more successful has been the complex image method [2] and the Legendre series formulation [1]. Peculiarity of the first method is velocity whereas the second allows also separation of the frequency and space dependence. A combination of the two methods yields to a combined and more sensitive reduction of computer time in evaluating the Green's functions [3]. The

present study reports a new space domain Green's functions closed form in terms of Chebyshev polynomials that maintains all the advantages of the Legendre polynomials representation but permits more efficient evaluation of the series coefficients and simpler computational handling of the polynomials. On these features is based a modified method of moment procedure that accelerates the solution of the pertaining integral equations at equal or better accuracy [1].
Derived from text
Chebyshev Approximation; Microstrip Antennas; Microwaves; Millimeter Waves; Integral Equations; Method of Moments

20050169341 Illinois Univ. at Urbana-Champaign, Urbana, IL, USA
Hybrid MoM/SBR and FEM/SBR Methods for Scattering by Large Bodies with Inhomogeneous Protrusions
Ling, F.; Sheng, X. Q.; Jin, J. M.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 644-647; In English; See also 20050169243; Copyright; Avail: Other Sources

Recently, a hybrid technique was developed for computing scattering by large bodies with cracks and cavities [l]. This technique employs the shooting-and- bouncing-ray (SBR) method to compute the scattering by large, bodies and uses the finite-element method (FEM) to characterize the cracks and cavities. The two methods are combined through a coupling scheme based on the electromagnetic equivalence principle and the reciprocity theorem. The coupling scheme is designed in such a manner that it includes all significant interactions between the FEM and tile SBR method and it permits the SBR and FEM computations to be done separately. The resulting technique is shown to be efficient and accurate and, because of this, it is extended to the calculation of the radiation patterns of conformal antennas in a complex environment [2].
Derived from text
Method of Moments; Finite Element Method; Antenna Radiation Patterns; Scattering; Cavities; Cracks

20050169342 Arizona State Univ., Tempe, AZ, USA
Analysis of Ferrite Loaded Cavity Backed Slot Antennas Using a Hybrid FEM/MoM Approach
Polycarpou, Anastasis C.; Balanis, Constantine A.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 652-655; In English; See also 20050169243; Copyright; Avail: Other Sources

Cavity Backed Slot (CBS) antennas are often used on airborne vehicles because of the many attractive features they exhibit such as light weight, conformability, ease of fabrication and low manufacturing cost. Phased arrays of these elements are also commonly used in aerospace technology mainly to enhance antenna performance such as gain and scanning volume. With recent technological advancements, interest in smaller and lightweight antennas also increased. Size reduction of the antenna however, results in lower gain and narrower bandwidth unless the frequency of operation increases. These shortcomings can be overcome by using layers of dielectric and ferrite materials. It was shown in the past [1] that the use of material layers may significantly improve the operational bandwidth of microstrip patch antennas. The use of magnetized letrites, either in the area of microstrip patch antennas [2] or aperture antennas [3], usually results in a significant shift of the first resonance toward lower frequencies. Additional resonant peaks also appear in the frequency spectrum of the antenna mainly because of the existence of magnetostatic modes inside the ferrite material. Ferrites have the attractive property that their permeability tensor is a function of not only the frequency but more importantly the strength and direction of the external magnetic field. By varying the external magnetic field, the material parameters change accordingly, therefore, the antenna can be tuned within a relatively wide range of frequencies. The polarization of the antenna may also be controlled by adjusting the level or the direction of the external magnetic field.
Derived from text
Slot Antennas; Cavities; Apertures; Ferrites; Finite Element Method; Method of Moments; Dielectrics; Microstrip Antennas

20050169343 Motorola, Inc., Scottsdale, AZ, USA
Analysis of Large Cavity Field Problems Using a Finite Element Formulation of the Connection Scheme
Loukota, John; Castillo, Steven; Millard, James B.; Jedlicka, Russell; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 656-659; In English; See also 20050169243
Contract(s)/Grant(s): DAAH04-96-1-0087; Copyright; Avail: Other Sources

The calculation of the fields in a large cavity is of interest for both electromagnetic interference (EMI) and radar cross section (RCS) problems. In the former, electromagnetic fields may penetrate a shielded enclosure affecting sensitive system components causing electronic upset or damage. In the latter case, scattering from the engine inlet on an aircraft is a major contributor to the overall RCS. In any case, modeling a complex cavity that is several wavelengths in at least of the cartesian directions with a conventional full-wave numerical technique may be intractable because of the number of unknowns needed. Additionally, the enclosure may be geometrically complex and contain volumetric materials that axe inhomogeneous and

anisotropic. The walls of the cavity will be lossy as well. Haxrington and Mautz [1] first presented a generalized admittance matrix approach using a method of moments (MoM) solution of an integral equation. Wang and Ling [2] developed a connection scheme for analyzing large cavities using an MoM approach. In this method, a cavity is split into two or more subregions. The overall system admittance matrix can be found by cascading the admittance matrices of each of the subregions. Rather than inverting a single large matrix, several smaller matrices are inverted resulting in a reduction in computational complexity and memory requirements. In this paper, we extend the connection scheme to the finite element method (FEM). With the FEM, cavities with complex geometries can be analyzed avoiding the limitations of a Green's function.
Derived from text
Electromagnetic Interference; Radar Cross Sections; Cartesian Coordinates; Method of Moments; Scattering; Electrical Impedance

20050169345 Arizona State Univ., Tempe, AZ, USA
Analysis of Microwave Integrated Circuits Using the Finite Element Method
Polycarpou, Anastasis; Balanis, Constantine A.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 668-671; In English; See also 20050169243; Copyright; Avail: Other Sources

The continual advances in speed and integration scale of electronic circuits have created enormous demands for high-speed, high-density packages which ensure reduced interconnection delays and improved electrical performance. Such structures usually involve a large number of planar transmission lines at various levels within the package, whereas the geometrical orientation of these lines is not necessarily uniform. Also, the existence of multiple dielectric layers, discontinuities, bends, and curved surfaces adds considerable complexity to the package. Therefore, it is essential that new and more accurate techniques are developed for simulating electromagnetic behavior in such devices. A full-wave vector finite element method is implemented in this paper for modeling three-dimensional (3D) unshielded microwave circuits. A two-dimensional (2D) eigenvalue analysis [1] is first applied at the input and output ports to evaluate tl,e dominant field distribution, reference voltage, propagation constant, and characteristic impedance of tile corresponding transmission line. Tile field distribution at the input port is used to excite the 3D circuit. The propagation constant is used in the implementation of first-order absorbing boundary conditions at the two ports, whereas the reference voltage and characteristic impedance are both used in tile evaluation of the corresponding S-parameters.
Derived from text
Boundary Conditions; Circuits; Integrated Circuits; Microwave Circuits; Electrical Properties; Finite Element Method; Electrical Impedance

20050169346 Southeast Univ., Nanjing, China
Application of High-Order Finite Element in Grid Truncation Scheme for Open Region Electromagnetic Problems
Zhao, Yang; Wang, Yun-Yi; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 676-679; In English; See also 20050169243; Copyright; Avail: Other Sources

The measured equation of invanmace(MEI) is initially proposed for grid truncation of open region for electromagnetic(EM) scattering problems by using finite difference method(FDM) [I], and then it has been successfully used in EM scattering and radiation analysis by using finite element method(FEM) [2,3] In this paper an extensive application of MEI is proposed for quasi-static EM analysis such as interconnect parameter extraction of transmission line by employing high-order finite element(HOFE) rather than low-order finite element(LOFE), i.e. linear element in FEM[2,3]. In the paper the implementation of HOFE incorporating MEI is described clearly, moreover, the concept of one extensive MEI is also introduced in FEM. For comparison purpose, a simple electrostatic problem is calculated by using both HOFE and LOFE to show that the application of HOFE can make the computation more accurately and also the grid truncation more closely to the body than that of LOBE. Further, a typical interconnect analysis of capacitance parameter extraction for multiconductor transmission line is done using HOFE, and results show that they are conform well to the published results very good efficiency.
Derived from text
Electrostatics; Transmission Lines; Finite Element Method; Finite Difference Theory

20050169347 Hughes Aircraft Co., El Segundo, CA, USA
Dual-Band, Dual-Polarization, Interleaved Cross-Dipole and Cavity-Backed Disc Elements Phased Array Antenna
Lee, Kuan Min; Wang, Allen T. S.; Chu, Ruey Shi; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 694-697; In English; See also 20050169243
Contract(s)/Grant(s): N66604-95-C-0821; Copyright; Avail: Other Sources

In the ship, submarine, or airborne satellite communication or multi-function radar operations, dual-band phased array antennas with dual-linear or circular polarizations are needed. In this paper, we present a dual-band/dual-polarization phased array design using interleaved cross-dipole radiator and cavity backed disk radiator in the same lattice structure. The low band radiator is a disk radiator sitting on top of a dielectric puck in a cavity and the high band radiator is the cross dipole element printed on a low -K dielectric layer above the disk-cavity plane. Dual-linear or circular polarizations can be achieved using these two elements to cover two separate bands with about 2:1 ratio. This is a relatively low profile, compact and rigid array. Good impedance match for both bands can be obtained over a wide scan volume. Previously, we have developed a dual-band phased array antenna using interleaved waveguide and dipole elements [1], and an ultra wideband phased array using interleaved waveguide element and wideband tapered element [2]. In those designs only single linear polarization can be achieved for each band. This paper we present a phased array by interleaving two types of dual-polarization elements to achieve dual-linear or dual-circular polarizations. The phase centers of each type of dual-polarization element are co-located for two orthogonal polarizations. Therefore, the CP axial ratio remains good as beam scans away from broadside.
Derived from text
Phased Arrays; Antenna Arrays; Dipole Antennas; Linear Polarization; Waveguides; Impedance

20050169348 Lockheed Martin Corp., Moorestown, NJ, USA
Design Criteria for Wideband Active Phased Array Antennas
Agrawal, Ashok K.; Williamson, Edward L.; Ferrante, John G.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 714-717; In English; See also 20050169243; Copyright; Avail: Other Sources

The instantaneous bandwidth of a phased array antenna can be increased by dividing the aperture into subarrays and placing a time delay network behind each subarray. The size of the subarray determines the instantaneous bandwidth of the antenna. Bandwidth criteria for phased array antennas were developed for both narrow band signal with frequency agility and for instantaneous wideband signals [1]. The bandwidth criteria were defined in terms of loss of antenna gain and relative amplitude of grating lobes. Radars may apply an amplitude weighting to the received pulse in order to reduce time sidelobes. This weighting for an LFM(Linear Frequency Modulated) wide bandwidth pulse effectively tapers the contribution from frequencies off midband, resulting in progressively more effective suppression of instantaneous grating lobes out to the edge of the band. The pulse compression of this time weighted receive pulse is formed from the sum of the contributions from the receive patterns over the bandwidth. The process of time weighted LFM pulse compression produces a return that has an effective antenna receive grating lobe contribution much less than that is exhibited by the instantaneous patterns at the band edges. In this paper we examine the receive sidelobe performance of a phased array antenna for instantaneous wide bandwidth after an amplitude taper is applied in the radar receiver.
Derived from text
Phased Arrays; Antenna Arrays; Design Analysis; Bandwidth; Frequency Modulation; Antenna Gain; Broadband

20050169349 Samsung Electronics Co. Ltd., Suwon, Korea, Republic of
Wideband Low Sidelobe Printed Array Antenna
Timofeev, Igor E.; Lee, Don-Shin; Song, Seong Chil; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 718-721; In English; See also 20050169243; Copyright; Avail: Other Sources

The development of wideband antennas with low sidelobe level (SLL) is vital for many up-to-date special communication and air traffic control applications. As it has been reported earlier, array antennas have advantages in SLL but are inherently narrower band than reflector antennas [1]. Another not easy question for array antennas (if to compare with reflectors) is usually the cost. This way researchers do their best to extend bandwidth (BW) of low SLL arrays and reduce their cost. The task to achieve good SLL is especially difficult in the case of small array aperture (L\h10 divided by 15 lambda) because amplitude and phase (A&cp) errors, the mutual coupling, edge effect are more influential in this case than for large arrays. In this paper the cost effective design approaches are considered for S-band dipole antenna array with relatively small aperture and potential opportunities are investigated to improve SLL and BW. The cost reduction is provided by use of the printed circuit technology for all antenna components (radiators, beamforming networks, phase shifters) and by minimizing the number of components. The improving of SLL and BW is provided by A&phi errors minimization, mutual coupling and edge effect suppression.
Derived from text
Printed Circuits; Antenna Arrays; Broadband; Sidelobes; Microwave Antennas; Phase Error; Bandwidth; Reflector Antennas

20050169350 Academy of Sciences (Russia), Saratov, Russia

Microstrip Phased Arrays with Variable Parameters for Wideband Acoustooptic Bragg Cells

Nefedov, I.; Petrov, V.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 722-725; In English; See also 20050169243; Copyright; Avail: Other Sources

In present work we develop the method of extension of acousto-optic (AO) interaction frequency bandwidth to more then one octave, which is particularly described in [1 and 2]. For this aim is designed the electroacoustical multielement transducer with variable, along it's length, parameters. In such a case to each frequency point inside chosen band there exist the region (the window) of the transducer's length where, from one hand, the condition for good excitation of sound waves is fulfilled and from the other hand the Bragg condition is also fulfilled because of closed coincidence of real and necessary frequency dependencies of Bragg angle and of the angle of sound wave front inclination. This window moves from one end of the transducer to the other when frequency changes from minimum to maximum one inside the band. Than more closer real angle frequency dependence follows to necessary one than larger the length of transducer can be done and than more higher the diffraction efficiency can be reached. At present work we additionally designed the electrodynamic array of electrodes so that to provide the transmission of electric signal through such filter-type system in whole chosen frequency band.

Author

Phased Arrays; Acousto-Optics; Electroacoustics; Transducers; Broadband; Bragg Angle

20050169351 New South Wales Univ., Kensington, Australia

Spatial-Temporal CM Equalization Based on Smart Antennas

Xu, Bing; Vu, T. B.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1044-1047; In English; See also 20050169243; Copyright; Avail: Other Sources

A new model for multipath channel is introduced in this paper. Under this model, two CM equalization approaches are derived. Compared to the normal temporal or spatial equalization techniques (beam-former), these two methods have better performance even under serious multipath conditions. Numerical simulations are also given to testify the theoretical analysis.

Author

Antenna Design; Mathematical Models; Multipath Transmission; Algorithms

20050169353 Optim Microwave, Inc., Westchester, CA, USA

Broadside Radiating Dielectric Rod Antennas with Dielectric Radiating Elements

Mahon, J. P.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1054-1057; In English; See also 20050169243; Copyright; Avail: Other Sources

A novel antenna which is comprised of collars made of high dielectric material slipped onto a cylindrical dielectric rod is presented. This antenna can be made to radiate broadside (unlike traditional rod antennas which radiate towards endfire). An accurate computer model based on a complex conjugate Galerkin method is also described. Measured and predicted antenna patterns are presented to verify the accuracy of the model and to demonstrate that the antenna under study is simple, feasible and effective.

Author

Dielectrics; Rods; Antenna Design; Antenna Radiation Patterns; Mathematical Models

20050169355 ATR Adaptive Communications Research Labs., Kyoto, Japan

A Multibeam Receiving Array Antenna by Means of Spatial Optical Signal Processing

Shibata, Osamu; Inagaki, Keizo; Ji, Yu; Karasawa, Yoshio; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 743-746; In English; See also 20050169243; Copyright; Avail: Other Sources

A multibeam receiving array antenna requires a beam-forming network (BFN) to separate signals according to the direction of signal arrival. When compared with conventional techniques which use a microwave BFN or the digital beam-forming array antenna, spatial optical signal processing has advantages with respect to bandwidth, circuit complexity, size and weight. Spatial optical signal processing is a technique that uses optical spatial Fourier transform characteristics. ATR has proposed a beam shaping, beam scanning and multiple beam transmitting array antenna that uses spatial optical signal processing [1], [2]. In addition, we have proposed the concept of a receiving mode spatial optical signal processing array antenna [3]. In this paper, we will show the configuration of our receiving mode spatial optical signal processing array antenna and also show experimental results for optical radiation patterns of a spatial optical signal processing BFN. The results for the

radiation patterns are in good agreement with theoretically calculated values.
Derived from text
Multibeam Antennas; Antenna Radiation Patterns; Antenna Arrays; Fourier Transformation

20050169358 National Technical Univ., Athens, Greece
Resonance Properties of Finite Dielectric Cylinders Placed on a Grounded Substrate
Karonis, G. J.; Uzunoglu, N. K.; Kaklamani, D. I.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1090-1093; In English; See also 20050169243; Copyright; Avail: Other Sources

The resonance properties of finite height cylinders of high permittivity value, placed on a dielectric grounded substrate is analyzed, using a Method of Moments technique in conjunction with volume integral equations. The complex resonance frequencies are determined by describing the electric field inside the finite cylinder in terms of superposition of plane waves, satisfying individually the wave equations. A homogeneous system is derived using the Green's function of the microstrip-grounded dielectric substrate and a Galerkin technique. Complex resonance frequencies are determined by computing the stored average electric and magnetic energies. The proposed technique is proved to be numerically stable and accurate.
Author
Dielectrics; Resonant Frequencies; Substrates; Cylinders

20050169363 E-Tek Dynamics, Inc., San Jose, CA, USA
Fiber Bragg Grating For Phased-Array Systems
Pan, J. J.; Shi,Y.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 751-754; In English; See also 20050169243; Copyright; Avail: Other Sources

Fiber Bragg grating based fiberoptic devices are discussed in this paper for phased-array system applications. These devices include fiber grating time-delay element, several fiber grating related laser sources and wavelength division multiplexer and demultiplexer. Detailed structures and performance of the fiber grating-based fiberoptic devices are presented.
Author
Bragg Gratings; Fiber Optics; Phased Arrays; Time Lag

20050169364 E-Tek Dynamics, Inc., San Jose, CA, USA
High Performance Tunable and Multi-Wavelength Laser Sources for Phased Array Antennas
Pan, J. J.; Jing, X. L.; Shi, Y.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 747-750; In English; See also 20050169243; Copyright; Avail: Other Sources

Photonic true time-delay technique provides weight, size, EMI/EMP and cost advantages for constructing squint free phased-array antennas. The photonic true time-delay networks demand high performance, high reliability wavelength tunable and multi-wavelength laser sources. This paper reports the hermetically sealed rapid-tuning tunable lasers and ultra-stable multi-wavelength laser diode and fiber laser sources. These devices have narrow linewidth, low intensity and phase noises, high side-lobe suppression, etc.
Author
Antenna Arrays; Time Lag; Phased Arrays; Tunable Lasers; Laser Arrays

20050169366 Connecticut Univ., Storrs, CT, USA
Multiple Quantum Well In-Line Optical Modulators Using Tunable Distributed Bragg Gratings Photonically Controlled Active Array
Jain, F.; Heller, E.; Parent, D.; Wang, H.; Zapone, W.; Srinivasan, S.; Cheung, S.; Huang, W.; Bansal, R.; Preiss, J., et al.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 755-758; In English; See also 20050169243; Copyright; Avail: Other Sources

The integration of photonic technology into phased array radar systems promises to reduce aperture weight, size, transmit/receive (T/R) module complexity, mitigate EMI, and accomodate wider signal bandwidth with frequency independent beam steering. One of the photonic control methodology is to employ true time delays which have been incorporated in a variety of ways [1-5] in the realization of phased array radar. We have proposed a technique [6] using wavelength division multiplexing (WDM) to address a large number of elements, with each element carrying the phase information on one channel/wavelength. This architecture is optically non-coherent and achieves a reduction in hardware complexity via sharing of various devices. The details of our WDM based architecture for a sixteen element array (composed of four subarrays each

with elements), has been discussed elsewhere [7]. As part of the Office of Naval Research's Accelerated Capabilities Initiative, Raytheon/University of Connecticut team is developing and implementing this methodology. This paper focuses on the devices, including novel waveguide amplitude modulators and tunable filters, required to implement such an architecture. In particular, we propose to employ quantum confined Stark effect [8] in 1.55micron InGaAsP/InP multiple quantum well (MQWs) for these components. We intend to use the quadratic electro-refractive effect [9] in InGaAsP(1.5micron)/InGaAsP(1.3micron) and/or InGaAsP(1.5micron)/InP multiple quantum well (MQW) structures to achieve intensity modulation with applied signal voltage. The investigation will focus on MQW devices which exhibit the Quantum Confined Stark Effect since these devices yield large changes of refractive index with low insertion loss and are capable of being modulated at the required frequencies. The details of modulator structures are described next.
Derived from text
Phased Arrays; Beam Steering; Amplitude Modulation; Wavelength Division Multiplexing; Weight Reduction

20050169371 Physics and Electronics Lab. TNO, The Hague, Netherlands
Mutual Coupling between Two Wires of Different Length and Finite Conductivity
Voosen, S. H. J. A.; Tijhuis, A. G.; Zwamborn, A. P. M.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 784-787; In English; See also 20050169243
Contract(s)/Grant(s): TNO Proj. 6026805; Copyright; Avail: Other Sources

Recently, the effect of electromagnetic fields on human beings is a growing concern. Especially the possible health hazards of using mobile communication devices such as hand-held telephones is an increasing topic of attention. One of the ways to examine these effects is to compute the electromagnetic field distribution in the human body that is exposed. Mutual coupling between the antenna wire structure and the human body has to be taken into account in most cases. In this paper we present the results of a pilot study in which we solve the mutual coupling between two wires of arbitrary length and finite conductivity. The coupling problem is solved in terms of an integral equation in the temporal Laplace domain. This integral equation in its strong form is weakened such that the spatial derivatives are integrated analytically. The integral equation is solved numerically by using the Conjugate-Gradient FYI' method. Further, an appropriate weakened form of the Green's function is presented. It is noted that both the wires are non-perfectly conducting. The complete system of two wires is excited by applying a gap voltage excitation on one of them. Numerical computations have been carried out for different test geometries.
Derived from text
Wire; Electromagnetic Fields; Electric Potential; Hazards; Telephones

20050169373 California Univ., Davis, CA, USA
Synthesis of Antenna Array Sectoral Patterns by Element Spacing Perturbation
Branner, G. R.; Kumar, B. Preetham; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 804-807; In English; See also 20050169243; Copyright; Avail: Other Sources

This paper describes a new method to synthesize sectoral patterns of nonuniformily spaced arrays. The technique proceeds by first obtaining the current distribution of a Lambda/2 spaced array, and apply the developed inversion algorithm to obtain a new set of element spacings. The procedure is unique in that it gives an analytical expression for the appropriate array element positions, given the upper and lower bounds of the adjacent element spacing.
Author
Antenna Arrays; Perturbation; Spacing; Sectors

20050169381 Toshiba Research and Development Center, Kawasaki, Japan
Weight Optimization Method for Array-Fed Reflector Antennas Used for Multibeam Satellite Communications
Shoki, Hiroki; Suzuki, Yasuo; Tokunaga, Kyoko; Tsunoda, Hiroaki; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 848-851; In English; See also 20050169243; Copyright; Avail: Other Sources

Array-fed reflector antennas are an attractive option for future satellite communications because of their flexibility with regard to beam scanning and beam shaping. Another advantage of this type of antenna is that the transmission amplifiers require lower output power than in the case of conventional cluster-fed reflector antennas. Considering that the electric power generated in satellites is limited, an important point in the design is the efficient use of these amplifiers. Multibeam satellite communications now require the capability to distribute and change the transmission power for each beam freely according to traffic conditions. In MSAT [1], used a cluster-fed reflector antenna, a hybrid matrix power amplifier (HMA) [2],[3] system

was adopted to achieve this power flexibility requirement. On the other hand, in the case of array-fed reflector antennas where a high power amplifier (HPA) is connected with each element antenna, the output power level of each HPA probably change according to the traffic condition, because the exciting weight distribution is generally different for each beam. This causes the degradation of the output power efficiency when the radiated power is changeable for each beam. This paper focuses on the efficient use of the output power of amplifiers in array-fed reflector antennas. The authors propose a new weight optimization method for array excitation to attain the power flexibility. In this method, only the phase weights are optimized for beams which have a high traffic capacity and strongly affect the total output power. The same amplitude weight distribution is set for each of these beams. For other beams, both the amplitude and phase weights are optimized. This paper also describes a weight optimization algorithm that allows such weight distributions to be obtained. The analytical results of this study show that a high power efficiency is achieved by using this optimization method.
Derived from text
Antenna Arrays; Reflector Antennas; Power Amplifiers; Collimation; Excitation

20050169384 Pisa Univ., Italy
EM Scattering from Edges in Artificially Hard and Soft Surfaces Illuminated at Oblique Incidence
Manara, G.; Nepa, P.; Pelosi, G.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 874-877; In English; See also 20050169243; Copyright; Avail: Other Sources

A canonical problem of remarkable importance for applications in the framework of high-frequency techniques is the diffraction from a wedge with arbitrary anisotropic impedance boundary conditions (IBC's) on its faces. At oblique incidence, the above scattering problem has not yet been solved analytically for the most general configurations. Indeed, the solutions available in the literature for arbitrary exterior wedge angles and IBC's are based either on numerical approaches [1] or on approximate analytical techniques [2]. The purpose of this paper is to provide uniform diffraction coefficients for those anisotropic impedance wedge configurations for which exact integral representations for the field are presently available. The specific class of anisotropic IBC's considered for the wedge faces is characterized by a surface impedance tensor with its principal axes parallel and perpendicular to the edge and exhibiting a vanishing surface impedance in one of the principal directions. Such an impedance tensor is suitable to simulate the behavior of artificially hard and soft surfaces [3], that are usually realized by means of dielectric filled corrugations in metallic surfaces or strip-loaded grounded dielectric slabs.
Derived from text
Boundary Conditions; Electrical Impedance; Diffraction; Dielectrics

20050169388 Lockheed Martin Astronautics, Denver, CO, USA
An Enhanced Microstrip Patch Radiating Element
Huebner, Donald A.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 920-923; In English; See also 20050169243; Copyright; Avail: Other Sources

A compound radiating element consisting of a rectangular microstrip patch plus two parasitically-excited wire monopoles is examined both theoretically and experimentally. The wires are located adjacent to the patch along its centerline in the E-plane. The overall radiation pattern of the element is calculated and found to exhibit beam narrowing and enhanced directivity for proper choice of the monopole height and spacing. Experimental pattern measurements were made and are in essential agreement with the predictions of the theory.
Author
Antenna Radiation Patterns; Microstrip Antennas; Selection; Wire

20050169389 Chinese Military Academy, Fong-Shan, Taiwan
Experimental Results of Compact Microstrip Antennas
Chen, Hong-Twu; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 932-935; In English; See also 20050169243; Copyright; Avail: Other Sources

Due to its low profile, the microstrip antenna has found many applications in personal communication systems. And, owing to the miniaturization of the communication equipments, the design for reducing the size of the microstrip antenna has received much attention. One of the effective ways to reduce the patch size of the microstrip antenna is to introduce a shorting pin at the edge of the patch [1]. Based on this technique, several novel designs of the compact microstrip antennas are described in this article. The antenna size can be reduced to less than 50% of the size of a conventional microstrip antenna. By incorporating the meandering of the patch, the electrical length of the patch can be further increased [2]. Characteristics

of such compact microstrip antennas are experimentally studied. Comparisons between the compact and conventional microstrip patch antennas are also given.
Derived from text
Microstrip Antennas; Patch Antennas; Miniaturization; Telecommunication

20050169390 Cheng-Shiu Coll. of Technology and Commerce, Kaohsiung, Taiwan, Province of China
Modified Annular-Ring Patch Antennas
Chen, Wen-Shyang; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 936-939; In English; See also 20050169243; Copyright; Avail: Other Sources

A new technique to enhance the impedance bandwidth visibly to be about twice as large as that of a probe-fed annular-ring microstrip antenna in the TM(sub 12) mode by using a two-notch sector in the annular-ring patch is proposed. The obtained bandwidth is improved to be about 6%, and this modified structure makes it possible to use a 50ohm microstrip line as a feed line.
Author
Microstrip Antennas; Patch Antennas; Impedance; Bandwidth

20050169391 National Sun Yat-Sen Univ., Kaohsiung, China
Design of a Two-Element Dual-Frequency Microstrip Array
Wong, Kim-Lu; Pan, Shan-Cheng; Chang, Chia-Ming; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 940-943; In English; See also 20050169243; Copyright; Avail: Other Sources

The design of a single-layer dual-frequency rectangular microstrip antenna using a single probe feed (see Fig. l(a)) has recently been demonstrated [1]. In this dual-frequency design, the two operating frequencies are mainly determined from the patch dimensions and the substrate parameters, and the feed position is selected such that the TM(sub 01) and TM(sub 10) modes are excited at the first two resonant frequencies. In this article, we report the design of a two-element dual-frequency array using the single-feed dual-frequency rectangular microstrip patches [1]. Experimental results for the characteristics of such a dual-frequency antenna array are presented and discussed.
Derived from text
Antenna Arrays; Resonant Frequencies; Microstrip Antennas

20050169392 Manitoba Univ., Winnipeg, Manitoba, Canada
Stacked Square Ring Resonators for Bandwidth Enhancement
Moosavi, P.; Shafai, L.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 944-947; In English; See also 20050169243; Copyright; Avail: Other Sources

The advantages of microstrip structures as antenna elements or resonators have aroused much interest in their theoretical and experimental studies. A novel structure that has not been studied well yet is the square ring patch, which is geometrically an intermediate configuration between a printed loop and a patch [1]. Several interesting features are associated with this patch. Its size is substantially smaller than that of a conventional square patch, and depend on the ring width. And, its input impedance is considerably higher, whereas its impedance bandwidth is smaller, in comparison with a similar size patch. Normally, the deviation of its properties from those of a square patch increases by decreasing its width. It is known that stacking similar size patches increases the impedance bandwidth. In this paper, we have investigated this property for two stacked square rings. A good number of simulations are carried out, using 'Ensemble 4.02 of Boulder Microwave Technologies Inc.' to understand the behaviour of stacked rings, and determine suitable parameters. An optimized configuration is also fabricated and tested.
Derived from text
Antenna Components; Bandwidth; Fabrication; Impedance; Microwaves

20050169393
On Improving the Surface Wave Efficiency of Microstrip Patches
IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 952-955; In English; See also 20050169243; Copyright; Avail: Other Sources

Printed antennas manufactured on high, rather than low, relative permittivity substrates typically exhibit a lower surface wave efficiency. Recently two novel circular printed antennas were proposed which weakly excited a surface wave mode [l]. The resulting configurations, although larger and somewhat more difficult to fabricate than a more conventional microstrip

patch antenna, improve the surface wave efficiency of the radiating element considerably. In this paper, two other geometries are considered which can improve the surface wave efficiency of a radiating element while making the element construction comparable to a conventional printed antenna. These elements are examined using a full-wave spectral domain Green's function/Galerkin's technique. Both the advantages and the drawbacks of the geometries are addressed.
Derived from text
Microstrip Antennas; Surface Waves; Dipole Antennas; Green's Functions

20050169394 California Univ., Los Angeles, CA, USA
Time Domain Vector Potential Formulation for the Solution of Electromagnetic Problems
DeFlaviis, Franco; Noro, Massimo; Diaz, Rodolfo E.; Alexopoulos, Nicolaos G.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 970-973; In English; See also 20050169243; Copyright; Avail: Other Sources

Several techniques have been proposed for the solution of Maxwell's equations, such as FDTD, which rely on discretization of Maxwell's equations in the time. These techniques are attractive because of their simplicity but are limited to dealing with structures with low dispersion characteristics. Other techniques as condensed TLM offer superior characteristics in terms of dispersion but are more demanding in terms of computer resources. Attempts to use the vector potential formulation by discretization of the vector potential wave equation have also been made in the past. Although the scheme is attractive because of some of the advantages of the TLM technique, they have the shortcoming of the difficulty of implementing metal boundaries. In this paper a new technique based on discretization of Maxwell's equations in the vector potential form (VP) is presented. This new technique maintains the advantage of condensed node representation as in the vector potential formulation, but offers an easy way to treat metal boundaries.
Author
Finite Difference Time Domain Method; Maxwell Equation; Wave Equations

20050169396 Georgia Inst. of Tech., Atlanta, GA, USA
A Complete Electromagnetic Simulation of a Ground Penetrating Radar for Mine Detection: Theory and Experiment
Bourgeois, Jacqueline M.; Smith, Glenn S.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 986-989; In English; See also 20050169243
Contract(s)/Grant(s): DAAH-04-93-G-0027; DAAH-04-96-1-0161; DAAh-04-94-G-0144; Copyright; Avail: Other Sources

Ground penetrating radar (GPR) systems are electromagnetic systems used in detecting objects buried in the earth. The U. S. Army is currently investigating a particular GPR, a separated aperture sensor, as a method for detecting buried land mines. The sensor consists of transmitting and receiving dipole antennas housed in corner reflectors and separated by a metallic septum, as shown in Figure 1. The dipoles are tuned to the frequency 790 MHz. When this sensor is moved from a position over empty soil to a position over a target (mine) the reflection from the target causes an increase in coupling between the antennas (S(sub 21)) and the resultant increase in coupling is used to detect the buried mine. In this paper, a complete three-dimensional finite-difference time-domain (FDTD) analysis of the separated aperture sensor will be described. A similar FDTD analysis of a pipe detection GPR was described previously [1]. The geometry for the FDTD numerical model is shown in Figure 1. The FDTD simulation includes all details of the detector: the dipoles, the tuning stubs attached to the dipoles, the corner reflectors, and the septum. It also includes the earth and the buried mine. The boundaries of the FDTD grid are terminated using the Generalized Perfectly Matched Layer (GPML) [2]. In the FDTD simulation, the transmitting antenna is fed with a differentiated Gaussian signal through a simple, one-dimensional feed and the results from a single FDTD run provide S-parameter data over a wide frequency range. The FDTD calculations are made on a Connection Machine Model CM-5 parallel computer and require about 4 GBytes of memory.
Author
Ground Penetrating Radar; Simulation; Apertures; Finite Difference Time Domain Method; Frequency Ranges; Mathematical Models

20050169397 New Mexico State Univ., Las Cruces, NM, USA
Finite-Difference and Pseudospectral Time-Domain Methods for Subsurface Radar Applications
Liu, Q. H.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 990-993; In English; See also 20050169243; Copyright; Avail: Other Sources

The finite-difference time-domain (FDTD) method [1] is widely applied to simulate transient electromagnetic wave propagation. In this method, the spatial and temporal derivatives in Maxwell's equations are approximated by finite

differences. Numerical experiments show that accurate results require a fine discretization of about 8-20 grids per wavelength at the highest frequency being simulated. To increase the efficiency of time-domain solutions, various spectral-domain techniques, for examples [2-5], have been developed to reduce the grid density. In particular, the pseudospectral time-domain (PSTD) method [4, 5] uses a fast Fourier transform (FFT) algorithm to represent the spatial derivatives in Maxwell's equations, and provides accurate results with only two grids per wavelength. The purpose of this work is to further compare the FDTD and PSTD methods in terms of their development and capabilities in the simulations of subsurface radar applications. Numerical examples are used to demonstrate their relative accuracy and efficiency for different problems.
Derived from text
Finite Difference Time Domain Method; Maxwell Equation; Electromagnetic Wave Transmission; Fast Fourier Transformations; Algorithms

20050169398 Remcom, Inc., State College, PA, USA
Efficient FDTD Calculation of Multi-Port S Parameters for Microstrip and Stripline Circuits
Langdon, H. Scott; Luebbers, Raymond; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 998-1001; In English; See also 20050169243; Copyright; Avail: Other Sources

The Finite Difference Time Domain (FDTD) method has been used for the calculation of scattering (S) parameters for a number of years. A recent paper [1] contains a representative set of references to this topic starting in 1985. As pointed out in [1], a difficult problem has been separating the interaction between the source excitation and the time domain reflections. In a previous paper [2] we presented the idea of a voltage source with an internal source resistance as a means for exciting a microstrip patch antenna. The resistive source feed also allows us to position the feed very close to the structure, thereby reducing the number of cells and computer memory needed. In addition, as shown in [2], the number of time steps needed can be drastically reduced, especially for a resonant structure. In this paper we extend the resistive source approach to the calculation of multiport S parameters. Each FDTD calculation determines one column of the matrix. For example, if Port 1 is excited then that calculation provides S(sub 11), S(sub 21)..... S(sub N1).
Derived from text
Finite Difference Time Domain Method; Patch Antennas; Electric Potential; Finite Difference Theory; Microstrip Antennas; Memory (Computers)

20050169400 National Sun Yat-Sen Univ., Kaohsiung, China
A New Multi-Target Angle Tracking Algorithm for Antenna Array
Chen, Yuan-Hwang; Kuo, Pau-Lin; Li, Guo-Jang; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1012-1015; In English; See also 20050169243; Copyright; Avail: Other Sources

A new algorithm for multi-target angle tracking is presented using antenna array output. It combines discrete wavelet transform(DWT) based beamspace processing with MUSIC algorithm [l] to track multiple target angles by recursively updating the center frequency of spatial prefilter. Compared to Lo and Li's [2], the improved performance of the proposed method is demonstrated by computer simulations
Author
Tracking (Position); Targets; Algorithms; Antenna Arrays; Directional Antennas; Wavelet Analysis

20050169401 Griffith Univ., Nathan, Australia
Direction Finding Using a Switched Parasitic Antenna Array
Preston, Stephanie; Thiel, David V.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1024-1027; In English; See also 20050169243; Copyright; Avail: Other Sources

An electronically controlled antenna array consisting of one active element and a number of parasitic elements can be used for direction finding. Array directivity is controlled by exchanging the position of the feed and the parasitic elements. An array of four monopoles on a ground plane provides 360 degree azimuthal coverage with no moving parts, provides excellent directional resolution and can be controlled using a simple microcontroller. The antenna design, its application to direction finding and reliability in noisy environments are presented.
Author
Direction Finding; Antenna Arrays; Parasitic Elements (Antennas); Antenna Design; Monopoles

20050169402 Siena Univ., Italy
An Incremental Formulation for the Scattering of an Electromagnetic Wave by Circular Cylinders
Tiberio, R.; Toccafondi, A.; Maci, S.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 898-901; In English; See also 20050169243; Copyright; Avail: Other Sources

Recently, a quite general incremental formulation for describing the scattering of a scalar field from cylinder-shaped structures has been presented. This is based on a suitable interpretation of the exact solution for the scattering in the near zone from a canonical cylindrical structure, when it is illuminated by a spherical source. It is shown that its spectral integral representation may be represented as a spatial integral convolution along the axis of the structure. This leads to directly define the local incremental field contribution. In this paper the general vector problem of electromagnetic wave scattering from a perfectly conducting cylinder with circular cross-section is considered. High-frequency expressions for incremental scattered field contributions are determined, when the cylinder is illuminated by both an electric and a magnetic elementary dipole oriented along its axis. As in the scalar case, they are obtained by applying the same spatial integral convolution interpretation to the exact spectral integral representation of the axial components of the total scattered electric and magnetic fields.
Derived from text
Electromagnetic Scattering; Wave Scattering; Circular Cylinders

20050169403 Kokusai Denshin Denwa Co. Ltd., Saitama, Japan
HA Adaptive Array with a Novel DOA Estimation Method Applicable to TDMA Communication Systems
Kamiya, Yukihiro; Nomoto, Shinichi; Kobayashi, Hideo; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1028-1031; In English; See also 20050169243; Copyright; Avail: Other Sources

Recently, the applications of adaptive arrays based on the digital beam forming technique are widely considered for various communication systems. However, the adaptive control algorithm of the array antennas under TDMA systems requires particular consideration due to the fact that it employs intermittent signals. Howells-Applebaum(HA) algorithm [z313]is one of the control algorithms of such adaptive arrays which utilize the Direction Of Ardval(DOA) of the desired signal as a reference. It is expected that HA algorithm is suitable for TDMA systems. This algorithm requires DOA estimation system. Many DOA estimation algorithms have been presented conventionally [41tsj.However, most of them require heavy computational load. From the practical point of view, DOA estimation accuracy, especially DOA for HA algorithm, does not have to be so precise. Therefore, simpler DOA estimation algorithm with less precision would be preferred. In this paper, first, we suggest the novel DOA estimation algorithm which takes advantage of features of the TDMA s_gnals. Second, the performance of the adaptive array with the HA algorithm for TDMA communication systems will be evaluated through computer simulations and experiments.
Derived from text
Antenna Arrays; Algorithms; Adaptive Control; Time Division Multiple Access; Digital Techniques; Beamforming

20050169407 Tohoku Univ., Sendai, Japan
Estimation of Three-Dimensional Coherent Source Positions with a Directional Borehole Radar by MUSIC Algorithm
Ebihara, Satoshi; Sato, Motoyuki; Niitsuma, Hiroaki; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1036-1039; In English; See also 20050169243
Contract(s)/Grant(s): MOE-0070266; Copyright; Avail: Other Sources

A borehole radar is one form of ground penetrating radars, which operates in a borehole. The significant feature of the borehole radars is its accessibility to targets. Most conventional borehole radar use dipole antennas, which are omnidirectional. However, in many engineering applications, three-dimensional positions of targets such as fractures and pipes should be accurately determined. We have designed and constructed a prototype broadband directional borehole radar system. A receiver is a con_formal array antenna [1]. This radar system operates between 100MHz and 300MHz. Since the space available for the array and frequency band-width are limited, a super resolution technique should be applied. This paper presents a method for three-dimensional position estimation of coherent broadband sources with the conformal array in a borehole. This method is based on the MUSIC algorithm [2], and problem formulation and a decorrelation algorithm will be shown. Also, we show experimental results to
Derived from text
Boreholes; Radar Antennas; Dipole Antennas; Pipes (Tubes); Radiation Sources; Broadband

20050169408 Defence Science Organization, Singapore
Scan Blindnesses in Infinite Arrays of Microstrip Dipole Antennas with Coplanar Strip Feedlines
Yeo, Stephen K. N.; Parfitt, Andrew J.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1130-1133; In English; See also 20050169243; Copyright; Avail: Other Sources

A spectral periodic Green's function technique was previously used to analyze infinite, planar, phased arrays of microstrip dipoles with idealized feeds [1,2]. The results of the numerical models using this technique were shown to agree well with

those obtained with other models found in the literature [2], including the prediction of a substrate induced scan blindness effect. The same technique of analysis is now extended to model microstrip dipole and microstrip folded dipole arrays with coplanar strip feedlines. In the case of dipole arrays without substrates, the effect of feedline-induced scan blindness has long ago been observed [3]. However, for a phased array of microstrip dipoles with feedlines, both the feedline and substrate effects can potentially cause a blindness condition to occur in its scanning performance. The aim of this paper is to describe the feedline-induced and substrate-induced scan blindness effects in microstrip dipole and folded dipole arrays with feedlines, and the effect of each type of scan blindness for different substrate electrical thicknesses.
Derived from text
Green's Functions; Feed Systems; Microstrip Antennas; Planar Structures; Phased Arrays

20050169409 Queensland Univ., Brisbane, Australia
The Effect of an Air Gap on the Radiation Pattern of a Microstrip Leaky Wave Antenna Radiating into a Half Space
McMillan, Lee O.; Shuley, Nicholas V.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1134-1137; In English; See also 20050169243; Copyright; Avail: Other Sources

In various antenna applications it is not desirable to have the antenna in direct contact with the medium the radiation is trying to penetrate. In ground penetrating radar [1], the antenna is moved over the ground, so that data can be obtained about subsurface features. Clearly in this application, if the antenna was in direct contact with the ground the antenna would be damaged very quickly. Hence the need for an air gap. Researchers investigating the effect of a dielectric coating on a leaky wave Long Slot waveguide antenna, concluded that some slight discrepancies between measured and theoretical results in backlobe radiation, may be due to the presence of a small air gap between the antenna's metalization surface and the dielectric coating, as a result of the adhesive process [2]. In this paper, the effect of a small air gap between a microstrip leaky wave antenna (LWA) and a half space is examined. The propagation constant and power radiation pattern is evaluated for various air gap spacings (t).
Derived from text
Ground Penetrating Radar; Gaps; Dielectrics; Coating; Antenna Radiation Patterns

20050169412 Tehran Univ., Tehran, Iran (Islamic Republic of)
A Leaky Transmission Line Method for the Analysis of the Microstrip Line Traveling Wave Antenna
Manteghi, M.; Shooshtari, A.; Safavi-Naeini, S.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1138-1141; In English; See also 20050169243; Copyright; Avail: Other Sources

There is a growing interest in traveling wave antennas, specially their microstrip printed board realizations [1,2], because of their wide bandwidth and high gain. These are among their desirable features for many communication system applications. For example, wideband crank-line antenna has been suggested as a satellite receiver antenna [3]. Traveling wave antennas are generally large (in terms of wavelengths) structures. The analysis methods based on full-wave moment method such as the one introduced in [4], requires a considerable amount of the computer resources in terms of CPU time and memory and therefore are not very suitable for design and optimization purposes. In this paper we present a numerically efficient and fast technique which can be used for design and optimization of traveling wave radiating structures. This technique is similar to the leaky cavity method which has successfully been applied to the analysis of the microstrip patch antennas [5]. It is based on the fact that the traveling wave antennas are essentially leaky wave radiators. The traveling wave RF current over the body of these antennas, which are usually in the form of long transmission lines, radiates electromagnetic power continuously and therefore decreases, in amplitude, exponentially [4]. In the proposed 'leaky transmission line model' for this antenna, discussed in the following, the per unit length resistance of the line is modified to include the power lost to the radiation in addition to the other losses.
Derived from text
Microstrip Transmission Lines; Broadband; High Gain; Radio Frequencies

20050169413 National Chiao Tung Univ., Hsinchu, Taiwan, Province of China
Design of the Feeding Structures for the Excitation of the Microstrip Line Second Higher Order Mode Leaky-Wave Antenna
Lin, Yu-De; Chi, Pei-Min; Chen, Tai-Lee; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1142-1145; In English; See also 20050169243; Copyright; Avail: Other Sources

Two feeding structures for the excitation of the microstrip line second higher order mode as leaky-wave line sources are proposed in this paper. Since the second higher order mode of the microstrip line assumes a magnetic wall symmetry plane

at the center of the strip as the dominant mode does, the feeding line adopted is coplanar waveguide (CPW). One of the feeding structures uses CPW on the same plane with the microstrip; while the other places the feeding CPW on the ground plane of the microstrip line. To suppress the excitation of the dominant mode, the slots of the feeding coplanar waveguide are placed appropriately. Experiments are conducted to exhibit the efficiency of the excitation schemes.
Author
Antenna Arrays; Microstrip Transmission Lines; Planar Structures; Waveguides; Antenna Components

20050169415 Rome III Univ., Rome, Italy
Evaluation of the Radar Cross Section for Chiral Stratified Structures
Toscano, A.; Urbani, F.; Vegni, L.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1164-1167; In English; See also 20050169243; Copyright; Avail: Other Sources

In this paper the problem of the Radar Cross Section (RCS) of a biisotropic stratified structure is considered. By means of the Method of Lines (MoL) we firstly found the spectral dyadic Green's function for a generic multilayered biisotropic (chiral) structure, then we determined the behavior of the RCS in the spatial domain. Numerical results for a biisotropic monolayered structure are presented. This study may find application for stratified media involving an arbitrary number of layers like planar microwave and millimeter-wave components and printed circuit antennas.
Author
Radar Cross Sections; Green's Functions; Microwave Circuits; Isotropic Media; Millimeter Waves; Printed Circuits

20050169422 Naval Air Warfare Center, Point Mugo, CA, USA
Near-Field Electromagnetic Modeling and Analysis
Yu, C. Long; Kipp, R.; Andersh, D. J.; Lee, S. W.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1168-1171; In English; See also 20050169243; Copyright; Avail: Other Sources

For missile fuzing applications, the transmitting and receiving antennas on a missile are generally located in the near-field zone of the scattered field from the target encountered. In consequence, the radar return computation is complicated by the partial target illumination, nonuniform antenna patterns, target material coatings, and engine inlet returns. Existing near-field radar cross section (RCS) computation algorithms, such as NcPTD [1], are typically based on first-order high-frequency methods that do not account for multiple bounce, complex shadow effects and scattering from a cavity, such as an engine inlet or a sensor box. A successful missile/target engagement analysis must thus be conducted with accurate near-field target RCS information that includes effects attributable to multi-bounce, complex-shape shadowing, material coatings, antenna patterns, etc.. This paper discusses techniques for solving near-field modeling problems in missile/target end-game scenarios.
Derived from text
Antenna Radiation Patterns; Near Fields; Radar Cross Sections; Scattering

20050169431 Wisconsin Univ., Madison, WI, USA
A Novel Impedance-Tuned Monopole Antenna
Wagner, Keely A.; Gearbart, Steven S.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1332-1335; In English; See also 20050169243; Copyright; Avail: Other Sources

In this paper, we introduce the slot-tuned monopole antenna whose input impedance may be tuned using slots integrated within the antenna. The slots may be thought of as integrated coplanar-waveguide tuning stubs and may also be used to create a second impedance-tuned resonance. The ratio of the two impedance-tuned resonances can be adjusted by changing the dimensions of the antenna and slots. To illustrate the flexibility of the slot-tuned monopole antenna, two examples will be presented. The f'u'st example shows how the insertion of a open circuited stub within the antenna can increase the resonant impedance of the monopole from approximately 35ohms, which is typical to monopoles, to 50ohms. The 50ohm input impedance is chosen because it is well matched to 50ohm coaxial lines. In actual applications, nearly any input impedance may be chosen. In the second example short and open circuited stubs were inserted in parallel and the dimensions of the antenna were adjusted to create an antenna with two impedance-tuned resonant frequencies with a frequency ratio of 1.5: 1. For these tests, the antennas are fabricated on 10 mil thick substrate with e(sub t approx. equals 4. Simulations are performed using HP Momentum moment method software [1].
Derived from text
Monopole Antennas; Impedance; Waveguides; Slot Antennas; Planar Structures; Frequencies

20050169433 Technische Univ., Eindhoven, Netherlands

Detecting Fractures in Artificial Heart Valves

Lepelaars, E. S. A. M.; vanOoijen, W. D. R.; Tijhuis, A. G.; deMol, B. A. J. M.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1198-1201; In English; See also 20050169243

Contract(s)/Grant(s): NHF Proj. 44.064; Copyright; Avail: Other Sources

In recent years, it has been established that the minor outlet closure strut in certain artificial heart valves may suffer from mechanical defects. These defects appear as cracks or fractures near the junction of a leg of this strut with the main ring of the device. As a consequence, the valve occluder may escape from the device, which subjects the patient to a lethal risk. In The Netherlands, between 1979 and 1986, the heart valve of 2303 patients was replaced by this type of artificial heart valve. An epidemiological study [1] found 42 strut fractures during mean follow up of 6.6 years, while a non-destructive evaluation of 24 representative explanted valves [2] showed single-leg fractures in seven and fatigue changes in two of them. Fig. la shows a photograph of a typical valve; Fig. Ib shows a result of applying scanning electron microscopy to a fractured leg. In view of this development, the last author approached several research groups with the question whether, from their expertise, it would be possible to develop techniques for assessing the quality of existing heart valves implanted in patients. The present paper presents the first steps towards using pulsed electromagnetic waves for this purpose.

Derived from text

Fractures (Materials); Detection; Artificial Heart Valves; Scanning Electron Microscopy; Epidemiology

20050169438 Garmin International, Inc., USA

A New GCPW Resonant Quadrifilar Helix Antenna for GPS Land Mobile Applications

Shumaker, Paul K.; Ho, Chien H.; Smith, Keith B.; Huang, David; Wang, Richard; Liao, Jih W.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1344-1347; In English; See also 20050169243; Copyright; Avail: Other Sources

This paper presents a new quadrifilar helix volute antenna using grounded coplanar waveguide (GCPW) infinite feeding baluns. This new quarter-wavelength volute antenna provides small size, low cost, ease of mass production, and substantially improved elevation pattern coverage and circular polarization properties.

Author

Global Positioning System; Planar Structures; Circular Polarization; Antenna Arrays; Waveguides

20050169440 Mayo Clinic, Rochester, MN, USA

Phase Alignment of Multiple Surface Coil Data for Reduced Bandwidth and Reconstruction Requirements in Volumetric MRI Applications

Debbins, Josef P.; Felmlee, Joel P.; Riederer, Stephen J.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1214-1217; In English; See also 20050169243; Copyright; Avail: Other Sources

Introduction: Multiple element surface coils, or 'phased array' multicoils, are often used volumetrically in magnetic resonance imaging (MRI) around a region of interest, such as the pelvis, head, abdomen or thorax to increase the image signal-to-noise ratio (S/N) when compared to the single channel 'built-in' birdcage body coil. Reconstruction of the raw data from the N active coil elements is typically achieved by a standard method in which an individual magnitude image is reconstructed from the data from each element. These N intermediate images are then combined to form the final composite image (1), typically by taking the square root of the sum of the squared intermediate images. This combined phased array magnitude reconstruction, or 'sum of squares' technique provides up to 90% of the maximum available S/N (1); however, it requires a net data sampling bandwidth N times greater than that required for a single coil, and N Fourier transform reconstructions. N separate receivers are also required, unless modifications are made to the receiver hardware. For the applications noted above, and applications which require high bandwidth such as echo-planar imaging or which perform continuous image acquisition such as real-time], or which acquire data with high temporal and spatial resolution such as 3D phase contrast and time-resolved 3D, the additional S/N gained from using multiple element surface coils is often critical for attaining adequate image quality. However, using the standard 'sum of squares' technique can pose significant temporal limitations to the reconstruction, or pose significant demands on the available memory size, especially as requirements for reduced image acquisition time and improved spatial resolution increase. The purpose of this work is to show that multicoil phase alignment allows decreased technical requirements compared to the standard 'sum of squares' method, while providing substantially improved S/N performance over a volumetric body coil.

Derived from text

Data Sampling; Magnet Coils; Signal to Noise Ratios; Phased Arrays; Magnetic Resonance; Imaging Techniques

20050169441 Korea Maritime Univ., Pusan, Korea, Republic of

Phase Control of Circularly Polarized Waves from a Parasitic Dipole Mounted above a Slot

Min, Kyeong-Sik; Hirokawa, Jiro; Sakurai, Kimio; Ando, Makoto; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1348-1351; In English; See also 20050169243; Copyright; Avail: Other Sources

A combination of a slot and a parasitic dipole is a well known element for circular polarization [1]. The authors adopted these elements and proposed a single-layer linear-to-circular polarization converter consisting of a dipole array [2] to be mounted on an existing narrow-wall slotted waveguide array as in Fig. 1. Unfortunately, slots on the narrow wall in an existing array are inclined alternatively with respect to the waveguide axis. It results in alternating phase error of array illumination and the serious grating lobes appear in the array pattern The authors have suppressed these lobes by changing only the dipole angle at the cost of the axial ratio of the element pattern in [2]. this paper, we discuss and extract the mechanism of these novel findings. By using the simple approximation for the induced currents on the dipole, we express the amplitude and the phase of circular polarization in analytical forms. This expression clearly explains all the behavior of circular polarization. An important result amongst all is that the phase of circular polarization is determined only by the dipole angle and is independent of that of the slot. These relations are also confirmed by experiments.

Derived from text

Phase Control; Circular Polarization; Slots; Linear Polarization; Extraction

20050169444 California Univ., Los Angeles, CA, USA

Finite Element Analysis of Out-of-Plane Propagation in Two-Dimensional Photonic Crystals

Coccioli, Roberto; Itoh, Tatsuo; Pelosi, Giuseppe; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1298-1301; In English; See also 20050169243; Copyright; Avail: Other Sources

The analysis of two dimensional photonic crystals in the literature have been mainly conducted in the case of propagation of the electromagnetic wave in the plane perpendicular to the axis along which the crystal is uniform. However, to develop practical applications of such material is necessary to evaluate and understand also its out-of-plane band structure. To this end, a three-dimensional finite element analysis has been carried out and some practical structures have been analyzed.

Author

Finite Element Method; Photons; Crystals; Three Dimensional Models

20050169445 Allgon System A.B., Taby, Sweden

The Performance of Polarization Diversity Antennas at 1800 MHz

Wahlberg, Ulrik; Widell, Svante; Beckman, Claes; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1368-1371; In English; See also 20050169243; Copyright; Avail: Other Sources

Cellular radio systems have been in operation since the early 1970‘s and are experiencing tremendous growth. However, a major problem for cellular systems is the multipath, or short-term fading. Due to the fact that the signals can take several paths between the transmitting and the receiving antenna, the received signal becomes a vector summation of all received rays. If two rays have a phase difference of rt radians, a cancellation occurs and the call may be dropped. One way to combat multipath fading on the uplink is to implement a diversity scheme at the base station. Until recently this was done by using two separate antennas positioned some distance apart from each other. The disadvantage with this method, however, is that the antennas have to be separated by several wavelengths to receive ‘independently fading’ signals. Thus the antenna systems become large: e.g. for GSM systems an horizontal separation of about 6m (20lambda) is normally used. With the two antennas positioned with vertical separation an even wider distance is needed. Due to the facts that it can be very expensive to acquire the rights to install large base station antenna systems and that our downtown areas already are littered with antennas ways to reduce the size of these antenna systems are needed. Polarization diversity has been well known for over 20 years but it is not until recently and for the reason mentioned above that it has become of real interest. With polarization diversity two antennas are also used but there is no need for any physical separation between them. Instead the two antennas are polarized in two orthogonal polarizations, e.g., horizontal/vertical or +/-45 degrees slanted. In a recent study by Lotse et. al. [1] it was found that space diversity yields typically about 1 dB better ‘diversity gain’ than polarization diversity. However, how different antenna parameters affect the results has to our knowledge never been studied. The aim of this report is to fill this void.

Derived from text

Reception Diversity; Polarization; Antenna Design; Uplinking; Antennas

20050169448 Space Systems/Loral, Palo Alto, CA, USA

Antenna Geometries for Shaped Dual Reflector Antennas

Luh, Howard H. S.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1398-1401; In English; See also 20050169243; Copyright; Avail: Other Sources

The geometry of a shaped dual reflector antenna customarily evolves from the classical Gregorian (or Cassegranian) which satisfies the Mizugutch condition [1]. The reasons for choosing this initial antenna geometry are, partially, due to lack of knowledge, and partially, due to convenience. Indeed most of shaped dual reflector antennas were designed with such a process [2][3]. The principal polarization contours are, in general, satisfactory. The cross-polarization level, nevertheless, becomes too high when the angular coverage area is large. Because of such results, the application of shaped dual reflector antennas has been questioned. Occasionally, this approach is abandoned in favor of an expensive dual grided shaped reflector design in order to achieve high polarization purity. This investigation discovers that the major cause of this high cross polarization behavior is not due to the reflector being shaped. It is due to the antenna geometry. Thus, with an' improved' antenna geometry, the cross polarization level can be significantly reduced.

Derived from text

Reflector Antennas; Cross Polarization; Reflectors

20050169450 Perugia Univ., Perugia, Italy

Modal Analysis of Discontinuities between Elliptical and Rectangular Waveguides

Dionigi, M.; Mongiardo, M.; Tomassoni, C.; Vernata, M.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1426-1429; In English; See also 20050169243; Copyright; Avail: Other Sources

Waveguides with elliptical cross-section are of considerable interest since, when compared to circular waveguides, they provide additional degrees of freedom for the design of complex waveguide components. We present the full-wave modal analysis of the discontinuity between rectangular and elliptical waveguides; theoretical results are compared with measured data showing the accuracy of the proposed approach.

Author

Discontinuity; Rectangular Waveguides; Ellipticity; Mathematical Models; Coupled Modes

20050169451 Hughes Space and Communications Co., Los Angeles, CA, USA

Effect of Feed Cross-Polarization on the Cross-Polar Characteristics of a Shaped Dual Reflector Antenna

Arnold, B. H.; Clancy, K.; Park, B. M.; Ramanujam, P.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1406-1409; In English; See also 20050169243; Copyright; Avail: Other Sources

The two common forms of shaped reflector antennas for linear polarization applications are the dual gridded reflector antenna (with two orthogonally polarized surfaces) and a dual reflector antenna with a single surface main reflector and a single surface subreflector. Both these configurations are currently used in many satellites[I,2]. The superior cross-polar performance in a dual gridded reflector is obtained by a combination of the polarizing grid and the separation between the feeds for the two polarizations. In this configuration the feed cross-polarization has a second order effect on the overall cross-polar performance. In a dual reflector antenna, the geometry inherently results in a low cross-polar performance if it satisfies the optimum cross-polar condition. Since the reflector induced cross-polarization is very low, the feed cross-polarization has a significant effect on the overall antenna cross-polar performance. This paper describes the effect of feed cross-polar performance on the antenna cross-polar performance of a shaped dual reflector antenna.

Derived from text

Cross Polarization; Reflector Antennas; Two Reflector Antennas; Linear Polarization

20050169457 Pennsylvania Univ., Philadelphia, PA, USA

Knots and Unknots: Scattering and Perceived Symmetry

Manuar, Omar; Jaggard, Dwight L.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1464-1467; In English; See also 20050169243; Copyright; Avail: Other Sources

We examine the role of rotational symmetry in electromagnetic wave backscattering from wire knots and unknots. Calculations demonstrate the dominant role of rotational symmetry with respect to the scattering axis in the backscattering of polarized waves from symmetric and asymmetric wire structures. We investigate simple variations of the loop that display the remarkable global range of behavior first shown by trefoils and untrefoils. It is the rotational symmetry as perceived from the scattering axis that is the determining factor in characteristic scatter.

Author

Rotational Spectra; Polarization (Waves); Electromagnetic Radiation

20050169459 Michigan Univ., USA

Time Adaptive Time-Domain Techniques for the Design of Microwave Circuits

Tentzeris, Emmanouil; Harvey, James; Katehi, Linda P. B.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1476-1479; In English; See also 20050169243; Copyright; Avail: Other Sources

The recently developed MultiResolution Time Domain Method (MRTD) schemes are used for the development of a time adaptive time-domain technique for circuit design. The new technique exhibits considerable savings in memory and computational times in comparison to the conventional FDTD scheme.

Author

Time Domain Analysis; Design Analysis; Microwave Circuits; Finite Difference Time Domain Method

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*.

20050165787 NASA Langley Research Center, Hampton, VA, USA, National Inst. of Aerospace, Hampton, VA, USA

On Efficient Multigrid Methods for Materials Processing Flows with Small Particles

Thomas, James, Technical Monitor; Diskin, Boris; Harik, VasylMichael; July 2004; 26 pp.; In English

Contract(s)/Grant(s): NCC1-02043; WU 23-762-20-21

Report No.(s): NASA/CR-2004-213031; NIA-2004-01; No Copyright; Avail: CASI; A03, Hardcopy

Multiscale modeling of materials requires simulations of multiple levels of structural hierarchy. The computational efficiency of numerical methods becomes a critical factor for simulating large physical systems with highly desperate length scales. Multigrid methods are known for their superior efficiency in representing/resolving different levels of physical details. The efficiency is achieved by employing interactively different discretizations on different scales (grids). To assist optimization of manufacturing conditions for materials processing with numerous particles (e.g., dispersion of particles, controlling flow viscosity and clusters), a new multigrid algorithm has been developed for a case of multiscale modeling of flows with small particles that have various length scales. The optimal efficiency of the algorithm is crucial for accurate predictions of the effect of processing conditions (e.g., pressure and velocity gradients) on the local flow fields that control the formation of various microstructures or clusters.

Author

Solids Flow; Viscous Flow; Two Phase Flow; Particulates; Multigrid Methods

20050166419, Department of the Navy, Washington, DC, USA

Heat Transfer in Oscillating Flow

Jul. 15, 1963; 178 pp.; In English

Report No.(s): DE2004-4161918; No Copyright; Avail: Department of Energy Information Bridge

Pressure oscillations imposed upon a compressible fluid flowing in a duct produce a substantial increase of heat transfer between the heated duct wall and the fluid. An experimental investigation was made of the causes of this increase. Resonant conditions in a duct were used to achieve increased oscillating amplitudes. The local heat transfer incresse was found to be highly dependent on the amplitude of the local velocity oscillations, and to depend also on the frequency of oscillations and the duct steadystate pressure and Mach number. The presence of flow reversal further increased the observed heat transfer. NTIS

Heat Transfer; Oscillating Flow

20050167060 North Carolina State Univ., Raleigh, NC, USA

Continued Research into Characterizing the Preturbulence Environment for Sensor Development, New Hazard Algorithms and Experimental Flight Planning

Kaplan, Michael L.; Lin, Yuh-Lang; March 2005; 8 pp.; In English

Contract(s)/Grant(s): NAG1-03013; No Copyright; Avail: CASI; A02, Hardcopy

The purpose of the research was to develop and test improved hazard algorithms that could result in the development of sensors that are better able to anticipate potentially severe atmospheric turbulence, which affects aircraft safety. The research focused on employing numerical simulation models to develop improved algorithms for the prediction of aviation turbulence. This involved producing both research simulations and real-time simulations of environments predisposed to moderate and

severe aviation turbulence. The research resulted in the following fundamental advancements toward the aforementioned goal: 1) very high resolution simulations of turbulent environments indicated how predictive hazard indices could be improved resulting in a candidate hazard index that indicated the potential for improvement over existing operational indices, 2) a real-time turbulence hazard numerical modeling system was improved by correcting deficiencies in its simulation of moist convection and 3) the same real-time predictive system was tested by running the code twice daily and the hazard prediction indices updated and improved. Additionally, a simple validation study was undertaken to determine how well a real time hazard predictive index performed when compared to commercial pilot observations of aviation turbulence. Simple statistical analyses were performed in this validation study indicating potential skill in employing the hazard prediction index to predict regions of varying intensities of aviation turbulence. Data sets from a research numerical model where provided to NASA for use in a large eddy simulation numerical model. A NASA contractor report and several refereed journal articles where prepared and submitted for publication during the course of this research.
Author
Atmospheric Turbulence; Turbulence Models; Flight Hazards

20050167208 Space and Naval Warfare Systems Center, San Diego, CA USA
Film Implementation of a Neutron Detector (FIND): Proof of Concept Device
McGinnis, W. C.; Oct. 2003; 54 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431409; SSC/SD-TR-1921; No Copyright; Avail: Defense Technical Information Center (DTIC)

The research described in this report addresses the problem of efficient and convenient inspection of buildings, vehicles, persons, and other places for concealed nuclear materials (such as uranium or plutonium) that are being used, or capable of being used, in nuclear weapons. One way to determine the presence of nuclear materials is to detect the neutrons that are emitted from the atomic nucleus of these materials in the radioactive decay process. To overcome the problems encountered with conventional detectors, a solid-state analog of the gas proportional counter based on films or thin bulk pieces of boron nitride (BN) was investigated. This new type of detector is known as a Film Implementation of a Neutron Detector (FIND).
DTIC
Neutron Counters; Nuclear Weapons; Radioactive Materials

20050167267 New Mexico State Univ., Las Cruces, NM USA
Sound Propagation and Scattering in Nighttime Atmospheric Boundary Layers
Ostashev, V. E.; Goedecke, G. H.; Mar. 2005; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-1-0640
Report No.(s): AD-A431684; ARO-42469.34-EV-H; No Copyright; Avail: Defense Technical Information Center (DTIC)

In this project, we developed 3D models of temperature and wind velocity fluctuations in nighttime boundary layers (NBL) and, using these models, studied sound propagation and scattering. The 3D spectra of temperature and velocity fluctuations due to internal gravity waves in moderately and very stable NBL were obtained. The 3D spectra of turbulent temperature and wind velocity fluctuations in weakly stable, intermittent NBL were modeled with the use of the von Karman spectra. Quasi-wavelet models of turbulent temperature and velocity fluctuations were developed. The developed models of internal gravity waves, turbulence, and quasi-wavelets were then used for calculations of the statistical moments of plane and spherical sound waves propagating in the atmosphere. These calculations were done for three different problems: scattering of sound, line-of-sight sound propagation, and sound propagation in a refractive, turbulent atmosphere near an impedance ground. The coherence function of a sound field propagating in NBL was measured and compared with that predicted theoretically.
DTIC
Atmospheric Stratification; Boundary Layers; Night; Scattering; Sound Propagation

20050167269 University of South Florida, Saint Petersburg, FL USA
Improved Parameterization of Stably Stratified Boundary Layer Turbulence in Atmospheric Models
Galperin, B.; Sukoriansky, S.; Perov, V.; Zilitinkevich, S.; Mar. 2005; 7 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0816
Report No.(s): AD-A431687; ARO-42414.3-EV; No Copyright; Avail: Defense Technical Information Center (DTIC)

In the course of the project, our research has spanned over several areas encompassing theoretical, numerical and phenomenological aspects of stably stratified atmospheric boundary layers (SBLs). We have laid a solid foundation for studying stably stratified turbulence in the framework of a Quasi-Normal Scale Elimination theory (QNSE) developed by us.

We consider the QNSE theory as a major breakthrough in this field. Being maximally proximate to the first principles, the theory penetrates very deeply into the physics of anisotropic turbulence and turbulence-wave interaction yet its calculations can be carried out analytically almost to the final results. We have performed initial analytical exploration of the new theory and implemented it in Reynolds-averaged, Navier-Stokes (RANS) models whose predictions agree well with data collected in BASE and SHEBA campaigns. In addition, we investigated non-local features of stable planetary boundary layers (PBLs) caused by semi-organized structures overlooked in traditional boundary-layer meteorology and in PBL schemes currently used in atmospheric models. Theoretical developments focused on basic length scales characterizing semi-organized structures and corresponding revision of classical similarity theory, PBL depth equations, and bulk resistance and heat/mass transfers laws. DTIC

Atmospheric Models; Parameterization; Strata; Turbulence Models; Turbulent Boundary Layer

20050167310 Princeton Univ., NJ USA

An Experimental Study of the Receptivity of a Compressible Laminar Boundary Layer and the Effects on Stability and Receptivity of 2-D and 3-D Pressure Gradients

Brown, Garry L.; Jan. 2005; 16 pp.; In English

Contract(s)/Grant(s): F49620-00-1-0040

Report No.(s): AD-A431796; AFRL-SR-AR-TR-05-0072; No Copyright; Avail: CASI; A03, Hardcopy

Techniques have been developed to provide, for the first time, pure tone acoustic forcing with a wave packet having a particular wave vector and at instability wave frequencies for a supersonic boundary layer. Receptivity to this pure tone forcing has been studied, initially with continuous forcing and now with well defined wave packets. In the latter case precise measurements can now be made of the detailed response to the free-stream disturbance. The wave velocity and wave vector in the free-stream have been determined consistently. A preliminary finding from the wave packet experiments is that the boundary layer response is broadly in two parts; one which is a local forced response in phase with the free-stream forcing and the other which, at downstream locations, has larger amplitude, is growing with downstream distance and has a significant time delay compared with the first forced response. The explanation for this second wave packet and its relation to the first is not yet clear and is the present subject of detailed investigation. Once the data and an understanding are obtained with the present U + a wave forcing attention will be focused on U - a waves. It was found in 1, that the stream-wise wavelengths of the instability waves and the acoustic U - a free-stream fluctuations were closely matched and it was speculated that this played an important role in receptivity.

DTIC

Compressible Boundary Layer; Laminar Boundary Layer; Pressure Gradients; Responses; Stability

20050167328 Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ USA

Structural Loading Statistics of Live Gun Firings for the Army's Excalibur Projectile

Cordes, Jennifer; Vega, Julio; Carlucci, Donald E.; Chaplin, Raymond; Peterson, W. S.; Apr. 2005; 16 pp.; In English; Original contains color illustrations

Report No.(s): AD-A431877; ARAET-TR-05005; ARDEC/ARAET-TR-05005; No Copyright; Avail: Defense Technical Information Center (DTIC)

Excalibur is a 155-mm projectile under development and scheduled for Army use in 2008. During development, Excalibur was gun-fired using a variety of propellant charges. The purpose of the tests was to determine the reliability, structural integrity, and performance for different field charges. On-board accelerations and gun-tube pressures were recorded for most tests. This paper summarizes the accelerations and pressures from dozens of tests using different propellant charges. Average pressures and accelerations are presented. Variations and correlations are also given.

DTIC

Acceleration (Physics); Pressure; Projectiles

20050167473 Army Research Lab., Aberdeen Proving Ground, MD USA

Time-Accurate Aerodynamic Modeling of Synthetic Jets for Flow Control

Sahu, Jubaraj; Heavey, Karen R.; Jan. 2003; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A432189; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper describes a computational study undertaken to determine the aerodynamic effect of tiny unsteady synthetic jets as a means to provide the control authority needed to maneuver a spinning projectile at low subsonic speeds. Advanced Navier-Stokes computational techniques have been developed and used to obtain numerical solutions for the unsteady

jet-interaction flow field at subsonic speeds and small angles of attack. Unsteady numerical results show the effect of the jet on the flow field and on the aerodynamic coefficients. The unsteady jet is shown to substantially alter the flow field both near the jet and the base region of the projectile that in turn affects the forces and moments even at zero degree angle of attack. The results have shown the potential of computational fluid dynamics to provide insight into the jet interaction flow fields and provided guidance as to the locations and sizes of the jets to generate the maximum control authority to maneuver a projectile to hit its target with precision.
DTIC
Aerodynamic Forces; Computational Fluid Dynamics

20050167475 Newcastle Univ., Newcastle, Australia
Conversion of Ozone-Depleting Substances (ODS) to Useful Products: Design of a Process for Conversion of Halons 1211 and 1301 to HFCS. Part A
Kennedy, Eric; Dlugogorski, B. Z.; Jun. 2003; 43 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F6256202P0109
Report No.(s): AD-A432193; No Copyright; Avail: Defense Technical Information Center (DTIC)
The contractor will investigate two processes for the conversion of Cf3Br to Cf3I and perform a detailed analysis of the practical implementation of adapting these technologies to full scale production including reactor design (kinetic variables, heat and fluid flow characteristics and non-ideal flow, multiple step reactions, etc) and construction of the reactor itself.
DTIC
Flames; Fluid Flow; Halon; Ozone

20050167477 Massachusetts Inst. of Tech., Cambridge, MA USA
Developing a Research Roadmap on Performance Limiting Flow Processes in High-Stage Loading Compressors
Tan, Choon S.; Mar. 2005; 19 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0060
Report No.(s): AD-A432196; AFRL-SR-AR-TR-05-0730; No Copyright; Avail: CASI; A03, Hardcopy
This document constitutes the final report on a research program on 'Developing a Research Roadmap on Performance Limiting Flow Processes in High-Stage Loading Compressors.' The focus is on developing the required research framework and tasks to address the fluid dynamic difficulties of highly loaded, high Mach number (HLHM) compressor stages. These consist of identifying the database available on such compressor stages, developing a plan to determine what additional data are needed, and defining the steps needed for successful execution of the research program in collaboration with the AFRL (Air Force Research Lab), NASA GRC and Rolls-Royce Inc. Indianapolis. The framework under which these tasks have been developed is based on hypothesis that the fluid dynamic difficulties encountered are linked to two specific flow processes in high-stage loading, high Mach number compressor stages.
DTIC
Compressors; Fluid Dynamics

20050167701 Naval Research Lab., Washington, DC USA
Submarine Hydraulic Fluid Explosion Mitigation and Fire Threats to Ordnance
Hoover, John B.; Bailey, Jean L.; Willauer, Heather D.; Williams, Frederick W.; Jan. 2005; 29 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 61-8244-H5
Report No.(s): AD-A432078; NRL/MR/6180--05-8859; No Copyright; Avail: Defense Technical Information Center (DTIC)
Previous work has shown that leaks in submarine hydraulic systems can produce sprays and mists that are highly flammable and potentially explosive. To evaluate the feasibility of using currently available Fire extinguishing technologies for preventing or mitigating these explosions, large-scale tests were conducted in the SHADWELL/688 test area aboard ex-USS Shadwell. PKP AFFF, carbon dioxide, and water (applied with a Vari-Nozzle, a Navy applicator, and a water mist spray system) were evaluated. PKP prevented the explosions; the other agents were ineffective. Additional testing was performed to characterize the Fire threat to ordnance located in the torpedo room. It was found that the temperature produced, even by small spray fires, exceeded the maximum safe temperature limits for the Mk-48 torpedo.
DTIC
Explosions; Fire Prevention; Fires; Hydraulic Equipment; Hydraulic Fluids; Ordnance; Sprayers

20050167846 Building and Construction Research TNO, Delft, Netherlands

Nearby UNDEX Simulations Using LS-DYNA

vandenEikhoff, J; January 19, 2005; 46 pp.; In English

Contract(s)/Grant(s): A04/KM/14311398; TNO Proj. 006.48233/01.01

Report No.(s): TD-2004-0275; TNO-2004-CMC-R069; Copyright; Avail: Other Sources

Insight is gained in the possibilities and shortfalls of LS-DYNA's EULER capability in predicting jetting loadings. A Doubly Asymptotic Approximation for a Lagrangian fluid model is implemented in LS-DYNA with a user routine including shock and hydrostatic loading. A Trojka drone shock trial is analyzed and agrees well. Without DAAs it is only possible to obtain acceptable results with very large models. The results with a Lagrangian fluid and DAAs are correct for a 1D spherical oscillating bubble. Modelling such bubble with a 2 or 3D Lagrangian model is impossible due to large element distortions around the bubble, but with an Arbitrary Lagrange Euler model it is promising. ALE with DAAs works, although mass transport is ignored and allows smaller fluid models. ALE models can be coupled to Lagrangian structural models. User routine validation is suggested and it should be extended to 2 1/2 D models. Evaluation of the ALE and Euler modelling depends on the experience with the Euler code CHINOOK and must include frequent remeshing.

Author

Underwater Explosions; Shock Waves; Euler Equations of Motion; Lagrangian Function; Asymptotic Methods

20050167849 Maritime Research Inst. Netherlands, Wageningen, Netherlands

Tail Angle Investigation for DARPA SUBOFF Submarine

Toxopeus, S. L.; February 2005; 47 pp.; In English

Contract(s)/Grant(s): A02/KM/192; MARIN Proj. 15357.205

Report No.(s): TD-2005-202; TNO-153574CPM; Copyright; Avail: Other Sources

For several years, the Royal Netherlands Navy (RNLN) has ordered the Maritime Research Institute Netherlands (MARIN) to conduct studies into the maneuverability and controllability of submarines. One of the aims of this study is to increase the accuracy of submarine maneuvering simulation programs. During the recent years, viscous-flow calculations have become increasingly popular to calculate and study the flow around (surface) ships. Progress has also been made into the estimation of the flow around ships in oblique motion and subsequently the prediction of the forces and moments acting on a ship sailing at a drift angle. After discussions between RNLN and MARIN, it was decided to initiate a study to investigate the possibilities of calculating the viscous flow around a submarine at zero incidence using MARIN's in-house flow solver PARNASSOS. This report presents the results of this study. Special attention is paid to the uncertainty in the predicted results and the correlation between the results and available experiments. Conclusions will be drawn regarding the influence of the tail angle on the flow along the stern of the submarine.

Author

Submarines; Tail Assemblies; Maneuverability; Controllability; Viscous Flow

20050167850 Maritime Research Inst. Netherlands, Wageningen, Netherlands

Verification Study of SAMSON v2004_12

Jurgens, A. J.; Prins, M. T.; February 2005; 94 pp.; In English

Contract(s)/Grant(s): A02/KM /192; MARIN Proj. 15357.205

Report No.(s): TD-2005-203; TNO-15357-3-CPM; Copyright; Avail: Other Sources

The Royal Netherlands Navy ordered MARIN to update the existing prediction program SAMSON. This work was necessary to fix some shortcomings of the program and to implement the effects of 2nd order wave forces on the submarine while sailing near the surface. As final step in the coding, two steps are undertaken: verification and validation. The objective of the verification is to demonstrate that the code gives comparable results to previous versions of SAMSON. The objective of the validation is to explore the boundaries of validity and investigate the overall accuracy. The main objectives of this validation study are: to compare predictions with results of the previous version of SAMSON; to compare predictions with model-scale experiment results. This report contains the verification and validation results of the latest version of SAMSON Version v2004_12 as released in December 2004.

Author

Program Verification (Computers); Computerized Simulation; Computational Fluid Dynamics; Submarines

20050167855 NASA Langley Research Center, Hampton, VA, USA
Electro-Active Device Using Radial Electric Field Piezo-Diaphragm for Control of Fluid Movement
Bryant, Robert G., Inventor; Working, Dennis C., Inventor; February 15, 2005; 19 pp.; In English
Patent Info.: Filed 13 Mar. 2003; US-Patent-6,856,073; US-Patent-Appl-SN-390675; US-Patent-Appl-SN-365033; NASA-Case-LAR-16363-1; No Copyright; Avail: CASI; A03, Hardcopy

A fluid-control electro-active device includes a piezo-diaphragm made from a ferroelectric material sandwiched by first and second electrode patterns configured to introduce an electric field into the ferroelectric material when voltage is applied thereto. The electric field originates at a region of the ferroelectric material between the first and second electrode patterns, and extends radially outward from this region of the ferroelectric material and substantially parallel to the plane of the ferroelectric material. The piezo-diaphragm deflects symmetrically about this region in a direction substantially perpendicular to the electric field. An annular region coupled to and extending radially outward from the piezo-diaphragm perimetrically borders the piezo-diaphragm, A housing is connected to the region and at least one fluid flow path with piezo-diaphragm disposed therein.

Official Gazette of the U.S. Patent and Trademark Office
Electric Fields; Fluid Flow; Piezoelectricity; Ferroelectric Materials

20050167891 Building and Construction Research TNO, Delft, Netherlands
UNDEX Analyses on a Rigid Plate Using CHINOOK
vandenEikhoff, J.; January 20, 2005; 57 pp.; In English
Contract(s)/Grant(s): A01/KM/117/13759; TNO Proj. 006.48260/01.01
Report No.(s): TD-2004-0276; TNO-2004-CMC-R070; Copyright; Avail: Other Sources

Insight is gained in the (im)possibilities and shortfalls of 'CHINOOK' in predicting the jetting loadings on the structure. Modelling an oscillating and migrating gas bubble near a rigid plate is possible with some requirements. Use triangular elements and the hydrostatic pressure feature. A layer of air must be above the free surface. Extend the model with a coarse mesh to avoid reflected shock waves. The charge must span some elements. Bulk cavitation closure occurs according to simplified models. Due to numerical dispersion, the primary shock wave flattens and gas and liquid phase mix. Further research to use an increased charge size with reduced detonation properties, allowing coarser models, is recommended. The gas bubble is attracted by the plate during contraction. At the bubble minimum, jetting occurs resulting in a pressure pulse. The bubble hits the plate after the first bubble contraction or before the bubble reaches its maximum volume. Plate impulse is up to 3 times larger than according to the similitude equations.

Author
Computational Fluid Dynamics; Computer Programs; Rigidity; Plates (Structural Members)

20050168096 Maritime Research Inst. Netherlands, Wageningen, Netherlands
A General Model for Shrouded Propellers
Holtrop, J.; March 2005; 58 pp.; In English
Contract(s)/Grant(s): A02/KM/135; MARIN Proj. 17772
Report No.(s): TD-2005-0205; TNO-17772-3-SP; Copyright; Avail: Other Sources

This report describes how a generic computational model has been developed to predict the propulsion characteristics of shrouded propulsors. Given the wide ranges and variation in types of existing ducted propulsors and given the intention not to focus on one restricted class of propulsors, the objective of this study was to keep the prediction model quite general to cover the widest possible variation in types of shrouded propulsors. On one side is the accelerating nozzle with the classical marine propeller, on the other side of the spectrum is the watejet installation. Of the types in between, the decelerating nozzles and the pumpjets, not too much is known as yet. The developed method employs a simple model for of the drag of the internal flow. The characteristics and efficiency of the impeller have been derived from the results of systematic research on ducted propeller systems. The developed method does not only serve the prediction of the propulsive power, it can be used also in the design of such shrouded propulsors.

Author
Marine Propulsion; Shrouded Propellers; Mathematical Models

20050169161 NASA Lewis Research Center, Cleveland, OH, USA
CFD-Based Design Optimization Tool Developed for Subsonic Inlet
[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The traditional approach to the design of engine inlets for commercial transport aircraft is a tedious process that ends with a less-than-optimum design. With the advent of high-speed computers and the availability of more accurate and reliable computational fluid dynamics (CFD) solvers, numerical optimization processes can effectively be used to design an aerodynamic inlet lip that enhances engine performance. The designers' experience at Boeing Corporation showed that for a peak Mach number on the inlet surface beyond some upper limit, the performance of the engine degrades excessively. Thus, our objective was to optimize efficiency (minimize the peak Mach number) at maximum cruise without compromising performance at other operating conditions. Using a CFD code NPARC, the NASA Lewis Research Center, in collaboration with Boeing, developed an integrated procedure at Lewis to find the optimum shape of a subsonic inlet lip and a numerical optimization code, ADS. We used a GRAPE-based three-dimensional grid generator to help automate the optimization procedure. The inlet lip shape at the crown and the keel was described as a superellipse, and the superellipse exponents and radii ratios were considered as design variables. Three operating conditions: cruise, takeoff, and rolling takeoff, were considered in this study. Three-dimensional Euler computations were carried out to obtain the flow field. At the initial design, the peak Mach numbers for maximum cruise, takeoff, and rolling takeoff conditions were 0.88, 1.772, and 1.61, respectively. The acceptable upper limits on the takeoff and rolling takeoff Mach numbers were 1.55 and 1.45. Since the initial design provided by Boeing was found to be optimum with respect to the maximum cruise condition, the sum of the peak Mach numbers at takeoff and rolling takeoff were minimized in the current study while the maximum cruise Mach number was constrained to be close to that at the existing design. With this objective, the optimum design satisfied the upper limits at takeoff and rolling takeoff while retaining the desirable cruise performance. Further studies are being conducted to include static and cross-wind operating conditions in the design optimization procedure. This work was carried out in collaboration with Dr. E.S. Reddy of NYMA, Inc.

Author

Computational Fluid Dynamics; Design Optimization; Engine Inlets; Subsonic Flow; Aerodynamic Configurations; Commercial Aircraft

20050169181 NASA Lewis Research Center, Cleveland, OH, USA

Coupled Monte Carlo Probability Density Function/ SPRAY/CFD Code Developed for Modeling Gas-Turbine Combustor Flows

[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The success of any solution methodology for studying gas-turbine combustor flows depends a great deal on how well it can model various complex, rate-controlling processes associated with turbulent transport, mixing, chemical kinetics, evaporation and spreading rates of the spray, convective and radiative heat transfer, and other phenomena. These phenomena often strongly interact with each other at disparate time and length scales. In particular, turbulence plays an important role in determining the rates of mass and heat transfer, chemical reactions, and evaporation in many practical combustion devices. Turbulence manifests its influence in a diffusion flame in several forms depending on how turbulence interacts with various flame scales. These forms range from the so-called wrinkled, or stretched, flamelets regime, to the distributed combustion regime. Conventional turbulence closure models have difficulty in treating highly nonlinear reaction rates. A solution procedure based on the joint composition probability density function (PDF) approach holds the promise of modeling various important combustion phenomena relevant to practical combustion devices such as extinction, blowoff limits, and emissions predictions because it can handle the nonlinear chemical reaction rates without any approximation. In this approach, mean and turbulence gas-phase velocity fields are determined from a standard turbulence model; the joint composition field of species and enthalpy are determined from the solution of a modeled PDF transport equation; and a Lagrangian-based dilute spray model is used for the liquid-phase representation with appropriate consideration of the exchanges of mass, momentum, and energy between the two phases. The PDF transport equation is solved by a Monte Carlo method, and existing state-of-the-art numerical representations are used to solve the mean gasphase velocity and turbulence fields together with the liquid-phase equations. The joint composition PDF approach was extended in our previous work to the study of compressible reacting flows. The application of this method to several supersonic diffusion flames associated with scramjet combustor flow fields provided favorable comparisons with the available experimental data. A further extension of this approach to spray flames, three-dimensional computations, and parallel computing was reported in a recent paper. The recently developed PDF/SPRAY/ computational fluid dynamics (CFD) module combines the novelty of the joint composition PDF approach with the ability to run on parallel architectures. This algorithm was implemented on the NASA Lewis Research Center's Cray T3D, a massively

parallel computer with an aggregate of 64 processor elements. The calculation procedure was applied to predict the flow properties of both open and confined swirl-stabilized spray flames.
Derived from text
Combustion Chambers; Computational Fluid Dynamics; Monte Carlo Method; Probability Density Functions; Mathematical Models; Gas Turbine Engines; Computer Programs

20050169188 NASA Lewis Research Center, Cleveland, OH, USA, NASA Marshall Space Flight Center, Huntsville, AL, USA, Rockwell International Corp., USA, Pennsylvania State Univ., USA
Cooperative Testing of Rocket Injectors That Use Gaseous Oxygen and Hydrogen
[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Gaseous oxygen and hydrogen propellants used in a special engine energy cycle called Full-Flow Staged Combustion are believed to significantly increase the lifetime of a rocket engine's pumps. The cycle can also reduce the operating temperatures of the engine. Improving the lifetime of the hardware reduces its overall maintenance and operations costs, and is critical to reducing costs for the joint NASA/industry Reusable Launch Vehicle (RLV). The work in this project will demonstrate the performance and lifetime of one-element and many-element combustors with gaseous O2/H2 injectors. This work supporting the RLV program is a cooperative venture of the NASA Lewis Research Center, the NASA Marshall Space Flight Center, Rocketdyne, and the Pennsylvania State University. Information about gas-gas rocket injector performance with O2/H2 is very limited. Because of this paucity of data, new testing is needed to improve the knowledge base for testing and designing new injectors for the RLV and to improve computer models that predict the combusting gas flows of new injector designs. Therefore, detailed observations and measurements of the combusting flow from many-element injectors in a rocket engine are being sought. These observations and measurements will be done with three different tools: schlieren photography, ultraviolet imaging, and Raman spectroscopy. The schlieren system will take photos of the density differences in combusting flow, the ultraviolet movies will determine the location of the hydroxyl (OH) radical in the combustion flow, and the Raman spectroscopic measurements will provide the combustion temperature and amount of water (H2O), hydrogen (H2), and oxygen (O2) in the combustor. Marshall is providing overall program management, design and computational fluid dynamics (CFD) analyses, as well as funding for the work at Penn State. An existing, windowed combustor and several injectors will be provided by Rocketdyne--two injectors for the initial screening tests and one with an optimized design based on the best design found in the screening tests. Lewis will provide a nozzle and several injectors for the screening test program. The configuration of the injectors will be based on a design chosen by all the participants, and their elements will be based on the coaxial and impinging flow. Lewis also will provide the instrumentation for the flow-field measurements: schlieren, ultraviolet imaging, and Raman spectroscopy. In addition, thermocouples will measure heat flow on the injector face. Other traditional measurements of rocket performance will be made as well: chamber pressure, mass flow of each propellant, purge flow, and the barrier cooling gas flow. Penn State will conduct single-element testing with the injector elements from both the Rocketdyne and the jointly designed injectors. A wide variety of traditional and nontraditional injector designs will be tested in this program. The results will be valuable in computational fluid dynamics code validation and overall rocket combustion efficiency measurements. Correlations between combustion efficiency, laser measurements of species, and ultraviolet and visible light photography will also be made. Thus far, several different single-element injectors have been tested at Penn State and Lewis. The experimental setup of a rocket engine with a viewing window is shown. The combusting flow is shown. The results are helping engineers design the many element injectors.
Author
Computational Fluid Dynamics; Hydrogen; Injectors; Oxygen; Reusable Launch Vehicles; Rocket Engines

20050169190 NASA Lewis Research Center, Cleveland, OH, USA, Pratt and Whitney Aircraft, USA
Coupled Aerodynamic-Thermal-Structural (CATS) Analysis
[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Coupled Aerodynamic-Thermal-Structural (CATS) Analysis is a focused effort within the Numerical Propulsion System Simulation (NPSS) program to streamline multidisciplinary analysis of aeropropulsion components and assemblies. Multidisciplinary analysis of axial-flow compressor performance has been selected for the initial focus of this project. CATS will permit more accurate compressor system analysis by enabling users to include thermal and mechanical effects as an integral part of the aerodynamic analysis of the compressor primary flowpath. Thus, critical details, such as the variation of blade tip clearances and the deformation of the flowpath geometry, can be more accurately modeled and included in the aerodynamic analyses. The benefits of this coupled analysis capability are (1) performance and stall line predictions are improved by the inclusion of tip clearances and hot geometries, (2) design alternatives can be readily analyzed, and (3) higher fidelity analysis by researchers in various disciplines is possible. The goals for this project are a 10-percent improvement in

stall margin predictions and a 2:1 speed-up in multidisciplinary analysis times. Working cooperatively with Pratt & Whitney, the Lewis CATS team defined the engineering processes and identified the software products necessary for streamlining these processes. The basic approach is to integrate the aerodynamic, thermal, and structural computational analyses by using data management and Non-Uniform Rational B-Splines (NURBS) based data mapping. Five software products have been defined for this task: (1) a primary flowpath data mapper, (2) a two-dimensional data mapper, (3) a database interface, (4) a blade structural pre- and post-processor, and (5) a computational fluid dynamics code for aerothermal analysis of the drum rotor. Thus far (1) a cooperative agreement has been established with Pratt & Whitney, (2) a Primary Flowpath Data Mapper has been prototyped and delivered to General Electric Aircraft Engines and Pratt & Whitney for evaluation, (3) a collaborative effort has been initiated with the National Institute of Standards and Testing to develop a Standard Data Access Interface, and (4) a blade tip clearance capability has been implemented into the Structural Airfoil Blade Engineering Routine (SABER) program. We plan to continue to develop the data mappers and data management tools. As progress is made, additional efforts will be made to apply these tools to propulsion system applications.
Derived from text
Thermal Analysis; Aerothermodynamics; Structural Engineering; Aircraft Engines; Computational Fluid Dynamics

20050169194 NASA Lewis Research Center, Cleveland, OH, USA
Advanced Subsonic Combustion Rig Developed
[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The Advanced Subsonic Combustion Rig (ASCR), a unique, state-of-the-art facility for conducting combustion research, is located at the NASA Lewis Research Center in Cleveland, Ohio. The ASCR, which was nearing completion at the close of 1995, will be capable of simulating the very high pressure and high temperature conditions that are expected to exist in future, advanced subsonic gas turbine (jet) engines. Future environmental regulations will require much cleaner burning (more environmentally friendly) aircraft engines. The ASCR is critical to the development of these cleaner engines. It will allow NASA and U.S. aircraft engine industry researchers to identify and test promising clean-burning gas turbine engine combustion concepts under the pressure and temperature conditions that are expected for those future engines. Combustion processes will be investigated for a variety of next-generation aircraft engine sizes, including engines for large, long-range aircraft (with typical trip lengths of about 3000 mi) and for regional aircraft (with typical trip lengths of about 400 mi). The ASCR design was conceived and initiated in 1993, and fabrication and construction of the rig, including the buildup of an advanced control room, took place throughout 1994 and 1995. In early 1996, the ASCR will be operational for obtaining research data. The ASCR is an intricate part of the NASA Advanced Subsonic Technology Propulsion Program, which is aimed at developing technologies critical to the next generation of gas turbine engines. This effort is in collaboration with the U.S. aircraft gas turbine engine industry. A goal of the Advanced Subsonic Technology Propulsion Program is to develop combustion concepts and technologies that will result in gas turbine engines that produce 50 percent less nitrous oxide (NO_x) pollutants than current engines do. This facility is unique in its capability to simulate advanced subsonic engine pressure, temperature, and air flow rate conditions. Specifically, it will provide operating temperatures up to 3000 F and pressures up to 60 atm. Under these conditions, researchers will obtain detailed combustion temperatures, pressures, and flow velocities as well as the chemical compositions of the combustion exhaust. Researchers also will be able to obtain data by using nonintrusive laser diagnostic techniques. The ASCR facility will be used to test fundamental combustion configurations (flametubes) for detailed study of combustion processes, to test sectors of gas turbine combustors to study the process in configurations more like those of aircraft engines, and in some cases to test full annular combustors.
Author
Combustion Physics; Subsonic Flow; Gas Turbine Engines; Test Facilities

20050169214 Old Dominion Univ., Norfolk, VA, USA
Studies in Forced and Time Varying Turbulent Flows
Grosch, Chester E.; [2005]; 6 pp.; In English
Contract(s)/Grant(s): NNL04AA34G; No Copyright; Avail: CASI; A02, Hardcopy

The reasearch focused on two areas; (a) the dynamics of forced turbulent flows and (b) time filtered Large Eddy Simulations (TLES). The dynamics of turbulent flows arising from external forcing of the turbulence are poorly understood. In particular, here are many unanswered questions relating the basic dynamical balances and the existence or nonexistence of statistical equilibrium of forced turbulent flows. This research used rapid distortion theory and direct numerical simulations to explore these questions. The properties of the temporally filtered Navier-Stokes equations were also studied.
Author
Turbulent Flow; Large Eddy Simulation; Equilibrium Flow

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INSTRUMENTATION AND PHOTOGRAPHY

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

20050165720 Sensors Unltd., Inc., Princeton, NJ, USA

Successful Detector Design is a Game of Give and Take

Lange, Michael J.; Photonics Spectra; April 2005; ISSN 0731-1230; Volume 39, No. 4, pp. 70-75; In English; Copyright; Avail: Other Sources

InGaAs short-wave infrared imaging is growing rapidly. In military circles, it is emerging as a complement to thermal imaging for covert surveillance, fire control and training, and as the ideal solution for eye-safe laser imaging. In commercial applications, it is enabling machine vision systems and medical devices to see what other imagers cannot. Sales of InGaAs short-wave IR detectors and imagers are rising much faster than the 8 to 10 percent growth rate for imaging as a whole, with the increases splitting about evenly between commercial machine vision and military surveillance. The reasons are simple. Imagers using this technology can see objects and events that visible and thermal cameras cannot. They can monitor fill levels in opaque drug vials, enemy troop movements at dawn and dusk, the back side of computer chips during fabrication, invisible bruises on produce and tissue health in vitro.

Author

Indium Gallium Arsenides; Infrared Detectors; Imaging Techniques; Infrared Imagery

20050166864 Institute of Space Medico-Engineering, Beijing, China

An Experimental Study of the Effect of Structure Sealing of Infrared CO2 Sensor on Its Accuracy

Huang, Gang; Deng, Yi-Bing; Xu, Bo; Wang, Wei-Rong; Xia, Lin-Gen; Chao, Zhao-Gang; Wang, Xiao-Xia; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 52-54; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

The objective of this research was to study the effect of structure sealing of Infrared CO2 sensor on its accuracy. Two experiments were designed. The IR CO2 sensor based on infrared principle and no comparing lighting path with only one beam of light were calibrated in one experiment, and in the other experiment the sensors were placed in an environment simulating the practical condition. The temperature, pressure and standard gas were kept same in the two experiments while CO2 concentrations in the dead volume were varied. Readings from the sensors varied with the variation of the CO2 concentration in the dead volume of the sensors. The structure sealing of the IR CO2 sensor has great influence on its accuracy. A sealed dead volume in the IR CO2 sensor can decrease or eliminate the effect.

Author

Infrared Detectors; Sealing; Accuracy; Instrument Errors; Carbon Dioxide Concentration

20050166905 NASA Johnson Space Center, Houston, TX, USA

New Sensor Technology

Covault, Craig; Aviation Week and Space Technology; May 02, 2005; ISSN 0005-2175; Volume 162, No. 18, pp. 46; In English; Copyright; Avail: Other Sources

The three instruments on the Orbiter Boom Sensor System (OBSS) will use a mix of U.S. and Canadian developed laser, television, infrared, and 3D imaging technologies. The sensors are the: 1) Laser Dynamic Range Imager (LDRI); 2) Intensified Television Camera (ITVC); 3) Laser Camera System (LCS).

Author

Robot Arms; Space Shuttles; Range Finders; Television Cameras; Infrared Imagery

20050166999 NASA Ames Research Center, Moffett Field, CA, USA

CheMin: A Definitive Mineralogy Instrument in the Analytical Laboratory of the Mars Science Laboratory (MSL '09)

Blake, D. F.; Sarrazin, P.; Bish, D. L.; Chiprera, S. J.; Vaniman, D. T.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An important goal of the Mars Science Laboratory (MSL 09) mission is the determination of definitive mineralogy and chemical composition. CheMin is a miniature X-ray diffraction/X-ray fluorescence (XRD/XRF) instrument that has been chosen for the analytical laboratory of MSL. CheMin utilizes a miniature microfocus source cobalt X-ray tube, a transmission

sample cell and an energy-discriminating X-ray sensitive CCD to produce simultaneous 2-D X-ray diffraction patterns and X-ray fluorescence spectra from powdered or crushed samples. A diagrammatic view of the instrument is shown.
Derived from text
Mineralogy; Chemical Composition; Mars Surface; X Ray Fluorescence; X Ray Tubes

20050167075 Laurin Publishing Co., Inc., Pittsfield, MA, USA
New South Pole Telescope Seeks Neutrinos in Ice
Fischer, Anne L., Editor; Photonics Spectra; April 2005; ISSN 0731-1230; Volume 39, Issue 4, pp. 49-50; In English; Copyright; Avail: Other Sources

A telescope under construction at the South Pole will be employed to study the high-energy subatomic particles known as neutrinos. IceCube, as the telescope is called, will consist of up to 4800 basketball-size instruments spread throughout 1 cu km of Antarctic ice, buried 1400 to 2400 m below the surface. According to Spencer Klein of the Institute for Nuclear and Particle Astrophysics at Lawrence Berkeley National Laboratory in California, a member of the team that designed the digital optical modules used in IceCube, the modules pick out the rare light signal produced by a neutrino colliding with an atom in a water molecule. By collecting data on the intensity and arrival time of the light at multiple modules, the researchers can determine the type, direction and energy of the neutrino that created it. This helps separate a muon generated by a cosmic neutrino from the millions more muons generated by cosmic rays passing through the atmosphere. IceCube will study neutrinos with energies ranging from 200 billion to 1 quadrillion more electron volts.
Author
Particle Telescopes; Neutrinos

20050167200 Manchester Univ., UK
Characteristics and Applications of RELAX, an Ultrasensitive, Resonance Ionization Mass Spectrometer for Xenon
Crowther, S. A.; Mohapatra, R. K.; Turner, G.; Blagburn, D. J.; Gilmour, J. D.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

RELAX - Refrigeration Enhanced Laser Analyser for Xenon - combines a number of features to achieve the most sensitive instrument for determination of xenon isotope ratios currently available. It consists of a resonant ionization ion source, a cryogenic sample concentrator and a time of flight mass analyser. The resonant ionization ion source uses a pulsed, ultraviolet laser to excite then ionize xenon atoms. It adopts the excitation / ionization scheme of Chen et al. The laser is tuned to exactly half the energy required for the transition between the (sup 1)S ground state and the (sup 2)P(sub 3/2) = 6(sub p)[1/2](sub 0)(j(sub 1)l coupling) excited state of xenon, 249.6 nm. Two photons at 249.6 nm are used for excitation, followed by a third photon of the same wavelength for ionization. Using a resonant ionization scheme means that xenon is the only atomic species to be ionized. Within the volume of gas illuminated by the laser beam this ionization process is very efficient.
Derived from text
Xenon Isotopes; Mass Spectrometers; Ground State; Concentrators

20050167250 Florida Univ., Gainesville, FL USA
Ground-Tracking for On And Off-Road Detection of Landmines With Ground Penetrating Radar
Lee, Wen-Hsiung; Gader, Paul D.; Wilson, Joseph N.; Weaver, Richard; Bishop, Steven; Gugino, Peter; Howard, Peter; Dec. 2004; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAB15-01-3-0004; DAAB07-98-D-H752
Report No.(s): AD-A431641; No Copyright; Avail: Defense Technical Information Center (DTIC)

Ground penetrating radar is a high-resolution electromagnetic technology that has demonstrated excellent potential for high probability of detection while keeping false alarm rate low for landmine detection in on-road tests. Off-road situations require more advanced methods for dealing with the most significant reflection in GPR data, the ground bounce. Performance enhancements achieved via ground-tracking are demonstrated in terms of receiver operating characteristic curves.
DTIC
Ground Penetrating Radar; Mine Detectors; Mines (Ordnance); Roads

20050167254 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Pre-Screening for Explosives Residues in Soil Prior to HPLC Analysis Utilizing Expray
Bjella, Kevin L.; Feb. 2005; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431646; ERDC/CRREL-TN-05-2; No Copyright; Avail: Defense Technical Information Center (DTIC)

The characterization of Department of Defense (DoD) training lands for explosives residues involves sampling and analyzing soil samples collected at firing points and impact areas. Laboratory instruments used for this analysis are susceptible to accumulating high concentrations of these compounds, thus possibly requiring reanalyzing. By using the Expray Explosives Detection Kit to determine the approximate concentration of explosives compounds prior to analysis, soil extracts can be diluted to a concentration that will not interfere with analysis results. This report describes the method used to develop the visual index for concentration determination of explosives in soil extracts, and also the use of the Expray Kit.
DTIC
Explosives; Explosives Detection; Kits; Liquid Chromatography; Residues; Soils

20050167258 Army Communications-Electronics Command, Fort Belvoir, VA USA
Landmine Detection by Nuclear Quadrupole Resonance (NQR)
Deas, Robert M.; Cervantes, Constantino; Schaedel, Stephen F.; Dec. 2004; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431654; No Copyright; Avail: Defense Technical Information Center (DTIC)
Landmines continue to threaten U.S. and allied forces. Conventional mine detection sensors. such as ground penetrating radar (GPR), can give many false alarms due to natural and manmade objects in the ground having mine-like characteristics to these sensors. This can result in a slow advance rate as the forces must deal with these false alarms. Nuclear quadrupole resonance (NQR) technology is being developed by the U.S. Army for application to landmine detection as a confirmation sensor to verify the presence of landmines and eliminate false alarms from GPR. NQR technology has the capability to detect and discriminate explosives from of other items in the environment and it can discriminate among the different types of explosives found in landmines.
DTIC
Mines (Ordnance); Nuclear Quadrupole Resonance

20050167344 Air Force Research Lab., Hanscom AFB, MA USA
An Algorithm for De-Shadowing Spectral Imagery
Adler-Golden, Steven; Matthew, Michael W.; Anderson, Gail P.; Felde, Gerald W.; Gardner, James A.; Jul. 2002; 10 pp.; In English
Contract(s)/Grant(s): Proj-1010
Report No.(s): AD-A431924; AFRL-VS-HA-TR-2005-1004; No Copyright; Avail: CASI; A02, Hardcopy
A new matched filter-based algorithm has been developed for detecting and approximately correcting for shadows or other illumination variations in spectral imagery. Initial evaluations have been conducted with a handful of data cubes, including AVIRIS data. The de-shadowed images have a generally realistic appearance and reveal a wealth of previously hidden surface details.
DTIC
Algorithms; Detection; Image Processing; Imagery; Matched Filters; Remote Sensing; Shadows; Spectra

20050167374 Maryland Univ., Baltimore, MD USA
Local Area Defense (LAD) Demonstration
Mackenzie, Colin F.; Sep. 2004; 534 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0519
Report No.(s): AD-A431977; No Copyright; Avail: Defense Technical Information Center (DTIC)
This pilot program is funded by the Army Medical Department (AMEDD) to demonstrate a real-time detection and rapid response system for local area defense using the University of Maryland Baltimore (UMB) Campus as a testbed. Additional goals includes the identification of Rapid Response teams performance and the coordination of the Campus and Baltimore City Emergency Management Plans and Responses in the event of a environmental sensor trigger. Transmission of images from UMB campus video surveillance cameras and from a mobile wireless platform to North Atlantic Treaty Organization (NATO) Headquarters and University of Regensberg Germany was also achieved. Emergency Operation Center Remote expert review and evaluation of telecommunications were carried out. This demonstration can serve as a model system to test performance of integrated environmental sensors to support Homeland Security threat detection, for protection of a terrorist target that crossed local, City, State and Federal jurisdiction in an urban testbed setting of a major U.S, city.
DTIC
Cameras; Detection; Remote Control; Surveillance; Terrorism

20050167728 Clark-Atlanta Univ., GA USA

Node Selection for Unattended Ground Sensor Networks While Interrogating Multiple Targets

Le, Qiang; Kaplan, Lance M.; McClellan, James H.; Dec. 2004; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-2-008

Report No.(s): AD-A431618; No Copyright; Avail: Defense Technical Information Center (DTIC)

This work investigates the performance of a multiple target tracker that exploits bearings-only measurements from a network of unattended ground sensors (UGS). To conserve energy while interrogating multiple maneuvering targets, the tracker integrates node resource management with the multiple-mode probabilistic data association (PDA) or joint probabilistic data association(JPDA) filter. Experiments show that for sufficiently separated targets, the global node selection leads to better geolocation performance than the closest selection approach when the number of active nodes is set to two per snapshot. A track purity metric is also calculated to quantify the quality of the measurementto-track association performance of the tracking filter.

DTIC

Targets; Maneuvers; Tracking Filters

20050167859 NASA Langley Research Center, Hampton, VA, USA

Methods of Improving a Digital Image Having White Zones

Wodell, Glenn A., Inventor; Jobson, Daniel J., Inventor; Rahman, Zia-Ur, Inventor; January 11, 2005; 12 pp.; In English

Patent Info.: Filed 25 Jun. 2001; US-Patent-6,842,543; US-Patent-Appl-SN-888816; NASA-Case-LAR-16332-1-CU; No Copyright; Avail: CASI; A03, Hardcopy

The present invention is a method of processing a digital image that is initially represented by digital data indexed to represent positions on a display. The digital data is indicative of an intensity value I,(x,y) for each position (x,y) in each i-th spectral band. The intensity value for each position in each i-th spectral band is adjusted to generate an adjusted intensity value for each position in each i-th spectral band in accordance with SIGMA (sup N)(sub n=1)W(sub n)(log I(sub i)(x,y)-log[I(sub i)(x,y)*F(sub n)(x,y)]), i = 1,...,S where W(sub n) is a weighting factor, "*' is the convolution operator and S is the total number of unique spectral bands. For each n, the function F(sub n)(x,y) is a unique surround function applied to each position (x,y) and N is the total number of unique surround functions. Each unique surround function is scaled to improve some aspect of the digital image, e.g., dynamic range compression, color constancy, and lightness rendition. The adjusted intensity value for each position in each i-th spectral band of the image is then filtered with a filter function to generate a filtered intensity value R(sub i)(x,y). To Prevent graying of white zones in the image, the maximum of the original intensity value I(sub i)(x,y) and filtered intensity value R(sub i)(x,y) is selected for display.

Official Gazette of the U.S. Patent and Trademark Office

Digital Data; Image Processing

20050167902 Physics and Electronics Lab. TNO, The Hague, Netherlands

Air Defence Seeker Model

Ruizenaar, M. G. A.; vanderLans, M. J.; February 2005; 38 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): TNO Proj. 015.33077

Report No.(s): TNO-DV1 2004 A170; TD-2004-0198; Copyright; Avail: Other Sources

This report presents the results of the second step in a two-phase effort towards the modelling of a semi-active continuous wave seeker with a so-called 'inverse receiver' in a multi-target environment. The research is motivated by the need to get a better understanding of the multi-target performance of the NATO Seasparrow missile and its successor, the evolved Seasparrow missile.

Author

Air Defense; Homing Devices; Missiles; Continuous Wave Radar

20050169215 NASA Dryden Flight Research Center, Edwards, CA, USA

Optical Air Flow Measurements in Flight

Bogue, Rodney K.; Jentink, Henk W.; December 28, 2004; 101 pp.; In English

Contract(s)/Grant(s): WU 728-92-02-M1-E8

Report No.(s): NASA/TP-2004-210735; H-2506; No Copyright; Avail: CASI; A06, Hardcopy

This document has been written to assist the flight-test engineer and researcher in using optical flow measurements in

flight applications. The emphasis is on describing tradeoffs in system design to provide desired measurement performance as currently understood. Optical system components are discussed with examples that illustrate the issues. The document concludes with descriptions of optical measurement systems designed for a variety of applications including aeronautics research, airspeed measurement, and turbulence hazard detection. Theoretical discussion is minimized, but numerous references are provided to supply ample opportunity for the reader to understand the theoretical underpinning of optical concepts.
Author
Flow Measurement; Air Flow; Optical Measuring Instruments; Optical Measurement; Velocity Measurement; Flow Velocity

20050169419 Canadian Space Agency, Saint Hubert, Quebec, Canada
Radarsat, Status and Development
McNally J.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1249-; In English; See also 20050169243; Copyright; Avail: Other Sources

The operational status of Radarsat I will be presented, including some of the latest images obtained around the world. The operation of Radarsat I has produced excellent images and data which has been used to manage oil spills, floods, forestry and many other applications. Many countries are using Radarsat data to manage their resources because it is more reliable in time-critical applications since it is not affected by cloud cover. Plans are well advanced to continue remote sensing using radar satellites and preparations to form a commercial entity using Canadian government support is well underway. Radarsat II will be required to replace Radarsat I early in the next century. The approach to this planning will be discussed.
Author
Radarsat; Image Analysis; Remote Sensing

36
LASERS AND MASERS

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also *76 Solid-State Physics*.

20050166899 Laurin Publishing Co., Inc., Pittsfield, MA, USA
Quantum Cascade Raman Laser May Offer Mid-IR Tunability
Hitz, Breck; Photonics Spectra; April 2005; ISSN 0731-1230; Volume 39, No. 4, pp. 24-28; In English; Copyright; Avail: Other Sources

By integrating a Raman laser into the same band-structure-engineered crystal as a quantum cascade laser, a collaboration of researchers in the US has realized a promising approach to a compact, wavelength-tunable, mid-IR laser. Lasers in the mid-IR - nominally the 3- to 30-micron spectral region - are crucial to applications from molecular spectroscopy and medical diagnostics to military countermeasures.
Author
Quantum Cascade Lasers; Infrared Lasers; Raman Lasers; Tunable Lasers

20050167229 Army Research Lab., Aberdeen Proving Ground, MD USA
Real-Time, Laser-Based Sensors for Military and Civilian Applications
Sausa, Rosario C.; Cabalo, Jerry; Dec. 2004; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431577; No Copyright; Avail: Defense Technical Information Center (DTIC)

We report on a novel laser-based technique coined surface laser photofragmentation-fragment detection (SPF-FD) spectroscopy for detecting explosives residues, chemical warfare agents, and other hazardous materials on surfaces in real time at ambient conditions. Our technique utilizes one or two laser to both photolyze the target species and to facilitate the detection of the characteristic photofragments by resonance-enhanced multiphoton ionization, laser induced fluorescence, or both. We demonstrate its analytical utility on explosives RDX, HMX, CL20, and TNT, and report the effects of laser photofragmentation wavelength and energy, delay between photofragmentation and probe lasers, and electrode orientation on signal intensity. Signal to noise analyses yield limits of detection in the range of 1 to 15 ng/cm2 (S/N=3) at 1 atm and 298K.
DTIC
Chemical Warfare; Hazardous Materials; Lasers; Military Technology; Optical Measuring Instruments; Real Time Operation

20050167364 Army Research Office, Research Triangle Park, NC USA

The Use of Laser-Induced Breakdown Spectroscopy to Discriminate Between Landmines and Other Objects

Harmon, Russell S.; De Lucia, Frank C.; Miziolek, Andrzej W.; LaPointe, Aaron; Winkel, Raymond J., Jr.; Walters, Roy A.; Dec. 2004; 3 pp.; In English; Original contains color illustrations

Report No.(s): AD-A431962; No Copyright; Avail: Defense Technical Information Center (DTIC)

Laser Induced Breakdown Spectroscopy (LIBS) is an emerging, minimally-destructive sensor technology for in-situ, real-time chemical species identification and analysis. The Army Research Laboratory has been engaged in LIBS analysis for over a decade and recently has been investigating the potential to apply broadband LIBS analysis to specific military problems, one of which is as a handheld, confirmatory sensor for land mine detection.

DTIC

Detection; Laser-Induced Breakdown Spectroscopy; Mines (Ordnance)

20050167413 New Mexico Inst. of Mining and Technology, Socorro, NM USA

Teramobile Laser and Lightning

Winn, William; Feb. 2005; 32 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9451-04-C-0392; Proj-3151

Report No.(s): AD-A432059; AFRL-DE-PS-TR-2005-1022; No Copyright; Avail: Defense Technical Information Center (DTIC)

An ultrashort, terawatt laser was used to trigger lightning by creating ionized path in atmosphere. Joint French-German Teramobile was brought to the Langmuir Laboratory for Atmospheric Research for the experiment. Arrays of instruments were used to assess lightning initiation, or ionized path to perturb the local electric field. No lightning discharges were observed triggered by the laser, but good understanding of physics and future laser needs were determined.

DTIC

Lasers; Lightning

20050167697 Physics and Electronics Lab. TNO, The Hague, Netherlands

Multifunction Lasers

Benoist, K. W.; vanPutten, F. J. M.; Boetz, H. E. R.; February 2005; 50 pp.; In English

Contract(s)/Grant(s): A01/KL/622; TNO Proj. 015.31145

Report No.(s): TD-2004-0187; TNO-DV1-2004-A183; Copyright; Avail: Other Sources

In the project Multifunction lasers the use of 1.54 micron laser technology for systems that have more than one military application, i.e. a multi-function laser system, was studied and demonstrated. This technology has the following advantages: eye-safety, covertness due to continuous wave instead of laser pulse and low cost due to the use of telecom technology. The military applications that were investigated are target ID using laser vibrometry, secure communications and laser range finding using AM-FMCW. Besides, it was investigated whether the pulsed laser system of the Leica Vector 1500 rangefinder binoculars, currently in use by the Dutch army, could be used for secure laser voice communication. This could offer an alternative way of communication for instance in cases of radio silence.

Author

Laser Applications; Military Technology; Optical Communication

20050167901 NASA Ames Research Center, Moffett Field, CA, USA

Ultrafast Laser Beam Switching and Pulse Train Generation by Using Coupled Vertical-Cavity, Surface-Emitting Lasers (VCSELS)

Goorjian, Peter M., Inventor; Ning, Cun-Zheng, Inventor; March 08, 2005; 8 pp.; In English

Patent Info.: Filed 10 Jun. 2002; US-Patent-6,865,208; US-Patent-Appl-SN-171554; NASA-Case-ARC-14682-1; No Copyright; Avail: CASI; A02, Hardcopy

Ultrafast directional beam switching is achieved using coupled VCSELs. This approach is demonstrated to achieve beam switching frequencies of 40 GHz and more and switching directions of about eight degrees. This switching scheme is likely to be useful for ultrafast optical networks at frequencies much higher than achievable with other approaches.

Official Gazette of the U.S. Patent and Trademark Office

Cavities; Surface Emitting Lasers; Beam Switching

20050168275 Israel Atomic Energy Commission, Beersheba, Israel

Operation Of Two Copper Vapor Lasers By A Single Magnetic Modulator

Druckmann, Ilan; Smilanski, Israel; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 657-662; In English; See also 20050168165; Copyright; Avail: Other Sources

Copper vapor lasers are often operated in oscillator-amplifier configuration. Proper synchronization is a critical issue for such systems, and different solutions have appeared in literature, in general of high complexity and costly. We propose here another solution: operating two lasers by a single modulator. At a certain stage, the circuit is split into two branches by means of coupled inductors. The proposed circuit allows distribution of energy between the two branches according to a pre-defined ratio, and conservation of this ratio even if nonlinearities appear in the branches. We present the theoretical analysis of the circuit and a complete design procedure. An experimental circuit is also described

Author

Copper; Metal Vapor Lasers; Modulators; Magnetic Compression

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*.

20050165783 National Inst. of Information and Communications Technology, Japan

Development of Molecular-Beam Apparatus with Spray-jet Technique

Yamada, Toshiki; Suzuki, Hitoshi; Shinohara, Hidenori; Mashiko, Shinro; Review of the National Institute of Information and Communications Technology, Volume 50, Nos. 3/4; September/December 2004, pp. 95-101; In Japanese; See also 20050165771; Copyright; Avail: Other Sources

We developed a molecular-beam apparatus with a spray-jet technique that produces a molecular beam of non-volatile molecules from a sprayed mist of sample solution. In the present paper, the schematic of this apparatus and its characteristics as well as some experimental results obtained with this apparatus are described. We also report recent development of a molecular-beam deposition apparatus to apply the spray-jet technique to molecular-beam deposition.

Author

Molecular Beams; Molecules; Sprayers

20050166406 Department of Energy, Washington, DC, USA

Advanced Petroleum-Based Fuels-Diesel Emissions Control Project (APBF-DEC) Lubricants Project

Jul. 2004; 16 pp.; In English

Report No.(s): DE2004-15008788; No Copyright; Avail: Department of Energy Information Bridge

The Advanced Petroleum-Based Fuels-Diesel Emissions Control (APBF-DEC) project is a government/industry collaborative project to identify the optimal combinations of low-sulfur diesel fuels, lubricants, diesel engines, and emission control systems to meet projected emission standards for the 2004 to 2010 time period. Properties of fuels and vehicle systems could lead to even lower emissions beyond 2010. APBF-DEC consists of five projects that use a systems approach to enhance the collective knowledge base about engines, diesel fuels, lubricants, and emission control technologies.

NTIS

Diesel Fuels; Exhaust Emission; Lubricants; Air Pollution

20050166428 Georgia Inst. of Tech., Atlanta, GA, USA

Piezohydraulic Pump Development

Lynch, Christopher S.; [2005]; 25 pp.; In English

Contract(s)/Grant(s): NAG1-02015; No Copyright; Avail: CASI; A03, Hardcopy

Reciprocating piston piezohydraulic pumps were developed originally under the Smart Wing Phase II program (Lynch) and later under the CHAP program (CSA, Kinetic Ceramics). These pumps focused on 10 cm scale stack actuators operating below resonance and, more recently, at resonance. A survey of commercially available linear actuators indicates that obtaining power density and specific power greater than electromagnetic linear actuators requires driving the stacks at frequencies greater than 1 KHz at high fields. In the case of 10 cm scale actuators the power supply signal conditioning becomes large and heavy and the soft PZT stack actuators generate a lot of heat due to internal losses. Reciprocation frequencies can be

increased and material losses significantly decreased through use of millimeter scale single crystal stack actuators. We are presently targeting the design of pumps that utilize stacks at the 1-10 mm length scale and run at reciprocating frequencies of 20kHz or greater. This offers significant advantages over current approaches including eliminating audible noise and significantly increasing the power density and specific power of the system (including electronics). The pump currently under development will comprise an LC resonant drive of a resonant crystal and head mass operating against a resonant fluid column. Each of these resonant systems are high Q and together should produce a single high Q second order system.
Author
Piezoelectric Actuators; Pumps; Resonance; Stacks

20050167078 Toledo Univ., OH, USA
Development of Particulates and Aerosols Research
DeWitt, Kenneth; Rivera, Monica; May 2005; 2 pp.; In English
Contract(s)/Grant(s): NCC3-1055; No Copyright; Avail: CASI; A01, Hardcopy

During the past year several accomplishments were made for both the Particulate Matter Characterization and Measurement System, (PMCMS) and PAGEMS projects. The PAGEMS focus is to measure particulate emissions as a function of combustor parameters such as inlet temperature, inlet pressure and fuel air ratio. These measurements are used to evaluate combustor performance in hopes of correlating particulate emissions with engine conditions. These measurements have taken place at in-house NASA combustor facilities and off-site facilities. Ths work is unique because particulate measurements at high- pressure conditions are not commonly made. Some calibration of the PAGEMS instrumentation was done as well as minor modifications to the PAGEMS plumbing setup. These led to measurement improvements. The instrumentation and measurement process for PAGEMS was assessed and new instruments such as a thermodenuder, thermal mass flow meters and a cyclone separator were purchased to improve the PAGEMS instrumentation and measurement process. A worksheet was created to simulate varying inlet conditions to the DMA. This worksheet allows the user to assess the error in the measurements when certain conditions exist. Two technical papers were written with the PAGEMS team for the EXCAVATE field project. A paper was also reviewed for an in house publication. Also data was processed and analyzed for another field project (PAX) and will be part of a third PAGEMS paper. Accomplishments were also made with the PMCMS project. The calibration of the radial differential mobility analyzer, (RDMA) in the particle sizing system in the PMCMS was completed and provided satisfactory results. The voltages used for the RDMA depending on the particle of interest were corrected. The measurement capability of the PMCMS was increased by replacing the MetOne CPC with a TSI CPC. Lastly, assistance was provided to three college summer students with calibration of their particulate equipment and Monica Rivera shared her understanding of the aerosol technology with them. She also provided input for their end of the summer presentations. And attended the Aviation and Particle Emissions workshop. This workshop brought together experts in the aircraft particulate emissions field. As a result Ms. Rivera made two significant contacts with academia (UMR) and government (WPAFB) which could lead to future collaboration. She also attended the Aerosol and Particle Measurement Class held at the University of Minnesota. This class refreshed her particulate knowledge and introduced her to new aerosol applications and technology. Furthermore at the class contacts were made with private industry (TSI) and government (WPAFB). Ms. Rivera also enhanced her education by taking an in-house class on aircraft design and operation.
Author
Aerosols; Particulates; Research and Development

20050167768 California Inst. of Tech., Pasadena, CA, USA
Next-Generation Robotic Planetary Surface/Subsurface Reconnaissance Missions: A Paradigm Shift
Fink, W.; Dohm, J.; Tarbell, M.; Hare, T.; Baker, V.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A fundamentally new scientific mission concept for remote planetary surface and subsurface reconnaissance will soon replace the engineering and safety constrained mission designs of the past, allowing for optimal acquisition of geologic, paleohydrologic, paleoclimatic, and possible astrobiologic information of Mars and other extraterrestrial targets. Traditional missions have performed local, ground-level reconnaissance through immobile landers and rovers, or global mapping performed by an orbiter. The former is safety and engineering constrained, affording limited detailed reconnaissance of a single site at the expense of a regional understanding, while the latter returns immense datasets, often overlooking detailed information of local and regional significance. A 'tier-scalable' paradigm integrates multi-tier-(orbit-atmosphere-ground) and multi-agent (orbiter-blimps-rovers) hierarchical mission architectures, not only introducing mission redundancy and safety, but enabling and optimizing intelligent, unconstrained, and distributed science driven exploration of prime locations on Mars and

elsewhere, allowing for increased science return, and paving the way towards fully autonomous robotic missions.
Derived from text
Autonomy; Position (Location); Reconnaissance; Robotics; Roving Vehicles; Planetary Surfaces

20050167845 Maritime Research Inst. Netherlands, Wageningen, Netherlands
The Design of Three Pumpjets
Holtrop, J.; March 2005; 45 pp.; In English
Contract(s)/Grant(s): A02/KM/135; MARIN Proj. 17772
Report No.(s): TD-2005-0206; TNO-177724SP; Copyright; Avail: Other Sources

This report presents the design of a series of three pumpjets according to the method developed earlier within the scope of this project. The three pumpjets have been developed for a typical naval application with the objective to attain more favorable signature properties in the end. This is to be achieved by making the generated noise less dependent of the variation in operational circumstances in comparison with open propellers. The three pumpjets designed are a small, medium and a large unit. The efficiency will vary as a function of the size. For experimental research the pump jets have been manufactured on model scale, keeping the diameter of the impeller constant at 240 mm. In this manner, the components of the pumpjets become interchangeable and in this way a test matrix of impeller/stator and strongly decelerating nozzle combinations emerges.
Author
Pumps; Impellers; Hydraulic Jets; Marine Propulsion

20050167856 NASA Glenn Research Center, Cleveland, OH, USA
Mechanically Resilient Polymeric Films Doped with a Lithium Compound
Meador, Mary Ann B., Inventor; Kinder, James D., Inventor; February 15, 2005; 8 pp.; In English
Patent Info.: Filed 16 Jun. 2004; US-Patent-6,855,433; US-Patent-Appl-SN-874008; US-Patent-Appl-SN-147477; NASA-Case-LEW-17299-2; No Copyright; Avail: CASI; A02, Hardcopy

This invention is a series of mechanically resilient polymeric films, comprising rod-coil block polyimide copolymers, which are doped with a lithium compound providing lithium ion conductivity, that are easy to fabricate into mechanically resilient films with acceptable ionic or protonic conductivity at a variety of temperatures. The copolymers consists of short-rigid polyimide rod segments alternating with polyether coil segments. The rods and coil segments can be linear, branched or mixtures of linear and branched segments. The highly incompatible rods and coil segments phase separate, providing nanoscale channels for ion conduction. The polyimide segments provide dimensional and mechanical stability and can be functionalized in a number of ways to provide specialized functions for a given application. These rod-coil black polyimide copolymers are particularly useful in the preparation of ion conductive membranes for use in the manufacture of fuel cells and lithium based polymer batteries.
Official Gazette of the U.S. Patent and Trademark Office
Doped Crystals; Lithium Compounds; Polymeric Films; Fabrication

20050167857 NASA Glenn Research Center, Cleveland, OH, USA
Mouse Cleaning Apparatus and Method
Williams, Glenn L., Inventor; February 08, 2005; 11 pp.; In English
Patent Info.: Filed 3 Oct. 2002; US-Patent-6,852,170; US-Patent Appl-SN-264189; NASA-Case-LEW-17236-1; No Copyright; Avail: CASI; A03, Hardcopy

The method of using the mouse pad cleaning apparatus is disclosed and claimed. The method comprises the steps of uncovering the mouse cleaning surface, applying the mouse and ball of the mouse to the cleaning surface, moving the mouse in a rotational pattern on the mouse cleaning surface, removing the mouse form the mouse cleaning surface, washing the cleaning surface, and covering the mouse cleaning surface. A mouse pad cleaning apparatus comprising a plurality of substrates, each said substrate having adhesive thereon, said plurality of substrates residing in and affixed to a receptacle. A single substrate having adhesive, which may be washable or non-washable, thereon may be employed. The washable adhesive may be an organopolysiloxane or gelatinous elastomer.
Official Gazette of the U.S. Patent and Trademark Office
Equipment; Cleaning

20050167886 NASA Ames Research Center, Moffett Field, CA, USA
Wide Operational Range Thermal Sensor
Goebel, John H., Inventor; McMurray, Robert E., Jr., Inventor; January 04, 2005; 8 pp.; In English

Patent Info.: Filed 25 Apr. 2002; US-Patent-6,838,669; US-Patent-Appl-SN-135014; NASA-Case-ARC-14577-1; No Copyright; Avail: CASI; A02, Hardcopy

Bolometer system and method for detecting, at BLIP levels, presence of radiation over a broad range of wavelengths in an infrared spectrum and in a temperature range from 20 K to as high as room temperature. The radiation is received by a Si crystal having a region that is doped with one or more of In, Ga, S, Se, Te, B, Al, P, As and Sb in a concentration ratio in a range such as 5 x 10(exp -11) to 5 x 10(exp -6). Change in electrical resistance delta R due to receipt of the radiation is measured through a change in voltage difference or current within the crystal, and the quantity delta R is converted to an estimate of the amount of radiation received. Optionally, incident radiation having an energy high enough to promote photoconductivity is removed before detection.

Official Gazette of the U.S. Patent and Trademark Office

Bolometers; Temperature Sensors

20050167897 NASA Langley Research Center, Hampton, VA, USA

Membrane Tension Control

Su, Ji, Inventor; Harrison, Joycelyn S., Inventor; March 15, 2005; 8 pp.; In English

Patent Info.: Filed 22 Oct. 1999; US-Patent-6,867,533; US-Patent-Appl-SN-696527; US-Patent-Appl-SN-161113; NASA-Case-LAR-16220-1; No Copyright; Avail: CASI; A02, Hardcopy

An electrostrictive polymer actuator comprises an electrostrictive polymer with a tailorable Poisson's ratio. The electrostrictive polymer is electroded on its upper and lower surfaces and bonded to an upper material layer. The assembly is rolled tightly and capped at its ends. In a membrane structure having a membrane, a supporting frame and a plurality of threads connecting the membrane to the frame, an actuator can be integrated into one or more of the plurality of threads. The electrostrictive polymer actuator displaces along its longitudinal axis, thereby affecting movement of the membrane surface.

Official Gazette of the U.S. Patent and Trademark Office

Membrane Structures; Tension; Actuators; Electrostriction

20050168242 Pulse Sciences, Inc., San Leandro, CA, USA

Design criteria for the Z vacuum insulator stack

Smith, I. D.; Corcoran, P. A.; Stygar, W. A.; Martin, T. H.; Spielman, R. B.; Shoup, R. W.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 168-176; In English; See also 20050168165; Copyright; Avail: Other Sources

The Z (formerly PBFA Z) vacuum insulator system consists of four stacks of Rexolite rings about 11-ft. in diameter, immersed in water, that insulate four biconic vacuum power-flow regions. The power flows are combined by a post-hole convolute just outside the imploding plasma load. Each ring stack is driven by nine similar water transmission lines connected around its perimeter. The different inductances between each stack of insulators and the load lead to a different voltage magnitude and waveform across each stack; therefore two stacks consist of five 2.25-inch-high insulators, and two stacks consist of six such insulators. The design criteria for the insulator stacks were developed using the analysis described. This treats the case of multiple stack modules each composed of a number of series insulators and each having a large circumferential transit time. The analysis tries to take account of the fact that when one flashover occurs at a particular location in one insulator stage, or even a number of flashovers at various locations, effective breakdown may not have occurred, because it takes time for series stages to flash locally in the same stack, while other parts of the stack are transit-time-isolated. To develop criteria for Z the analysis was In'st applied to Saturn, and was nom_alized by assuming a safe level for Saturn based on experience; it was then applied to Z. The analysis is presented, and results to date for the Z stack are described. Author

Insulators; Design Analysis; Stacks; Vacuum Systems

20050168268 Pulse Sciences, Inc., San Leandro, CA, USA

PBFA-Z Vacuum Section Design Using TLcode Simulations

Corcoran, P. A.; Douglas, J. W.; Smith, I. D.; Spence, P. W.; Stygar, W. A.; Struve, K. W.; Marti. T. H.; Spielman, R. B.; Ives, H. C.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 466-473; In English; See also 20050168165; Copyright; Avail: Other Sources

ABSTRACT Circuit code simulations were used to predict the performance of and to assess design trade-offs for the vacuum section of PBFA-Z. PBFA-Z was designed to drive a Plasma Radiation Source (PRS) within the PBFA-II facility by replacing its central water and vacuum sections. The insulator stack and vacuum feeds were patterned after those of the SATURN PRS configuration which has 4 separate sources combined in vacuum by a relatively small diameter Double Post

Hole Convolute (DPHC). The design method for choosing the PBFA-Z MITL impedance profiles is described and represents a departure from the method used for PROTO-II and SATURN and was motivated by analysis of SATURN experimental data. Other trade studies included the effect of MITL impedance profile on anode dose along the MITL due to partial magnetic insulation at early times and during the load run-in, and the choice of load diameter and mass on the choice of MITL profiles. These simulations predicted peak load currents ranging from 16 to 23 MA and kinetic energies from 1 to 1.6 MJ for plasma radiation sources (PRS) with implosion times from 100 to 150 ns. PBFA-Z experimental data is compared with an 'as built' circuit model for a wire array load with good agreement up to the time of peak load current. A significant disagreement between the data and the model then starts and increases until the time of implosion.
Author
Performance Prediction; Plasma Radiation; Radiation Sources; Insulation; Vacuum; Design Analysis

20050169205 NASA Glenn Research Center, Cleveland, OH, USA
MEMS Direct Chip Attach Packaging Methodologies and Apparatuses for Harsh Environments
Okojie, Robert S., Inventor; January 25, 2005; 30 pp.; In English
Patent Info.: Filed 03 Oct. 2002; US-Patent-6,845,664; US-Patent-Appl-SN-263980; NASA-Case--LEW-17256-1; No Copyright; Avail: CASI; A03, Hardcopy

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

38
QUALITY ASSURANCE AND RELIABILITY

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

20050166381 NASA Johnson Space Center, Houston, TX, USA
Self-Examination
Covault, Craig; Aviation Week and Space Technology; May 02, 2005; ISSN 0005-2175; Volume 162, No. 18, pp. 43-46; In English; Original contains color illustrations; Copyright; Avail: Other Sources

The operation of the new U.S./Canadian Orbiter Boom Sensor System (OBSS) by the STS-114 Discovery's crew 'will be the most complicated space robotics job of the shuttle program,' say Paul Hill, lead flight director. The OBSS is a laser-and-imaging-sensor- equipped 50-ft. extension to the existing 50-ft. arm, increasing the shuttle's reach to 100 ft. The return-to-flight mission will debut the autonomous robotic self-inspection capability to detect and possibly aid the repair of the type of damage that doomed Columbia and her crew, were it to occur again. With 3D imaging and laser contour-mapping capability, the OBSS will enable the diagnosis of cracks in reinforced carbon-carbon (RCC) wing and nose areas and thermal protection system (TPS) tiles beyond the view of the standard manipulator arm. Given the major changes to the shuttle external tank, no damage is expected. But the OBSS is a direct response to the Columbia Accident Investigation Board's recommendations. The new boom and a significant amount of its supporting software was developed by MacDonald Dettwiler heads. Space and Advanced Robotics Ltd. (MD Robotics) in Brampton, Ontario, a key contractor in the shuttle program for 25 years. The Canadian Space Agency is also heavily involved in supporting shuttle and International Space Station (ISS) robotics.
Author
Robot Arms; Manipulators; Booms (Equipment); Space Shuttles; Inspection; Wings; Damage Assessment

20050168091 NASA Langley Research Center, Hampton, VA, USA
Tributary Analysis Monitoring System
Woodard, Stanley, E., Inventor; Coffey, Neil C., Inventor; Taylor, Bryant D., Inventor; Woodman, Keith L., Inventor; April 12, 2005; 16 pp.; In English
Patent Info.: Filed 30 Sep. 2004; US-Patent-6,879,893; US-Patent-Appl-SN-675502; US-Patent-Appl-SN-411012; NASA-Case-LAR-16516-1; No Copyright; Avail: CASI; A03, Hardcopy

A monitoring system for a fleet of vehicles includes at least one data acquisition and analysis module (DAAM) mounted on each vehicle in the fleet, a control module on each vehicle in communication with each DAAM, and terminal module located remotely with respect to the vehicles in the fleet. Each DAAM collects/analyzes sensor data to generate analysis results that identify the state of a plurality of systems of the vehicle. Each vehicle's control module collects/analyzes the analysis results from each onboard DAAM to generate vehicle status results that identify potential sources of vehicle anomalies. The terminal module collects/analyzes the analysis results and vehicle status results transmitted from each control module from the fleet of vehicles to identify multiple occurrences of vehicle anomalies and multiple occurrences of those vehicle systems operating at a performance level that is unacceptable. Results of the terminal module's analysis are provided to organizations responsible for the operation, maintenance and manufacturing of the vehicles in the fleet as well as the plurality of systems used in the fleet.
Author
Systems Health Monitoring; Data Acquisition; Multisensor Fusion

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*.

20050165729 Defence Science and Technology Organisation, Fishermans Bend, Australia
Modelling of Stable Tearing in Aircraft Structures
Liu, Q.; Hamel, P.; Hu, W.; Sharp, P. K.; Lahousse, A.; Clark, G.; March 2005; 94 pp.; In English
Report No.(s): DSTO-TR-1657; DODA-AR-013-350; Copyright; Avail: Other Sources

This report summarizes the cooperative research program on stable tearing between DSTO and CEAT. The main objective was to study the conditions under which aircraft materials fracture by stable tearing and to develop a predictive capability for the process under operational conditions. The experiments on both CCT and CT specimens were to assist in validation of numerical modelling. Tear bands were successfully reproduced on CCT specimens with different specimen thickness by experiments at CEAT. The results were used to assess empirical models - Schijve's and Forsyth's models, and R-curve methods as well. Stable tearing feature was successfully simulated by a commercial finite element package ZENCRACK. Due to lack of local failure criteria, ZENCRACK cannot be used to predict whether stable tearing would occur or arrest under cyclic loading. But it appears to be useful for modeling such phenomena for indicative purpose only. A new 3D numerical model was proposed using a cohesive zone approach. This model can predict features similar to stable tearing and agrees well with the published experimental data. However, more research work needs to be done.
Author
Tearing; Structural Failure; Aircraft Structures; Aircraft Construction Materials

20050166396 Swedish Cement and Concrete Research Inst., Stockholm, Sweden
Self-Compacting Concrete Technique of Application
Billberg, P.; Oesterberg, T.; 2002; 154 pp.; In Swedish
Report No.(s): PB2005-102996; CBI-2-2002; No Copyright; Avail: CASI; A08, Hardcopy

During an earlier performed R&D project on self-compacting concrete, lack of knowledge was revealed on a number of issues such as for example how form pressure develops relative to different concrete mix designs, casting rates and form types. Also surface damages at the level of the interface between concrete layers was discovered. These questions, along with the experience gained through the construction of civil engineering structures using SCC between the years 1997 and 2000, has been the basis for the formation of the present R&D project. The aims of this project have been to study the thixotropic structural build-up of SCC at rest and to develop new test methods for the quantification of this structural build-up. Both existing as well as newly developed methods was to be investigated. It was also included in the plan to perform full-scale test

where the form pressure should be monitored at the same time as the structural build-up was measured using the developed test methods. The goal was to find relationships between the development of form pressures and the variables stated in the project plan and to correlate them to the thixotropic structural build- up. The project started with a literature study on 'Thixotropy of cement based materials' which resulted poorly, at least on the topic structural build-up at rest.
NTIS
Concrete Structures; Structural Engineering; Concretes

20050166900 NASA Marshall Space Flight Center, Huntsville, AL, USA
Safe Affordable Fission Engine-(SAFE-) 100a Heat Exchanger Thermal and Structural Analysis
Steeve, B. E.; March 2005; 48 pp.; In English
Report No.(s): NASA/TM-2005-213609; M-1131; No Copyright; Avail: CASI; A03, Hardcopy

A potential fission power system for in-space missions is a heat pipe-cooled reactor coupled to a Brayton cycle. In this system, a heat exchanger (HX) transfers the heat of the reactor core to the Brayton gas. The Safe Affordable Fission Engine-(SAFE-) 100a is a test program designed to thermally and hydraulically simulate a 95 Btu/s prototypic heat pipe-cooled reactor using electrical resistance heaters on the ground. This Technical Memorandum documents the thermal and structural assessment of the HX used in the SAFE-100a program.
Author
Brayton Cycle; Heat Exchangers; Structural Analysis; Thermal Analysis

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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*.

20050166924 Sternberg Astronomical Inst., Moscow, USSR
Earth, Moon, Mercury and Titan Seismicity: Observed and Expected Phenomena
Barkin, Yu V.; Ferrandiz, J. M.; Ferrandez, M. Garcia; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations
Contract(s)/Grant(s): SAB2000-0235; RFBR-02-05-64176; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Tidal and shell-dynamics interactions of the given celestial body with external celestial bodies lead to variations of their tensional state and as consequence to variations of different planetary processes including variations of seismic activity. It is clearly observed that variations of lunar seismicity have the celestial mechanical nature and depend from the Moon perturbed orbital motion. Using dynamical analogy in translatory-rotary motions of synchronous satellites and Mercury we have obtained evaluations of periods of variations of seismic activity of the Titan and Mercury. The high level of endogenous activity of Titan was predicted earlier [1].
Derived from text
Seismology; Moon; Titan; Mercury (Planet); Celestial Bodies; Tides; Earth (Planet)

20050166926 Open Univ., Milton Keynes, UK
Space Weathering: Laboratory Analyses and In-Situ Instrumentation
Bentley, M. S.; Ball, A. J.; Dyar, M. D.; Pieters, C. M.; Wright, I. P.; Zarnecki, J. C.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations
Contract(s)/Grant(s): NAG5-13609; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Space weathering is now understood to be a key modifier of visible and near infrared reflectance spectra of airless bodies. Believed to be caused by vapour recondensation after either ion sputtering or impact vaporization, space weathering has been successfully simulated in the laboratory over the past few years. The optical changes caused by space weathering have been attributed to the accumulation of sub-microscopic iron on regolith grain surfaces. Such fine-grained metallic iron has distinctive magnetic properties that can be used to study it.
Derived from text
Space Weathering; Space Laboratories; Near Infrared Radiation

20050166932 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Geographic Distribution of QCDs Around the Northern Plains Basins of Mars and the Relationship to Lowland Materials

Buczkowski, D. L.; Frey, H. V.; McGill, G. E.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It has been suggested that quasicircular depressions (QCDs) without a structural representation in Viking and MOC visible imagery represent buried impact craters [1,2,3,4]. Topographic depressions will form over impact craters buried by a differentially compacting cover material because total cover thickness, and thus total compaction, is greater over the center of completely buried impact craters than their rims [5]. If this is the process by which QCDs form, then only areas of differentially compacting materials should have QCDs. Previous work has established that there is a relationship of surface relief to diameter for QCDs around the Utopia Basin [6]. The slope of the trend of this relationship varies depending on cover thickness, becoming steeper with decreasing thickness [7]. Comparing trendslopes of QCDs around different lowland basins might give us insight into the relative thickness of the cover material in these areas. We explore the geographic distribution of QCDs around the Utopia, Isidis and Acidalia basins and compare their location to geologic units and materials. We also compare evidence for relative thickness of cover material at the three basins.

Derived from text

Geographic Distribution; Craters; Mars Surface; Structural Basins; Topography

20050166975 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Unified Planetary Coordinates System: A Searchable Database of Geodetic Information

Becker, K. J.a; Gaddis, L. R.; Soderblom, L. A.; Kirk, R. L.; Archinal, B. A.; Johnson, J. R.; Anderson, J. A.; Bowman-Cisneros, E.; LaVoie, S.; McAuley, M.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Over the past 40 years, an enormous quantity of orbital remote sensing data has been collected for Mars from many missions and instruments. Unfortunately these datasets currently exist in a wide range of disparate coordinate systems, making it extremely difficult for the scientific community to easily correlate, combine, and compare data from different Mars missions and instruments. As part of our work for the PDS Imaging Node and on behalf of the USGS Astrogeology Team, we are working to solve this problem and to provide the NASA scientific research community with easy access to Mars orbital data in a unified, consistent coordinate system along with a wide variety of other key geometric variables. The Unified Planetary Coordinates (UPC) system is comprised of two main elements: (1) a database containing Mars orbital remote sensing data computed using a uniform coordinate system, and (2) a process by which continual maintainance and updates to the contents of the database are performed.

Derived from text

Data Bases; Coordinates; Geodesy; Imaging Techniques; Geology

20050167035 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Effect of Cover Thickness on the Relationship of Surface Relief to Diameter of Northern Lowland QCDs on Mars

Buczkowski, D. L.; Frey, H. V.; McGill, G. E.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Previous work has established that there is a relationship of surface relief to diameter for quasi-circular depressions (QCDs) around the Utopia Basin [1]. This relationship has been used to support the contention that the QCDs represent impact craters buried beneath a differentially compacting cover material. For any given regional cover thickness, total cover thickness is greater over the centers of completely buried craters than over their rims; thus total compaction is greater over the center of craters than their rims and topographic depressions will form. Since large craters are deeper than small craters, differential compaction models also predict that surface relief will be proportional to the diameter of the buried crater [2]. It is highly unlikely, however, that the material covering the QCD impact craters is a consistent thickness throughout the entire northern lowlands of Mars. We explore the effects that changes in cover thickness would have on the surface relief vs. diameter relationship of QCDs.

Derived from text

Craters; Thickness; Topography; Mars Surface

20050167037 Purdue Univ., West Lafayette, IN, USA

Automated Classification of Landforms in Terra Cimmeria, Mars

Bue, B. D.; Stepinski, T. F.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present an automated method for identification and characterization of landforms on Mars using digital topography data. Applying our algorithm to the Terra Cimmeria region yields 20 distinct landforms whose spatial distribution is shown using a thematic map of landforms. Such a map serves as the first approximation to a geomorphic map of the site. We discuss future application of our method including automated crater counting and characterization. classes we cluster the pixels using a two-level approach consisting of self-organizing map (SOM) and Ward's minimum variance grouping methods. The SOM [3] is a neural network technique that, through an iterative procedure, groups similar vectors into nearby points on a 2-D grid composed of nodes. In the first step, all pixels (108) are mapped using the SOM into grid s nodes (102 -103) in such a way that

Author

Digital Data; Classifications; Landforms; Mars Surface; Planetary Geology; Spatial Distribution; Geomorphology

20050167138 New Mexico Univ., Albuquerque, NM, USA

Geochemistry and Ar-40-Ar-39 Geochronology of Impact-melt Clasts in Lunar Meteorites Dar Al Gani 262 and Calcalong Creek

Cohen, B. a.; Swindle, T. D.; Kring, D. A.; Olson, E. K.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We are continuing our study of impact-melt clasts in lunar meteorites [1, 2]. The dissimilarity of DaG262 and Calcalong Creek impact-melt clasts to Apollo mafic, KREEPy impact melts (Fig. 1) makes them excellent candidates for age dating in order to further constrain lunar bombardment history.

Derived from text

Impact Melts; Geochronology; Argon Isotopes; Meteorites; Geochemistry

20050167185 National Academy of Sciences - National Research Council, Washington, DC, USA

Groundwater Depth, Cryosphere Thickness, and Crustal Heat Flux in the Epoch of Ravi Vallis, Mars

Coleman, Neil M.; Dinwiddie, Cynthia L.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ravi Vallis is an outflow channel that emerged from Aromatum Chaos, a region of collapsed ground in Xanthe Terra, Mars. The megaflood that carved Ravi Vallis incised the crust \g700 m. We propose that this erosion penetrated the cryosphere and triggered the genesis of secondary chaos zones in the deep est parts of Ravi Vallis (Figure 1). Iamuna* and Oxia* Chaotes (IAU provisional names) represent a class of chaotes that can form solely in response to fluvial incision. We estimate the cryosphere thickness and depth to groundwater as the sum of the incision depth and the thickness of rock beneath the channel floor that could be disrupted by artesian pressure [Coleman, 2005]. Figure 2 shows a MOLA profile across the deepest channel of Ravi V allis. At this location, fluvial erosion incised ~730 m into the upper crust and created an inner channel more than 200 m deep. Iamuna Chaos formed just downstream of the profile in Figure 2. The inner channel leads directly into the deepest part of the chaos, which we interpret as the point of initial groundwater outbreak.

Derived from text

Cryospheres; Heat Flux; Ground Water; Mars Surface; Chaos; Depth; Erosion

20050167706 Building and Construction Research TNO, Delft, Netherlands

Selection of Materials for Topside Structures

vanAanhold, J. E.; vandenEikhoff, J.; January 23, 2004; 44 pp.; In English

Contract(s)/Grant(s): A03/KM/140/1392 1; TNO Proj. 006.38108/01.01

Report No.(s): TD-2004-0279; TNO-2004-CMC-R076; Copyright; Avail: Other Sources

A selection was made of candidate structural and functional materials for future topsides. These were compared against selection criteria: sensor performance, mechanical behaviour, durability, fire behaviour and costs. Also the ability to join materials to good functioning combinations was considered. Some specific materials are recommended for use in future

topsides. Most materials bond and work together relatively well. Functional requirements may nevertheless affect mechanical performance. The maximum operational temperature is an important constraint in the selection of topside materials. Usually, this is such elevated that only the most stable (and expensive) materials are suitable. Hence, this temperature must be reviewed critically and solutions to decrease this considered. It is recommended to test all new candidate materials with respect to their thermal stability. In order to achieve an optimum fire safety, all materials to be used in manned areas must satisfy at least the IMO High Speed Craft code requirements.
Author
Materials Selection; Structural Engineering; Mechanical Properties

20050167767 Academy of Sciences (Russia), Moscow, Russia
A Model for Multiple Populations of Presolar Diamonds
Fisenko, A. V.; Verchovsky, A. B.; Semjonova, L. F.; Wright, I. P.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the important questions related to meteoritic presolar diamonds is haw many different stellar sources they represent. Evidence that the diamonds consist of several populations include: (1) carbon isotope variations in diamonds from different meteorites [1], (2) differences in the release temperature of isotopically light nitrogen and Ar-36 during stepped pyrolysis [2], (3) variations in delta(sup 15)N and C/N during stepped combustion [3]. More evidence has come from experimental simulation of ion implantation into nonodiamonds [4,5] suggesting that differences in the release temperature of P3 and HL noble gases are caused by radiation damage and that meteoritic nanodiamonds represent at least two populations with different radiation histories [4]. Separation of the nanometer-sized meteoritic diamonds into grain size fractions [6] has made it even more clear that they come from different sources. For instance, variations in the low temperature Xe-129 abundances with grain size and metamorphic history of the diamonds in meteorite parent bodies have been taken as an indication of the formation of diamonds containing P3 noble gases in the early solar nebula [7]; in contrast, those associated with the HL component are believed to come from a supernova [8].
Derived from text
Diamonds; Carbon Isotopes; Meteoritic Composition; Argon Isotopes; Ion Implantation; Radiation Damage; Grain Size

20050167801 Oslo Univ., Norway
Did the Mjolnir Asteroid Impact Ignite the Barents Sea Hydrocarbon Source Rocks?
Dypvik, H.; Wolbach, W. S.; Shuvalov, V.; Weaver, S. L. W.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mjolnir impact crater was formed in the late Jurassic (142 +/- 2.6 Ma) by the impact of a 1.5 km large asteroid into this about 400 m deep sea. During this encounter the crater was formed, ejecta widely spread and tsunami generated. Simulations indicate that normal sea level was reestablished in the crater after a sub aerial exposure of about 20 minutes.
Derived from text
Asteroids; Ejecta; Hydrocarbons; Impact Damage; Meteorite Craters; Meteoritic Damage; Projectile Cratering

20050167809 Arizona State Univ., Tempe, AZ, USA
A Comparison of the Structure and Bonding of Carbon in Apex Chert Kerogenous Material and Fischer-Tropsch-Type Carbons
DeGregorio, B. T.; Sharp, T. G.; Flynn, G. J.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Microbial-like features preserved in the 3.5 Ga Apex chert are possibly the oldest fossils on Earth. However, despite their cellular appearance, the fact that they exist in an ancient hydrothermal system and few pristine (unaltered) microbial morphologies exist has led some researchers to look for alternative models for their formation. The kerogenous carbonaceous material that composes these features could be created by an abiotic organic synthesis reaction and preserved in a microbial-like morphology. Many different types of simple and complex organic molecules can be synthesized by a Fischer-Tropsch-type (FTT) reaction, which only requires sources of reactants, hydrothermal temperatures, and a proper

catalyst. All three of these requirements may be met in an ancient hydrothermal vent crosscutting basalts, as the Apex chert does. Micro-laser Raman spectroscopy has been previously
Derived from text
Synthesis (Chemistry); Microorganisms; Hydrothermal Systems; Carbonaceous Materials

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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*.

20050166908 Defence Science and Technology Organisation, Edinburgh, Australia
Resource Multipliers for ISR Assets
Fogg, D. A. B.; Pontecorvo, C.; Davies, A.; Clark, D.; August 2004; 8 pp.; In English
Report No.(s): DSTO-GD-0408; DODA-AR-013-161; Copyright; Avail: Other Sources

In this visual report, we show how smart use of surveillance assets can achieve a 'resource multiplier (RM)' effect by considering a specific case, namely reacquisition after loss-of-track of a small maritime vessel being observed by a constellation of SAR satellites. The process uses Gauss-Markov and Bayesian Inference Techniques (GAMBIT) and an information Measure of Effectiveness (MOE) based on entropy. These were developed in ISRD to provide the scientific basis for optimising and assessing intelligence, surveillance and reconnaissance (ISR) systems in a modelling and simulation framework, encompassing relevant operational aspects as well as ISR physical processes.
Author (revised)
Reconnaissance; Surveillance; Satellite Observation; Tracking (Position)

20050167055 NASA Marshall Space Flight Center, Huntsville, AL, USA
A Multi-scale Approach to Urban Thermal Analysis
Gluch, Renne; Quattrochi, Dale A.; [2005]; 1 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

An environmental consequence of urbanization is the urban heat island effect, a situation where urban areas are warmer than surrounding rural areas. The urban heat island phenomenon results from the replacement of natural landscapes with impervious surfaces such as concrete and asphalt and is linked to adverse economic and environmental impacts. In order to better understand the urban microclimate, a greater understanding of the urban thermal pattern (UTP), including an analysis of the thermal properties of individual land covers, is needed. This study examines the UTP by means of thermal land cover response for the Salt Lake City, Utah, study area at two scales: 1) the community level, and 2) the regional or valleywide level. Airborne ATLAS (Advanced Thermal Land Applications Sensor) data, a high spatial resolution (10-meter) dataset appropriate for an environment containing a concentration of diverse land covers, are used for both land cover and thermal analysis at the community level. The ATLAS data consist of 15 channels covering the visible, near-IR, mid-IR and thermal-IR wavelengths. At the regional level Landsat TM data are used for land cover analysis while the ATLAS channel 13 data are used for the thermal analysis. Results show that a heat island is evident at both the community and the valleywide level where there is an abundance of impervious surfaces. ATLAS data perform well in community level studies in terms of land cover and thermal exchanges, but other, more coarse-resolution data sets are more appropriate for large-area thermal studies. Thermal response per land cover is consistent at both levels, which suggests potential for urban climate modeling at multiple scales.
Author
Cities; Thermal Analysis; Earth Environment; Remote Sensing

20050167079 Johns Hopkins Univ., Laurel, MD, USA
Photolysis Rate Coefficient Calculations in Support of SOLVE II
Swartz, William H.; April 21, 2005; 7 pp.; In English
Contract(s)/Grant(s): NNG04GH56G; No Copyright; Avail: CASI; A02, Hardcopy

A quantitative understanding of photolysis rate coefficients (or 'j-values') is essential to determining the photochemical reaction rates that define ozone loss and other crucial processes in the atmosphere. j-Values can be calculated with radiative transfer models, derived from actinic flux observations, or inferred from trace gas measurements. The primary objective of the present effort was the accurate calculation of j-values in the Arctic twilight along NASA DC-8 flight tracks during the second SAGE III Ozone Loss and Validation Experiment (SOLVE II), based in Kiruna, Sweden (68 degrees N, 20 degrees E) during

January-February 2003. The JHU/APL radiative transfer model was utilized to produce a large suite of j-values for photolysis processes (over 70 reactions) relevant to the upper troposphere and lower stratosphere. The calculations take into account the actual changes in ozone abundance and apparent albedo of clouds and the Earth surface along the aircraft flight tracks as observed by in situ and remote sensing platforms (e.g., EP-TOMS). A secondary objective was to analyze solar irradiance data from NCAR s Direct beam Irradiance Atmospheric Spectrometer (DIAS) on-board the NASA DC-8 and to start the development of a flexible, multi-species spectral fitting technique for the independent retrieval of O3,O2.02, and aerosol optical properties.
Derived from text
Earth Surface; Ozone; Photolysis; Atmospheric Composition

20050167212 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Real-Time Mapping Using Stereoscopic Vision Optimization
Biggs, Kevin M.; Mar. 2005; 99 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431488; AFIT/GCS/ENG/05-03; No Copyright; Avail: Defense Technical Information Center (DTIC)

This research focuses on efficient methods of generating 2D maps from stereo vision in real-time. Instead of attempting to locate edges between objects, we make the assumption that the representative surfaces of objects in a view provide enough information to generate a map while taking less time to locate during processing. Since all real-time vision processing endeavors are extremely computationally intensive, numerous optimization techniques are applied to allow for a real-time application: horizontal spike smoothing for post-disparity noise, masks to focus on close-proximity objects, melding for object synthesis, and rectangular fitting for object extraction under a planar assumption. Additionally, traditional image transformation mechanisms such as rotation, translation, and scaling are integrated. Results from our research are an encouraging 10Hz with no vision post processing and accuracy up to 11 feet. Finally, vision mapping results are compared to simultaneously collected sonar data in three unique experimental settings.
DTIC
Image Reconstruction; Mapping; Maps; Pattern Recognition; Real Time Operation; Stereoscopic Vision; Visual Perception

20050167225 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Robot Mapping With Real-Time Incremental Localization Using Expectation Maximization
Owens, Kevin L.; Mar. 2005; 78 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431560; AFIT/GCS/ENG/05-12; No Copyright; Avail: Defense Technical Information Center (DTIC)

This research effort explores and develops a real-time sonar-based robot mapping and localization algorithm that provides pose correction within the context of a singe room, to be combined with pre-existing global localization techniques, and thus produce a single, well-formed map of an unknown environment. Our algorithm implements an expectation maximization algorithm that is based on the notion of the alpha-beta functions of a Hidden Markov Model. It performs a forward alpha calculation as an integral component of the occupancy grid mapping procedure using local maps in place of a single global map, and a backward beta calculation that considers the prior local map, a limited step that enables real-time processing. Real-time localization is an extremely difficult task that continues to be the focus of much research in the field, and most advances in localization have been achieved in an off-line context. The results of our research into and implementation of realtime localization showed limited success, generating improved maps in a number of cases, but not all-a trade-off between real-time and off-line processing. However, we believe there is ample room for extension to our approach that promises a more consistently successful real-time localization algorithm.
DTIC
Algorithms; Expectation; Mapping; Position (Location); Real Time Operation; Robotics; Robots

20050167248 Maryland Univ., College Park, MD USA
Hierarchical DEM Refinement Using Surface Parallax
Agrawal, Amit K.; Meth, Reuven; Chellappa, Rama; Dec. 2004; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-2-0009
Report No.(s): AD-A431639; No Copyright; Avail: Defense Technical Information Center (DTIC)

We present a multi-resolution approach to update and refine coarse 3D models of urban environments from a sequence of intensity images using surface parallax. A coarse and potentially incomplete depth map of the scene obtained from a Digital Elevation Map (DEM) is used as a reference surface which is refined and updated using this approach. We first estimate the camera motion using the reference depth map. Using the estimated camera motion, at each level in the multi-resolution

framework, motion of 3D points on the reference surface is compensated, and the residual flow field, which is an epipolar field, is estimated and used to refine the depth map at that level. At a coarse resolution, the difference between the reference depth and the true depth will be small, leading to a small parallax field. The refined depth map from the coarser level is the propagated to the finer level. Thus, significant deviations of an available model from a true model can be handled using this approach.
DTIC
Digital Data; Maps; Parallax

20050167270 Virginia Commonwealth Univ., Richmond, VA USA
Synthesis of Multifunction Materials
Morkoc, Hadis; Apr. 2005; 29 pp.; In English
Contract(s)/Grant(s): N00014-02-1-0929
Report No.(s): AD-A431688; TR-528811; No Copyright; Avail: CASI; A03, Hardcopy

Perovskite phase of PZT films have been formed On sapphire substrates and Pt/Ti/SiO2/Si and Ir/Ti/SiO2/Si substrates by RF sputtering and sol gel techniques. Structural, in the form of X-ray diffraction, optical in the form of absorption/transmission and spectroscopic ellipsometry, scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), and electrical measurements, in the form of polarization vs. electric field (or voltage) in capacitors have been performed. For electrical characterization, the top electrodes for Au/PZT/Pt and Au/PZT/Ir capacitors were fabricated by photolithography and liftoff process. The Ir bottom electrodes were obtained from Samsung Advanced Institute of Technology as part of a collaborative effort. The photolithography and wet etching conditions (HF, HF:H2O2:HNO3) were optimized to explore scheduled mulflfimctional device applications. The polarization hysteresis and fatigue characteristics were measured by using a ferroelectric tester. In order to prepare better quality perovskite film, all the necessary source and other configurational modifications have been completed in oxides MBE and growth runs are eminent.
DTIC
Dispersing; Electron Microscopy; Ellipsometry; Perovskites; Sound Waves; Spectroscopy; Sputtering; Substrates; Surface Waves; X Ray Diffraction; Zirconates

20050169218 NASA, Washington, DC, USA
[New Retrieval Algorithms for Geophysical Products from GLI and MODIS Data]
Dodge, James C.; Simpson, James J.; March 1, 2004; 18 pp.; In English
Contract(s)/Grant(s): NAG513435; No Copyright; Avail: CASI; A03, Hardcopy

Below is the 1st year progress report for NAG5-13435 'New Retrieval Algorithms for Geophysical Products from GLI and MODIS Data'. Activity on this project has been coordinated with our NASA DB project NAG5-9604. For your convenience, this report has six sections and an Appendix. Sections I - III discuss specific activities undertaken during the past year to analyze/use MODIS data. Section IV formally states our intention to no longer pursue any research using JAXA's (formerly NASDA's) GLI instrument which catastrophically failed very early after launch (also see the Appendix). Section V provides some indications of directions for second year activities based on our January 2004 telephone discussions and email exchanges. A brief summary is given in Section VI.
Author
MODIS (Radiometry); Data Processing; Volcanic Eruptions; Forecasting; Satellite Imagery

20050169554 California Univ., Irvine, CA, USA
Carbon Dynamics in Vegetation and Soils
Trumbore, Susan; Chambers, Jeffrey Q.; Camargo, Plinio; Martinelli, Luiz; Santos, Joaquim; [2005]; 19 pp.; In English
Contract(s)/Grant(s): NCC5-336; No Copyright; Avail: CASI; A03, Hardcopy

The overall goals of CD-08 team in Phase I were to quantify the contributions of different components of the carbon cycle to overall ecosystem carbon balance in Amazonian tropical forests and to undertake process studies at a number of sites along the eastern LBA transect to understand how and why these fluxes vary with site, season, and year. We divided this work into a number of specific tasks: (1) determining the average rate (and variability) of tree growth over the past 3 decades; (2) determining age demographics of tree populations, using radiocarbon to determine tree age; (3) assessing the rate of production and decomposition of dead wood debris; (4) determining turnover rates for organic matter in soils and the mean age of C respired from soil using radiocarbon measurements; and (5) comparing our results with models and constructing models to predict the potential of tropical forests to function as sources or sinks of C. This report summarizes the considerable

progress made towards our original goals, which have led to increased understanding of the potential for central Amazon forests to act as sources or sinks of carbon with altered productivity. The overall picture of tropical forest C dynamics emerging from our Phase I studies suggests that the fraction of gross primary production allocated to growth in these forests is only 25-30%, as opposed to the 50% assumed by many ecosystem models. Consequent slow tree growth rates mean greater mean tree age for a given diameter, as reflected in our measurements and models of tree age. Radiocarbon measurements in leaf and root litter suggest that carbon stays in living tree biomass for several years up to a decade before being added to soils, where decomposition is rapid. The time lags predicted from 14C, when coupled with climate variation on similar time scales, can lead to significant interannual variation in net ecosystem C exchange.
Author
Amazon Region (South America); Rain Forests; Trees (Plants); Carbon Cycle

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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*.

20050166390 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Nanoscale Fabrication and Modificaiton of Selected Battery Materials
Kostecki, R.; Yun Song, X.; Kinoshita, K.; McLarnon, F.; 2004; 14 pp.; In English
Report No.(s): DE2004-834264; No Copyright; Avail: Department of Energy Information Bridge
Carbon is an integral part of many battery electrodes. We explored the use of semiconductor-processing techniques that involve photolithography to pattern photoresists and subsequent pyrolysis to form carbon microstructures that function as microelectrodes. In this study, we describe the status of the fabrication of carbon microelectrodes obtained by pyrolysis of photoresist. Electrochemical nanometer-scale patterning of the surface of a conducting lithium manganese oxide (LiMn(sub 2)O(sub 4)) by scanning probe microscopy (SPM) was studied. We show that a localized surface chemical change can be confined to a depth which depends on the oxide-tip voltage difference and ambient humidity. The ability to produce nanometer-size patterns of chemically modified oxide or nanometer-sized alterations of the oxide morphology is demonstrated and discussed with reference to possible mechanisms.
NTIS
Electrodes; Electric Batteries; Fabrication

20050166407 National Renewable Energy Lab., Golden, CO
Photovoltaic and Solar Thermal Modeling with the EnergyPlus Calculation Engine
Griffith, B. T.; Ellis, P. G.; Jul. 2004; 12 pp.; In English
Report No.(s): DE2004-15009460; NREL/CP-550-36275; No Copyright; Avail: Department of Energy Information Bridge
EnergyPlus is a whole-building energy analysis software program developed by DOE. It was recently expanded with the addition of new active solar components for simulation of photovoltaic and solar thermal hot-water heating systems. The active solar models were integrated into the program because low- or zero-energy buildings often use renewable energy resources to accomplish their energy-saving goals. This paper provides an overview of the new models for PV and solar collectors in EnergyPlus and describes some preliminary efforts to validate the implementations.
NTIS
Renewable Energy; Power Supplies; Photovoltaic Effect

20050166408 National Renewable Energy Lab., Golden, CO
Modeling Current-Voltage Curves Using Bilinear Interpolation
Marion, B.; del Cueto, J.; Sekulic, B.; Aug. 2004; 12 pp.; In English
Report No.(s): DE2004-15009603; NREL/CP-520-36232; No Copyright; Avail: Department of Energy Information Bridge
Current-voltage (I-V) curves for photovoltaic (PV) modules representing all PV technologies were modeled by bilinearly interpolating the I-V curves from a PV module's four reference I-V curves. The interpolation was performed first with respect to open-circuit voltage to account for PV module temperature, and second with respect to short-circuit current to account for

irradiance. The modeled I-V curves compared closely with measured I-V curves for 26 PV modules located at the National Renewable Energy Laboratory.
NTIS
Interpolation; Photovoltaic Cells; Renewable Energy; Mathematical Models

20050166409 National Renewable Energy Lab., Golden, CO
Conductive Atomic Force Microscopy Applied to CdTe/CdS Solar Cells
Moutinho, H. R.; Dhere, R. G.; Jiang, C. S.; Al-Jassim, M. M.; Kazmerski, L. L.; Aug. 2004; 12 pp.; In English
Report No.(s): DE2004-15009703; NREL/CP-520-36323; No Copyright; Avail: Department of Energy Information Bridge
In this work we describe for the first time the use of conductive atomic force microscopy (C-AFM) in the study of CdTe/CdS solar cells, before and after the etching processes used in device fabrication. C-AFM is a new technique that provides information on the electrical properties of the sample in conjunction with topographic images with high lateral resolution. At the same time, this technique allows for the generation of I-V curves at very well-defined locations. A potential is applied between the sample and a very sharp tip, which scans the sample in contact mode. The current images showed that different CdTe grains produce different contrast. Etching the CdTe with a bromine/methanol solution enhanced the current along grains boundaries when compared to the intragrain material. Etching with a solution of nitric and phosphoric acids did not show this effect. Instead, it increased the current through the whole sample surface.
NTIS
Atomic Force Microscopy; Cadmium Tellurides; Solar Cells; Cadmium Sulfides; Fabrication

20050166410 National Renewable Energy Lab., Golden, CO
Solar Photovoltaic Hydrogen: The Technologies and Their Place in Our Roadmaps and Energy Economics
Kaxmerski, L. L.; Broussard, K.; Aug. 2004; 12 pp.; In English
Report No.(s): DE2004-15009704; NREL/CP-520-36401; No Copyright; Avail: Department of Energy Information Bridge
Future solar photovoltaics-hydrogen systems are discussed in terms of the evolving hydrogen economy. The focus is on distributed hydrogen, relying on the same distributed-energy strengths of solar-photovoltaic electricity in the built environment. Solar-hydrogen residences/buildings, as well as solar parks, are presented. The economics, feasibility, and potential of these approaches are evaluated in terms of roadmap predictions on photovoltaic and hydrogen pathways-and whether solar-hydrogen fit in these strategies and timeframes. Issues with the 'hydrogen future' are considered, and alternatives to this hydrogen future are examined.
NTIS
Economics; Hydrogen; Photovoltaic Conversion; Solar Energy; Energy Technology

20050167284 Army Construction Engineering Research Lab., Champaign, IL USA
A Candidate Army Energy and Water Management Strategy
Fournier, Donald F.; Westervelt, Eileen T.; Aug. 2004; 117 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431726; ERDC/CERL-TR-04-10; No Copyright; Avail: Defense Technical Information Center (DTIC)
Army installations are essential to the development and sustainment of operational capabilities and readiness to serve and protect the nation and its interests. Installations are small cities with a full complement of facility types and utility requirements that necessarily use significant amounts of energy and water. To secure its mission, the Army must competently manage these facilities and utility assets and their consumption of resources. The management of these resources is multi-faceted and must incorporate diverse issues into a cohesive program. This work augments on-going energy and water management initiatives within the Army by developing a new candidate Army level strategy that responds to anticipated legislation; reflects current DOD and DA requirements, vision, and values in light of the current world situation; incorporates sound science and management principles; and organizes and focuses efforts into an integrated program.
DTIC
Energy Conservation; Energy Policy; Management Planning; Water Management

20050167288 Army Research Lab., Aberdeen Proving Ground, MD USA
Composite Flywheel Development for Energy Storage
Tzeng, Jerome; Emerson, Ryan; Moy, Paul; Jan. 2005; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431734; ARL-TR-3388; No Copyright; Avail: Defense Technical Information Center (DTIC)
Composite flywheels for energy storage have been proposed and investigated for the past several decades. Successful

applications are, however, limited due to the inability to predict the performance, especially the long-term durability. In this investigation, a comprehensive study was proposed with the intent to implement composites in high-performance flywheels. The potential failure mechanism of flywheels constructed with fiber composites was evaluated. Analytical codes for predicting elastic and viscoelastic (long-term) behavior were developed for flywheel design. Material characterization and test matrices were proposed to design flywheels with maximum performance. Component-level test methods and devices were developed to validate flywheel performance. Finally, a methodology incorporating these studies is presented for the design and manufacture of composite flywheels.
DTIC
Energy Storage; Flywheels

20050167296 Army Construction Engineering Research Lab., Champaign, IL USA
Phosphoric Acid Fuel Cells Test and Evaluation
Unger, Robert J.; Kenner, Scott; Binder, Michael J.; Holcomb, Franklin H.; Oct. 2004; 177 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431752; ERDC/CERL-TR-04-21; No Copyright; Avail: Defense Technical Information Center (DTIC)
Fuel cell power plants can provide improvements in energy conservation and reduced environmental impacts for many DOD applications. Currently, the U.S. Army Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC/CERL) Fuel Cell Technology Program facilitates the development of Fuel Cell Technology. This work provided testing and evaluations of fuel cells in support of life-cycle-cost reduction and performance improvement goals. This program also undertook to provide the capability for independent design assessments of alternative technology fuel cell system configurations and components to achieve lower life cycle cost either through reduced capital cost, reduced operation and maintenance (O&M) costs, or increased performance and reliability.
DTIC
Energy Conservation; Evaluation; Fuel Cells; Phosphoric Acid Fuel Cells; System Effectiveness

20050167330 Army Construction Engineering Research Lab., Champaign, IL USA
Results of Source Emissions Testing. UTC Fuel Cell Model PC25C
White, Melissa; Taylor, William R.; Sep. 2004; 18 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431880; ERDC/CERL-TR-04-18; No Copyright; Avail: Defense Technical Information Center (DTIC)
Fuel cells generate electricity through an electrochemical process that combines hydrogen and oxygen to generate direct current (DC) electricity. Fuel cells are an environmentally clean, quite, and a highly efficient method for generating electricity and heat from natural gas and other fuels. The U.S. Army Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC-CERL) has actively participated in the development and application of advanced fuel cell technology since fiscal year 1993 (FY93), and has overseen the purchase, installation, and ongoing monitoring of fuel cells in the 'DOD Fuel Cell Demonstration Program.' This report documents a source emission study done on fuel cells at Fort Huachuca, in Tempe, AZ. This report describes the testing methods used to measure source emissions from the PC25C system, the conditions during the process, and the test results. Results are tabulated with the manufacturer's emissions ratings.
DTIC
Emission; Evaluation; Fuel Cells; System Effectiveness

20050167402 Army Construction Engineering Research Lab., Champaign, IL USA
Energy Savings Measurement and Verification Toolkit Guide: Version 2.96
Zych, Noah C.; Pennell, Matthew G.; Underwood, David M.; Jul. 2004; 51 pp.; In English; Original contains color illustrations
Report No.(s): AD-A432043; ERDC/CERL-SR-04-13; No Copyright; Avail: Defense Technical Information Center (DTIC)
The M&V Toolkit is a set of spreadheets and macros that can be used to estimate Measurement and Verification (M&V) costs. It allows a user to determine what method of monitoring will provide the necessary data at an acceptable cost. The toolkit estimates costs for four M&V methods (organized by methods of gathering data), each compatible with IPMVP 2001 and AHRAE Guide-line 14 standards. The methods included are: long-term analysis, short-term analysis, monthly utility bill analysis, and a calibrated simulation model. Summaries of costs for various methods can be easily compared using built in report summaries.
DTIC
Computer Programs; Energy Conservation; Software Development Tools

20050167404 Army Construction Engineering Research Lab., Champaign, IL USA

Application of Thermoelectric Devices to Fuel Cell Power Generation: Demonstration and Evaluation

Huston, John; Wyatt, Chris; Nichols, Chris; Binder, Michael J.; Holcomb, Franklin H.; Sep. 2004; 145 pp.; In English; Original contains color illustrations

Report No.(s): AD-A432046; ERDC/CERL-TR-04-20; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Department of Defense (DOD) is concerned with reliable and cost-effective power generation of on-site power generators as well as minimizing the environment impact of these generators. Thermoelectric (TE) devices offer the opportunity to generate power without additional fuels, without moving parts, and with negligible environmental impact. An electrical energy conversion efficiency of approximately 15% would be required to obtain an acceptable return on investment for TE devices. A feasibility study to was performed to determine how, assuming a 16% efficiency, TE devices could impact the DOD's power generation capabilities. Based on research indicating energy conversion efficiencies of 20%, TE devices were built and tested. Of 27 TE devices supplied, only 8 were functional; each device produced only 1 Watt of power. Current manufacturing processes and design parameters were assessed and recommendations made. Three locations were prepared as demonstration sites for TE devices, site evaluation criteria were outlined, and process results given. Control an Data Acquisition (CDAQ) Systems for single and multiple test stands were developed to gather all necessary data variables during the demonstrations, and a portable technology system was developed to enable personnel to demonstrate the technology in any location.

DTIC

Electric Generators; Electric Power Plants; Fuel Cells; Thermoelectric Generators; Thermoelectricity

20050168085 Department of Energy, Washington, DC, USA

Heat Your Water with the Sun. A Consumer's Guide

Dec. 2003; 24 pp.; In English

Report No.(s): PB2005-105638; DOE/GO-102003-1824; No Copyright; Avail: CASI; A03, Hardcopy

Would you like to learn more about how the sun can help meet your homes heating needs without straining your budget. Todays solar heating systems not only keep swimming pools warm they can also heat much of your homes water and interior space. Their popularity is increasing, for several reasons. Solar heating systems are reliable, adaptable, and pollution-free because they use renewable energy from the sun. Many systems include sleek, attractive, low-relief collectors that people often mistake for skylights. Did you know that solar heating systems work well in many different climates. Some applications, such as pool heating, are widely costeffective today. The cost-effectiveness of other applications depends on specific circumstances, such as the type and cost of your usual source of energy. Today, special financing is available to help you purchase the system thats right for your home. If youd like to find out more about solar heating for your home or pool, this booklet is a good place to start. Here, youll learn how solar heating systems work, how theyre used, their benefits, and how to purchase one yourself. Please note, however, that this booklet isnt a technical guide to designing and installing a system. For that, youll need to consult an experienced solar heating contractor; see Getting help in this booklet for more information.

NTIS

Solar Energy; Handbooks; Solar Houses; Domestic Energy; Residential Energy

20050168099 California Energy Commission, Sacramento, CA, USA

Buying a Photovoltaic Solar Electric System. A Consumer Guide. 2003 Edition

Starrs, T.; Wenger, H.; Mar. 2003; 34 pp.; In English

Report No.(s): PB2005-105637; P500-03-014F; No Copyright; Avail: CASI; A03, Hardcopy

The guidebook discusses the basic techincal, economic, and regulatory information that consumers should know before buying a photovoltaic (PV) solar electric generation system.

NTIS

Photovoltaic Conversion; Solar System

20050168144 Brookhaven National Lab., Upton, NY

New Findings on the Phase Transitions in Li(1-x)C(0)O(2) and Li(1-x)NiO(2) Cathode Materials during Cycling: In Situ Synchrotron X-Ray Diffraction Studies

Yang, X. Q.; Sun, X.; McBreen, J.; 1999; 20 pp.; In English

Report No.(s): DE2004-770778; BNL-66572; No Copyright; Avail: Department of Energy Information Bridge

No abstract available

Lithium Batteries; Phase Transformations; Synchrotrons; Cathodic Coatings; X Ray Diffraction

20050168247 Nuclear Research Center, Israel

Design and Testing of a 5 MW Battery-based Inductive Power Supply

Pokryvailo, A.; Kanter, M.; Kaplan, Z.; Maron, V.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 241-249; In English; See also 20050168165; Copyright; Avail: Other Sources

A 5MW battery-based inductive power supply (IPS) was designed and tested. The battery is assembled from 636 low-resistance lead-acid sealed batteries organized in strings that are connected to busbars via small-size contactors. A vacuum breaker serves as a closing switch, while an explosively driven opening switch interrupts the circuit, transferring the coil current to load. In case of load malfunction, the energy stored in the coil is dumped into a dummy load. The control and measurement means are decoupled from the high current carrying conductors. Optimization of the battery-coil matching is discussed. The current sharing between the strings is analyzed. IPS parasitic inductance for different arrangements is calculated. By careful design, it was reduced to 41 microhenry. PSpice simulations of the IPS, accounting for the components' nonlinearity, are presented. Main components, such as batteries, contactors and protective equipment were tested under high current conditions. The IPS was evaluated both with a resistive and an electro-thermal load up to a coil energy of 0.5MJ. The power amplification of 100 was realized. It was found the experimental results agree closely with calculations, and the IPS performs according to design specifications. Ways of IPS compactization using advanced battery technology are reviewed. Author

Lead Acid Batteries; Electric Power Supplies; Inductance; Electric Equipment Tests; Energy Storage

45
ENVIRONMENT POLLUTION

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

20050166374 Ohio State Univ., Columbus, OH, USA

Carbon Sequestration in Reclaimed Mined Soils of Ohio

Shukla, M. K.; Lal, R.; 2004; 24 pp.; In English

Report No.(s): DE2004-831124; No Copyright; Avail: Department of Energy Information Bridge

This research project is aimed at assessing the soil organic carbon (SOC) sequestration potential of reclaimed minesoils (RMS). The experimental sites, owned and maintained by the American Electrical Power, are located in Guernsey, Morgan, Noble, and Muskingum Counties of Ohio. These sites, characterized by age chronosequences, were reclaimed with and without topsoil application and are under continuous grass or forest cover. During this quarter, bulk and core soil samples were collected from all 13 experimental sites for 0-15 cm, 15-30 cm, and 30-50 cm depths.

NTIS

Carbon; Soil Sampling; Ohio; Mines (Excavations)

20050166387 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Survey of State Clean Energy Fund Support for Biomass

Fitzgerald, G.; Bolinger, M.; Wiser, R.; Aug. 2004; 26 pp.; In English

Report No.(s): DE2004-833540; No Copyright; Avail: Department of Energy Information Bridge

This survey reviews efforts by CESA member clean energy funds to promote the use of biomass as a renewable energy source. For each fund, details are provided regarding biomass eligibility for support, specific programs offering support to biomass projects, and examples of supported biomass projects (if available). For the purposes of this survey, biomass is defined to include bio-product gasification, combustion, co-firing, biofuel production, and the combustion of landfill gas, though not all of the programs reviewed here take so wide a definition. Programs offered by non-CESA member funds fall outside the scope of this survey. To date, three funds--the California Energy Commission, Wisconsin Focus on Energy, and the New York State Energy Research and Development Authority--have offered programs targeted specifically at the use of biomass as a renewable energy source. We begin by reviewing efforts in these three funds, and then proceed to cover programs in other funds that have provided support to biomass projects when the opportunity has arisen, but otherwise do not differentially target biomass relative to other renewable technologies.

NTIS

Biomass; Clean Energy; Energy Technology; Renewable Energy

20050166394 Sveriges Lantbruksuniv., Sweden

The Limitation of Air Pollution with Loose Housing of Laying Hens

Gustafsson, G.; von Wachenfelt, E.; 2004; 62 pp.; In Swedish

Report No.(s): PB2005-102990; No Copyright; Avail: CASI; A04, Hardcopy

Investigations about climate and air hygiene have been carried out at JBT:s research station Alnarp So'dergdrd. A climate chamber has been equipped with a housing system for loose housed laying hens which also has been supplied with a manure system with conveyors below a draining floor. How age, storage time of manure, ventilation rate, ventilation technique, bedding materials, fogging and showering with rape seed oil affect climate and air hygiene have been investigated during two production batches. He age of the hens had no influence on the release of ammonia. However, the age had an effect on the amount of manure stored in the building which will influence the release of ammonia. He investigations clearly showed that long time storage of manure will cause a rapid increase in ammonia concentrations. After about 7 days storage of manure in a bin the ammonia concentration will exceed the hygienic threshold limit value of 25 ppm. He release of ammonia from the bedding was considerable lower than from manure stored in a bin below a draining floor. The major reason why the release increases more rapid from manure stored in a bin is probably that the major part of the manure is left on the elevated slatted floor.

NTIS

Ammonia; Air Pollution; Chickens

20050166402 Environmental Protection Agency, Washington, DC, USA

Acid Rain Hourly Emissions Data 2004

2004; In English

Report No.(s): PB2005-500128; No Copyright; Avail: National Technical Information Service (NTIS)

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

NTIS

Electric Power Plants; Contaminants

20050166414 Lawrence Livermore National Lab., Livermore, CA

NARAC Products File Description, Version 2.1

Tull, J. E.; Belles, R. D.; Bonner, D. F.; Carroll, L. A.; Jan. 13, 2004; 30 pp.; In English

Report No.(s): DE2004-15009765; UCRL-TR-201941; No Copyright; Avail: Department of Energy Information Bridge

The National Atmospheric Release Advisory Center (NARAC) Products File is primarily used to transmit information about an atmospheric release calculation (a run) done on NARACs centralized system to end user tools such as the NARAC iClient and the NARAC Web. This Products File uses the eXtensible Markup Language (XML) to store this information. Normally, the name of this file is products.xml. This document describes the structure and content of this products.xml file.

NTIS

Information Dissemination; Document Markup Languages

20050166988 Grenoble-1 Univ., France

Which Tholins for Simulating Titan's Aerosols?

Bernard, J.-M.; Quirico, E.; Montagnac, G.; Reynard, B.; McMillan, P.; Bonal, Lydie; Rouzaud, J.-N.; Coll, P.; Schmitt, B.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The exploration of Titan by the CASSINI-HUYGENS mission includes different spectrometers covering the visible and

infrared ranges, which will probe the atmosphere (e.g. CIRS, DISR) and the surface (DISR). The analysis of these spectroscopic data requires the optical constant of analogues materials of Titan s aerosols. Titan s tholins, produced in laboratory from N2:CH4 mixtures in cold plasma, are considered as the best analogs available to date. However, large compositional and morphological variations are reported among Tholins formed from different experiments, and even within the same experiment. Different attempts have been made in order to better constrain the factors controlling Tholin s composition, but no systematic studies have been performed for determining the links between the spectroscopic properties and the chemical composition. This study focused on the chemical characterization of Tholins at the micrometric scale, by using different analytical techniques, and attempted to correlate the
Author
Aerosols; Titan; Spectroscopy; Infrared Radiation; Chemical Composition; Atmospheric Chemistry

20050167083 Wyoming Univ., Laramie, WY, USA
In Situ Aerosol Profile Measurements and Comparisons with SAGE 3 Aerosol Extinction and Surface Area Profiles at 68 deg North
[2005]; 5 pp.; In English
Contract(s)/Grant(s): NAG2-1576; No Copyright; Avail: CASI; A01, Hardcopy

Under funding from this proposal three in situ profile measurements of stratospheric sulfate aerosol and ozone were completed from balloon-borne platforms. The measured quantities are aerosol size resolved number concentration and ozone. The one derived product is aerosol size distribution, from which aerosol moments, such as surface area, volume, and extinction can be calculated for comparison with SAGE III measurements and SAGE III derived products, such as surface area. The analysis of these profiles and comparison with SAGE III extinction measurements and SAGE III derived surface areas are provided in Yongxiao (2005), which comprised the research thesis component of Mr. Jian Yongxiao's M.S. degree in Atmospheric Science at the University of Wyoming. In addition analysis continues on using principal component analysis (PCA) to derive aerosol surface area from the 9 wavelength extinction measurements available from SAGE III. Ths paper will present PCA components to calculate surface area from SAGE III measurements and compare these derived surface areas with those available directly from in situ size distribution measurements, as well as surface areas which would be derived from PCA and Thomason's algorithm applied to the four wavelength SAGE II extinction measurements.
Author (revised)
Aerosols; Sulfates; Atmospheric Composition; Principal Components Analysis; Ozone

20050168103 ICF Consulting, Fairfax, VA, USA
Air Toxics Risk Assessment Reference Library. Volume 2. Facility-Specific Assessment
Apr. 2004; 158 pp.; In English
Report No.(s): PB2005-104777; EPA-453-K-04-001B; No Copyright; Avail: CASI; A08, Hardcopy

This technical resource document describes several methods for preparing a site-specific risk assessment for a source (i.e., a single emission point within one facility), a group of sources (i.e., multiple emission points within one facility), or a group of similar facilities (e.g., within the same source category) that emit(s) toxic air pollutants. Air toxics may be emitted from power plants, factories, cars and trucks, and common household products. Sources that stay in one place are referred to as stationary sources. Vehicles and other moving sources of air pollutants are called mobile sources. This technical resource document is intended for assessing risks associated with stationary sources of air toxics. While its primary focus is on Hazardous Air Pollutants (HAPs), this resource document can be applied to all air pollutants (with the exception of criteria air pollutants, which are assessed using different tools and methods). This technical resource document is the second of a three-volume set. This report, Volume 2: Facility-Specific Assessment, builds on the technical tools described in Volume 1 by providing an example set of tools and procedures that can be used for source-specific or facility-specific risk assessments. Information is also provided on tiered approaches to source- or facility-specific risk analysis.
NTIS
Air Pollution; Emittance; Toxicity; Assessments

20050168117 National Inst. for Occupational Safety and Health, Pittsburgh, PA, USA
Airborne Dust Liberation during Coal Crushing
Organiscak, J. A.; Page, S. J.; 2000; 36 pp.; In English
Report No.(s): PB2005-105918; No Copyright; Avail: CASI; A03, Hardcopy

Airborne dust generation is one of the byproducts of coal mining, processing and handling. The amount of airborne total

dust (ATD, respirable size and larger) and airborne respirable dust (ARD) generated is of primary interest for designing the level of engineering controls needed for adequate dust abatement. Laboratory crushing experiments were conducted in a wind tunnel with a roll crusher to identify relationships among crushing parameters, product size, coal rank properties, and airborne dust generation. Through the first series of experiments, the effect of primary and secondary brakeage processes on both product size and airborne dust generation was examined. Through a second series of experiments, the effect of coal rank properties on product size and airborne dust generation was studied using a uniform crushing process with secondary breakage. Laboratory results indicate that secondary breakage of a particular coal notably increases the specific amount of ATD generated, while negligibly impacting the specific amount of ARD generated. A strong positive relationship was identified between the specific amounts of ATD and ARD generated during the primary breakage process (with minimal secondary breakage), but a negligible relationship was observed between the same two variables when secondary breakage was introduced into the crushing process. This indicates that most of the ATD and ARD is generated from the primary breakage, while secondary breakage has more of an influence on generating additional amounts of larger sized ATD.
NTIS
Coal; Dust; Crushing

20050168129 Federal Aviation Administration, Cambridge, MA, USA
EDMS Multi-Year Validation Plan
Wayson, R. L.; Fleming, G. G.; Kim, B.; Jun. 2001; 16 pp.; In English
Report No.(s): PB2005-105723; No Copyright; Avail: CASI; A03, Hardcopy

The Emissions and Dispersion Modeling System (EDMS) is the air quality model required for use on airport projects by the Federal Aviation Administration (FAA). This model has continued to be improved and very recently has included several important enhancements and methodology changes. These enhancements and changes have included changes to how the model computes dispersion, now using the U.S. Environmental Protection Agency (EPA) model, AERMOD. In theory, the incorporation of AERMOD should result in substantial improvements in EDMS accuracy, but validation using field measured data is necessary to substantiate this assumption and further support EDMS's use for airport evaluations.
NTIS
Air Quality; Environment Protection; Airports

20050168151
Airport Related Traffic and Mobile Emission Implications
Yu, L.; Li, X.; Wang, X.; Zhuo, W.; Dec. 2003; 138 pp.; In English
Report No.(s): PB2005-103024; No Copyright; Avail: CASI; A07, Hardcopy

This research intends to develop a microscopic framework to model the airport related traffic and emission implications. An approach to calibrate the driving behavior parameters of the traffic simulation model in the framework is proposed. A case study for Intercontinental Airport of Houston (IAH) is presented. The microscopic framework integrates a microscopic traffic simulation model and a modal emission model. A GA-based calibration approach defines the index of simulation accuracy as the Sum of Squared Errors (SSE) between the collected speeds and the simulated speeds at the pre-defined cross-sections along the road. The computer program implementing the GA-based approach is developed to search for the optimal parameters values. The field speed data are collected using the GPS system. It is found that the calibrated optimal values of the VISSIM driving behavior parameters result in a 50% decrease of the SSE value. The produced emissions of each vehicle show that the emission profiles reflect well the trends of the acceleration/deceleration. The emission results show that in the year 2002, the vehicles going in and out of IAH terminal area generate 2948 tons of CO2, 1.3 tons of HC, 13 tons of CO and 3.0 tons of NOx. These results can be referred by urban transportation planners when they conduct the airport-involved travel demand forecasting. The microscopic framework can not only assist in the operational-level analysis of the mobile source emission implications around the airport, but also provide a powerful tool to assist in the overall airport design and planning. The GA-based calibration approach can be used not only for airport roads, but also for other road networks.
NTIS
Airport Planning; Exhaust Emission; Air Traffic; Urban Transportation

20050168154 Apogee Scientific, Inc., Englewood, CO, USA
Assessment of Low Cost Novel Sorbents for Coal-Fired Power Plant Mercury Control. Quarterly Report, November 2, 2001-February 1, 2002
Sjostrom, S.; Feb. 2002; 16 pp.; In English
Report No.(s): DE2004-833617; No Copyright; Avail: Department of Energy Information Bridge

This is a Technical Report under a program funded by the Department of Energy's National Energy Technology Laboratory (NETL) to obtain the necessary information to assess the viability of lower cost alternatives to commercially available activated carbon for mercury control in coal-fired utilities. During this reporting period, several sorbent samples have been tested by URS in their laboratory fixed-bed system. The sorbents were evaluated under conditions simulating flue gas from power plants burning Powder River Basin (PRB) and low sulfur eastern bituminous coals. The equilibrium adsorption capacities of the sorbents for both elemental and oxidized mercury are presented. A team meeting discussing the overall program and meetings with Midwest Generation and Wisconsin Electric Power Company (WEPCO) concerning field testing occurred during this reporting period.
NTIS
Activated Carbon; Adsorption; Cost Reduction

20050168158 Apogee Scientific, Inc., Englewood, CO, USA
Assessment of Low Cost Novel Sorbents for Coal-Fired Power PLant Mercury Control. Quarterly Report, August 2, 2001-November 2, 2001
Sjostrom, S.; Nov. 2001; 14 pp.; In English
Report No.(s): DE2004-833621; No Copyright; Avail: Department of Energy Information Bridge
This is the first Technical Report under a program funded by the Department of Energy's National Energy Technology Laboratory (NETL) to obtain the necessary information to assess the viability of lower cost alternatives to commercially available activated carbon for mercury control in coal-fired utilities. During this reporting period, a Request for Candidate Sorbents was sent to fourteen groups including activated carbon manufacturers and research groups. Several sorbent samples have been sent to URS for laboratory fixed-bed testing. A preliminary Test Plan has also been developed.
NTIS
Sorbents; Activated Carbon; Energy Technology

20050168167 Kumamoto Univ., Japan
Streamer Discharges by Pulsed Power on a Spiral Transmission Line
Akiyama, Hidenori; Nishihashi, Yasuhiko; Tsukamoto, Shunsuke; Sueda, Tsuyoshi; Katsuki, Sunao; Hagler, Marion; Dickens, James C.; Inoue, Nobutada; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 109-114; In English; See also 20050168165; Copyright; Avail: Other Sources
Streamer corona discharges produced by pulsed power make enough high energy electrons to dissociate gases directly. Consequently, pulsed streamer discharges have been proposed for the removal of NOx and SO2 from flue gases, the production of ozone and the treatment of poisonous gases. It is proposed here to produce the pulsed streamer discharges on a spiral transmission line. The characteristics of the discharges are studied, comparing with results using a PSpice code. Then, the effectiveness and advantages of the spiral transmission line are discussed in view of real applications.
Author
Pulse Generators; Nitrogen Oxides; Sulfur Dioxides

20050168217 Old Dominion Univ., Norfolk, VA, USA
Pulsed Power for Advanced Waste Water Remediation
Schoenbach, Karl H.; Abou-Ghazala, Amr; Vithoulkas, Terry; Alden, Raymond W.; Turner, Robert; Beebe, Stephen; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 73-78; In English; See also 20050168165; Copyright; Avail: Other Sources
We describe a 2-stage technology for degradating water borne chlorinated/aromatic organic pollutants, based on a pulsed power treatment in the first stage followed by bio-treatment. The combination of a strong pulsed corona/streamer discharge in the water aerosol in the first stage with inoculation of partially dechlorinated (15-30%) processed water with bacteria Pseudomonas mendocina KR1 in the second stage demonstrated as high as 90% dechlorination in the first 40 hours after inoculation, whereas the control (non aerosol-treated sample) had no chloride ions released, and no bacterial growth. The main features and advantages of the novel two-stage approach, and future plans for research are presented and analyzed.
Author
Chlorination; Contaminants; Waste Water; Mediation; Electric Corona; Pulse Rate

20050168219 Lawrence Livermore National Lab., Livermore, CA, USA

Removal of NOx from diesel generator exhaust by pulsed electron beams

Penetrante, B. M.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 91-96; In English; See also 20050168165

Contract(s)/Grant(s): W-7405-eng-48; Copyright; Avail: Other Sources

The objective of this paper is to determine the effects of electron beam pulse parameters on the utilization of the reactive free radicals for removal of NO x from diesel generator exhaust. A dose per pulse less than 1 kGy has been determined to be optimum for effective radical utilization. During each post-pulse period, the radicals are utilized in the removal of NO x in a timescale of around 100 microseconds; thus, with pulse frequencies of around 10 kHz or less, the radical concentrations remain sufficiently low to prevent any significant competition between radical-pollutant and radical-radical reactions. It is shown that a pulsed electron beam reactor, operating with a dose per pulse of less than 1 kGy/pulse and pulse repetition rate of less than 10 kHz, will have the same plasma chemistry efficiency (parts per million of removed NOx per kGy of electron beam dose) as an electron beam reactor operating with a low dose rate of 50 kGy/s in continuous mode. Ozone accumulation is a limiting factor under high pulse frequency conditions. The total dose requirement determines the optimum combination of dose per pulse and pulse frequency for both radical utilization and prevention of ozone buildup.

Author

Nitrogen Oxides; Removal; Diesel Engines; Exhaust Emission; Electron Beams; Pulse Generators

20050168220 Los Alamos National Lab., NM, USA

Experimental results comparing pulsed corona and dielectric barrier discharges for pollution control

Korzekwa, R.; Rosocha, L.; Falkenstein, Z.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 97-102; In English; See also 20050168165; Copyright; Avail: Other Sources

Nonthermal plasmas efficiently produce highly reactive chemical species for the destruction of pollutants in gaseous effluents. Two devices commonly used to produce a nonthermal plasma in atmospheric pressure gases are the pulsed corona reactor (PCR) and the dielectric barrier discharge reactor, also referred to as a 'silent discharge plasma' (SDP) reactor. The PCR produces a nonthermal plasma by applying a fast-rising, short duration, high voltage pulse to a coaxial wire/tube geometry which initiates multiple streamers (electron avalanches) along the length of the tube. The high-energy electrons produced in the streamers create the desired active species (e.g., radicals) while maintaining near ambient neutral gas temperatures. The streamers are extinguished as the energy is depleted in the storage capacitance. The SDP reactor is constructed using either a coaxial or fiat-plate electrode geometry with a least one dielectric barrier placed between the high-voltage electrodes, leaving a few millimeter gap in which the nonthermal plasma is generated. When the breakdown voltage is reached in the gas gap, microdischarge streamers are produced throughout the gap volume which self-terminate when the build up of surface charge on the dielectric reduces the electric field in the gap. Although a fast rising pulse can be used to drive an SDP reactor, a sinusoidal voltage with a frequency of a few kilohertz is typically used to drive this type of reactor. When a fast-rising voltage pulse is used to drive these reactors, a higher reduced electric field strength (E/N) can be obtained than in the low-frequency-driven SDP reactors. In many cases a higher E/N results in a more efficient production of chemical radicals, which in turn interact with and destroy the low concentration pollutants in the gas. Commercially available power supplies are commonly used to drive the low frequency SDP reactor systems. These provide a simple and robust method of producing a nonthermal plasma for high power applications without the complexity of fast risetime, high-voltage switching circuits. A comparison of the results obtained in these devices is presented for various operating conditions and gas pollutants. Our primary interest is to explore whether the added complexity of fast risetime circuits has a payoff interms of overall chemical-processing efficiency.

Author

Pulse Generators; Dielectrics; Dischargers; Pollution Control; Electric Corona; Capacitance

20050168222 Technische Hogeschool, Eindhoven, Netherlands

Pulsed corona for gas and water treatment

vanHeesch, E. J. M.; Smulders, H. W. M.; vanPaasen, S. V. B.; Blom, P. P. M.; vanGompel, F. M.; Staring, A. J. P. M.; Ptasinski, K. J.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 103-108; In English; See also 20050168165; Copyright; Avail: Other Sources

Successful introduction of pulsed corona for industrial processes very much depends on the reliability of high-voltage and pulsed power technology and on the efficiency of energy transfer. In addition, it is crucial that we achieve adequate electromagnetic compatibility (EMC) between high-voltage pulse source and surrounding equipment. Pulsed corona (1.5 kW) is generated in a pilot unit that produces narrow 50 MW pulses at I000 pps. The pilot unit can run continuously for use in

industrial applications: cleaning of gases (100 m3/h) or fluids (e.g. waste water). Various chemical processes, such as toluene removal from an air flow are tested. To examine the processes in the reactor we use current and voltage sensors and a fast CCD camera. We also developed a model to analyze the VOC conversion. Incorporated EMC techniques are based on the successful concept of constructing a low transfer impedance between common mode currents induced by pulsed power and differential mode voltages in signal lines and external mains AC.
Author
Electric Corona; Water Treatment; Gases; Waste Water

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*.

20050166870 American Museum of Natural History, New York, NY, USA
Tomographic Location of Potential Melt-Bearing Phenocrysts in Lunar Glass Spherules
Ebel, D. S.; Fogel, R. A.; Rivers, M. L.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color and black and white illustrations
Contract(s)/Grant(s): W-31-109-eng-38; NAG5-12855; NAG5-13054; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In 1971, Apollo 17 astronauts collected a 10 cm soil sample (74220) comprised almost entirely of orange glass spherules. Below this, a double drive-tube core sampled a 68 cm thick horizon comprised of orange glass and black beads (crystallized equivalents of orange glass). Primitive lunar glass spherules (e.g.-A17 orange glasses) are thought to represent ejecta from lunar mare fire fountains [1, 2]. The fire-fountains were apparently driven by a combination of C-O gas ex-solution from orange glass melt and the oxidation of graphite [3, 4]. Upon eruption, magmas lost their volatiles (e.g., S, CO, CO2) to space. Evidence for volatile escape remains as volatile-rich coatings on the exteriors of many spherules [e.g., 5,6]. Moreover, [7] showed that Type I and II Fe-Ni-rich metal particles found within orange glass olivine phenocrysts, or free-floating in the glass itself, are powerful evidence for the volatile driving force for lunar fire fountains.
Derived from text
Spherules; Tomography; Petrology; Glass

20050166880 NASA Johnson Space Center, Houston, TX, USA
Three-System Isotopic of Lunar Norite 78238: Rb-Sr Results
Edmundson, J.; Borg, L. E.; Nyquist, L. E.; Asmerom, Y.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The duration of lunar magma ocean (LMO) crystallization is poorly constrained (Fig. 1). Three techniques employed to determine the age of LMO solidification are 1) dating ferroan anorthosites (FANs), thought to be primary cumulates from the LMO, 2) calculating model ages for KREEP, the most incompatible element enriched material that remained after approx.99.5% of the LMO crystallized [1], and 3) constraining the age of the oldest KREEP-rich magnesium suite (Mg-suite) or alkali suite rock. Dating FANs is difficult because the samples are essentially monomineralic and contain low abundances of many elements used in isotopic dating. In addition, the young ages determined for some FANs may be related to impact metamorphism, potentially making FANs non-ideal for dating the age of LMO crystallization (e.g., [2]). Model ages for KREEP formation are dependent on the assumptions of the initial isotopic composition and parent/daughter ratio of the source. However, lunar rocks are susceptible to isotopic resetting and volatile element loss during shock, and are therefore unlikely to yield consistent model LMO crystallization ages (e.g., [3]). Rocks from the Mg-suite contain KREEP, indicating that they formed after LMO crystallization, and have old ages that indicate they formed almost immediately after the LMO crystallized (Fig. 1). Therefore, precisely dating the oldest Mg-suite rock is a promising way to constrain the age of LMO solidification.
Derived from text
Magma; Lunar Rocks; Time Measurement; Anorthosite; Crystallization; Metamorphism (Geology); Kreep

20050166887 Geological Survey of Iran, Tehran, Iran (Islamic Republic of)

Petrological and Geochemical Consideration on the Tuserkanite Meteorite

Emami, M. H.; Monsee, R.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

On June 27th,1985, near midnight, according to the visual observation of people in Tuyserkan ,a light gray meteorite with dark vein system in 5.7 kg weight fell from the sky that its landing in Esmaeel Abad (Hamedan province ,Iran).The meteorite was radiating a yellow to red light at the time of falling and it was hot till tomorrow morning .Thermal temperature of the meteorite is estimated between 700 to 1000 C and in external surface it has a thin glassy layer which its' thickness not exceed than 1 mm. The mentioned layer is the result of external melting and fast getting cold of meteorite in moving to atmosphere. Its dimension is 21 cm length, 19 cm width and diameter of it is 14.5 cm .Density of the whole meteorite is 2.30 kg/cu m,which in parts with less vesicular and more concentrated dark minerals and basic materials, it reaches to 2.40 kg/m3.Because of its' falling place in Toyserkan city, we called it Tuyserkanite (fig1). Regarding to the size and weight of the meteorite, meteorite crater in ground wasn't considerable .Tuyserkanite, in respect of chemical compounds and higher amount of silica (SiO2=93%), is only comparable with some Tektites. It consists of two dark and light ones .The light part is contain of cristobalite , quartz and a little amount of alkali feldspar ,accompanying with some minerals such as magnetite ,hematite , ilmenite and rutile ,and it is enriching of mafic minerals such as olivine ,in form of skeletal crystal and pyroxene with radiating spinifex texture. Chemical compounds of dark parts are equal to phenotephrite alkali basic rocks. The existence of vesicular texture and more vesicular vitric veins and veinlets in mafic and dark part are some pronounced features of Tuyserkanite. Both dark and light parts of Tuyserkanite with distinct and contrast composition is somewhat similar to immicible liquids. This phenomenon is resembled of magma crystallization in residual fluid of lunar rocks (low temperature), that it has seen in form of inclusion in many samples which were collected by Apollo 11&12. In main texture of the meteorite, we could see lunar regolith, along with Breccia which is resulted by shock effect. The mineralogy compound of this meteorite is similar to residual rhyolite observed in lunar basic rocks.

Derived from text

Petrology; Geochemistry; Meteoritic Microstructures; Meteorites; Chemical Composition; Tektites; Mineralogy

20050166935 Tokyo Univ., Japan

The Flow Dynamics of Long Run-Out Landslides on Mars from 3-D Granular Flow Models

Barnouin-Jha, O. S.; Wada, K.; Matsui, T.; Sugita, S.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Interest in the emplacement mechanisms of large martian landslides exists because of their possible implications for the location and near surface evolution of water on Mars [e.g., 1,2]. These landforms could have formed as a direct consequence of the presence of such water. In addition, these landslides represent major mass displacements whose emplacement dynamics may contribute to the long term evolution of the Valles Marineris canyon system [3,4]. In this study, we attempt to gain some inferences into the flow conditions that may generate various topographic and morphologic attributes of long run-out landslides on Mars, and flow velocities as inferred from topography [e.g., 5]. Unlike previous numerical efforts where a continuum description was used to model the motion of the Valles Marineris slides [e.g., 6], we use a 3-D granular flow model. In this model, each grain in the flow is treated as a discrete element [7]. We compare landslide observations to results of our discrete element model (DEM) for several physical parameters describing the interaction between the individual grains in the flow. The results of this DEM are expected to differ from classic 2- D studies such as Campbell et al.,[8] because of the 3-D geometry.

Author

Landslides; Mars Surface; Structural Properties (Geology); Flow Velocity; Three Dimensional Models

20050166967 Academy of Sciences (Russia), Moscow, Russia

Venus: Geologic Mapping and History of the Beta Regio Structure

Basilevsky, A. T.; Head, J. W.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: This paper combines results of our previous [1] and recent [2] Magellan-image-based mapping of the V17

quadrangle (25-50degN, 270-300degE) (Figs 1 and 2) with the results of our research group in stratigraphy/geological history of other regions of this planet [e.g., 3-14].
Derived from text
Geological Surveys; Mapping; Stratigraphy; Venus Surface; Geology

20050166968 Academy of Sciences (Russia), Moscow, Russia
Mars Express HRSC View of Western Olympus Mons: Evidence for Ice-bearing Deposit and High-Altitude Glaciation
Basilevsky, A. T.; Neukam, G.; Ivanov, B. A.; Werner, S. C.; vanGesselt, S.; Head, J. W.; Hauber, E., et al.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This study is based on the geological analysis of the HRSC images taken on the orbit 0143 (12 m/px in nadir channel). The study area includes the western segment of Olympus Mons and the adjacent lowland plains (Fig. 1). Part of the volcano above the scarp is rather flat and is called 'summit plateau' below. What is often called the volcano scarp is a slope classified into three morphologic types: Type 1 (S1 in Fig.1) is the steepest and dominated by ravines in its upper part and by talus beneath; Type 2 (S2) is intermediate in steepness and dominated by downslope trending linear depressions, part of which have channel-like morphology; and Type 3 (S3), is the most gentle and covered by lava flows, continuing from the summit plateau down to the lowland plains.
Derived from text
Geology; Plateaus; Mars Express; Mars Volcanoes; High Altitude; Deposits

20050166970 NASA Ames Research Center, Moffett Field, CA, USA
Searching for Life Underground: An Analysis of Remote Sensing Observations of a Drill Core from Rio Tinto, Spain for Mineralogical Indications of Biological Activity
Battler, M.; Stoker, C.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Water is unstable on the surface of Mars, and therefore the Martian surface is not likely to support life. It is possible, however, that liquid water exists beneath the surface of Mars, and thus life might also be found in the subsurface. Subsurface life would most likely be microbial, anaerobic, and chemoautotrophic; these types of biospheres on Earth are rare, and not well understood. Finding water and life are high priorities for Mars exploration, and therefore it is important that we learn to explore the subsurface robotically, by drilling. The Mars Analog Rio Tinto Experiment (MARTE), has searched successfully for a subsurface biosphere at Rio Tinto, Spain [1,2,3,4]. The Rio Tinto study site was selected to search for a subsurface biosphere because the extremely low pH and high concentrations of elements such as iron and copper in the Tinto River suggest the presence of a chemoautotrophic biosphere in the subsurface beneath the river. The Rio Tinto has been recognized as an important mineralogical analog to the Sinus Meridiani site on Mars [5].
Derived from text
Remote Sensing; Mineralogy; Cores; Drilling; Bioassay; Minerals

20050166978 Lunar and Planetary Inst., Houston, TX, USA
Are the Complex Algerian Meteoritic Craters Potential Hydrocarbon Traps?
Belhai, D.; Merle, O.; Vincent, P.; Afalfiz, A.; Devouard, B.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 1 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the Algerian Sahara four meteoritic craters are described. They account for 26,6% of all the craters which exist in the African continent. Two as of them are of simple type and two others of complex type. All of these craters, are studied : They are Amguid, Maadna (Talemzane), Tin Bider and Ouarkziz. They are all located in the Saharan Platform, and form circular depressions. There diameter varies from 450 m (Amguid) to 6 km (Tin Bider). The Tin Bider and Ouarkziz are of complex type : Tin Bider is located on the 1/200 000 of Tilmas Lamra map, in North east of the erg A fer at 265 km in the East of In Salah, in the Tinrhert plateau (27 36 ' north 005 07' East). The Ouarkziz is crater is located near algero-Morrocan bondary, at 170 km North-East of Tindouf and to 20 km in the North-West of Foum-Defili (7 33' and 29 00 ' North). Its diameter is 3500 meters. Called round of Ouarkziz by Fabre and Al (1970), one recognized there all the characteristics of a meteoritic craters. World wide some meteoritic structures are recognized as hydrocarbon deposit. The most documented structures are

those of Avac (Alaska) (Kirschner and Al, 1992) and Viewfield and Red Creek (Donofrio, 1981). The Geological analysis of the meteoritic craters of Tin Bider and Ouarkziz reveals indentical characters to those of Avac and Viewfield. Their detailed study confirm the possibility of the presence of hydrocarbons.
Author
Meteorite Craters; Hydrocarbons; Tin; Deposits

20050166981 Institut de Physique du Globe, Paris, France
Modeling of Surface and Subsurface Loads Associated with the Major Martian Volcanoes
Belleguic, V.; Wieczorek, M.; Lognonne, P.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the absence of in situ geophysical measurements, modeling the relationship between gravity and topography is one of the few methods that can be used to constrain the properties of a planet s crust and upper mantle. In this study, localized spectral admittances of the large Martian volcanoes are modeled by assuming that surface and subsurface loads are elastically supported by the lithosphere. The resulting gravity anomalies depend upon physical parameters such as the crustal and load densities and the thicknesses of the elastic lithosphere and crust. In order to increase the accuracy of this type of modeling, a new method for calculating gravity anomalies and lithospheric deflections when the load density differs from that of the crust has been developed. As recent studies [12, 2] have highlighted the evidence for recent volcanic activity on Mars, the Martian mantle must be still dynamic, and variations in either temperature or composition are likely to play an important role in the planet s observed topography and gravity field. In addition of surface loads, we have therefore investigated the possible presence of subsurface loads acting on the lithosphere, either as dense intrusive materials in the crust or less dense materials in the mantle. This later possibility could be a result of temperature anomalies in a mantle plume and/or a depleted mantle composition.
Derived from text
Mars Volcanoes; Crusts; Depletion; Mars Surface; Loads (Forces); Gravitational Fields; Planetary Mantles

20050166997 Imperial Coll. of Science, Technology and Medicine, London, UK
Cryptoendolith Colonization of Diverse Substrates, 1, Cultivation and Characterization
Blackhurst, R. L.; Roberts, D.; Jadbubansa, P.; Genge, M. J.; Grady, M. M.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Cryptoendoliths are microorganisms that have found refuge from the hostile environmental conditions of the Dry Valleys of Antarctica in the interstitial spaces of porous rocks. The rock substrates provide conditions that are suitable for life which contrast sharply with the abiotic rock surface. Endolithic communities are thought to have evolved when changes in environmental conditions rendered rock surfaces inhospitable (e.g. owing to glaciation) and the organisms withdrew into protective rock niches. These microbial habitats are thought to represent the last footholds of life in a gradually deteriorating environment, and as such serve as models for certain exobiological scenarios of the putative Martian biosphere.
Derived from text
Cultivation; Deterioration; Exobiology; Interstitials; Microorganisms

20050167016 Academy of Sciences of the Ukraine, Kharkov, Ukraine
North-South Roughness Anisotropy on Venus: Magellan Altimeter Data Revisited
Bondarenko, N. V.; Kreslavsky, M. A.; Head, J. W.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Magellan radar altimeter (RA) measurements were processed independently by teams at MIT and at Stanford University. The latter team focused on surface roughness properties. Initial results from that work were reported in [1]. Later the results were archived in the PDS as the so-called SCVDR data set (Surface Characteristics Vector Data Record), where data are stored as points along orbits, and the GVDR data set (Global Vector Data Record), where data are presented in a map-projected gridded format. We are now applying these data to geology-related studies.
Derived from text
Anisotropy; Surface Roughness; Slopes; Geology

20050167099 Colorado Univ., Boulder, CO, USA

Cusp Dynamics-Particle Acceleration by Alfven Waves

Ergun, Robert E.; Parker, Scott A.; [2005]; 4 pp.; In English

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Successful results were obtained from this research project. This investigation answered and/or made progresses on each of the four important questions that were proposed: (1) How do Alfven waves propagate on dayside open field lines? (2) How are precipitating electrons influenced by propagating Alfven waves? (3) How are various cusp electron distributions generated? (4) How are Alfven waves modified by electrons? During the first year of this investigation, the input parameters, such as density and temperature altitude profiles, of the gyrofluid code on the cusp field lines were constructed based on 3-point satellite observations. The initial gyrofluid result was presented at the GEM meeting by Dr. Samuel Jones.

Author

Plasma Waves; Geomagnetism; Particle Acceleration; Polar Cusps

20050167130 New Mexico Univ., Albuquerque, NM, USA

Geochronology of Clasts in Polymict Ureilite Dar Al Gani 665

Cohen, B. A.; Swindle, T. D.; Olson, E. K.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Polymict ureilites are regolith breccias, composed mainly of monomict ureilite-like material, but containing approx. 2 vol.% of feldspathic clasts. O-isotope compositions of most feldspathic clasts in polymict ureilites plot along the ureilite mixing line (slope approx.1) with d17O values similar to those in monomict ureilites [1, 2]. Feldspathic clasts may therefore be pieces of 'missing basalts,' material complementary to monomict ureilites, providing unique insights into the evolution of the ureilite parent body (UPB). Several subsets of feldspathic clasts have been identified in polymict ureilites [2-5], some of which represent common igneous lithologies whose mafic minerals show a normal (carbon-free) igneous fractionation trend and are likely to be early partial melts from the UPB [3]. Other clast populations have common mineralogies, but their petrographic origin has not been definitively determined.

Derived from text

Ureilites; Geochronology; Breccia; Regolith; Mineralogy; Isotopes; Fractionation

20050167140 Minnesota State Univ., Moorhead, MN, USA

Dependence of Ru2O3 Activity on Composition of Silicate Melts: Using Statistical Correlations to Infer Thermodynamic Behavior in the Melt

Colson, R. O.; Malum, K. M.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124

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Understanding variations in activity with composition is an essential step in improving prediction of partition coefficients during magma evolution. Variations in activity with composition are complex and do not generally exhibit ideal behavior relative to a traditional melt-component set. Although deviations from component ideality can be modeled numerically by simply fitting to compositional variables (such as in a regular or subregular solution model), such models have not been particularly successful for describing variations in trace component activities. A better approach might be to try to identify components that do a better job of describing the behavior of the species in the melt. Electrochemical Measurement of Ru2O3 activities: Electrodes were inserted into silicate melt beads of various compositions (Table 1) suspended on Ptwire loops in a 1-atm gas mixing furnace. An electrical potential was imposed between the electrodes, the imposed potential increasing along a step ramp with a pulse imposed on each step (Fig. 1). Current flows between electrodes when electroactive species in the melt are oxidized or reduced at the electrodes. The resulting current was measured at the top and bottom of the voltage pulse, and the difference (the differential current) was plotted against potential. The peak of the resulting curve is related to the activity coefficient for the particular electroactive species (Ru2O3) in the melt [1, 2, 3]. A significant part of the nonideal contribution to activity is due not to intrinsic properties of the component in the melt, but to our ignorance about the state and mixing properties of the component in the melt.

Author

Melts (Crystal Growth); Dynamic Characteristics; Silicates; Statistical Correlation; Thermodynamics

20050167159 Geological Survey, Flagstaff, AZ, USA

Newly Discovered Meteor Crater Metallic Impact Spherules: Report and Implications

Chapman, M. G.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This report documents the discovery of large (3 mm to 1.5 cm) metallic particles 82 km from Meteor (Barringer) impact crater, on a high plain west of the Little Colorado River. The particles are nonvesicular and extremely spherical. Their location indicates that the Meteor Crater impact predated the deep cutting of the Little Colorado River. In addition, these spherules may have implications for the origin of the Mars 'blueberries' at the Opportunity Landing Site.

Derived from text

Spherules; Meteorite Collisions; Meteorite Craters; Hypervelocity Impact

20050167184 Rutgers Univ., Piscataway, NJ, USA

Isotopic Mass Fractionation of Iron in Chondrules, Evaporation or Reduction?

Cohen, B. A.; Levasseur, S.; Zanda, B.; Hewins, R. H.; Halliday, A. N.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: Isotopic mass fractionation of iron was measured in chondrules with values ranging between 1.0 to 2.0% [1]. These fractionations were interpreted as the result of Fe depletion from metal-silicate fractionation during chondrule formation [2]. An alternative explanation, presented by [1], suggests that these compositions reflect those of chondrule precursors based on the lack of correlation with textures or metal content. Calculations have shown that the iron isotope mass fractionations measured in chondrules are too low to explain chondrule formation by extensive free evaporation [3]. Work by [4] concluded that extensive Fe-loss during the formation of Renazzo chondrules was followed by its recondensation. As the loss of Fe is mostly driven by FeO-evaporation from the silicate melt [4], metal grains should exhibit lighter isotopic signatures relative to the silicates. This is however not observed so far, as preliminary results by [5] indicate that metal is heavier than silicates by approximately 0.2% for Fe57, similarly to what is observed in pallasites [6]. In a study presented by [7] experiments conducted at high temperatures and reducing conditions resulted in Fe-isotopic fractionations in the silicate phase with no significant fractionation in the metal. [7] proposed that these fractionations were the product of the formation of the metal rather than an evaporative effect. Here we have extended the study to both longer and shorter heating durations as well as to a lower temperature.

Derived from text

Iron Isotopes; Isotopic Labeling; Chondrule; Fractionation

20050167186 Imperial Coll. of Science and Technology, London, UK

How Big Was the Chesapeake Bay Impact? Insight from Numerical Modeling

Collins, G. S.; Wunnemann, K.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color and black and white illustrations

Contract(s)/Grant(s): USGS-03ERAG022; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Beneath the Chesapeake Bay and Delmarva Peninsula in Virginia, USA, lies a large impact structure. It was discovered as a result of an anomalous breccia layer in boreholes from the eastern seaboard of the USA [1-3]. The breccia was correlated with samples of impact-melt ejecta found across the region-the North American tektite strewn field [2, 4]-and an impact origin was confirmed by the presence of shocked minerals [5, 6]. At the time of impact (35.2 to 36.0 Ma), the locality was in a shallow marine environment: the crystalline basement was overlain by 600-1000 m of unconsolidated sediments and 200-600 m of water [7]. Aside from erosion by the tsunami and backwash generated by the impact, the crater is well preserved. Figure 1 illustrates the main structural elements of the Chesapeake Bay impact crater (CBIC), based on the interpretation of seismic reflection data and drill cores [2, 7-10]. In schematic terms, the basement structure at the CBIC has the morphology of an inverted sombrero with a deep inner basin surrounded by a shallower brim [2, 7, 8]. The surface morphology of the crater, however, is almost entirely flat due to the presence of an unusually thick synimpact crater fill deposit, the Exmore breccia, which blankets the crater floor and laps over the outer rim.

Derived from text

Boreholes; Craters; Impact Melts; Breccia

20050167189 Laboratoire de Planetologie et Geodynamique, Nantes, France

Methodology of Hyperspectral Reflectance Data Analysis for Mineralogical Mapping of Planetary Surfaces: Application to OMEGA/Mars-Express Images

Combe, J.-P.; Sotin, C.; LeMouelic, S.; Launeau, P.; Mustard, J.; Gendrin, A.; Bibring, J.-P.; Langevin, Y., et al.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Reflectance measurements performed by imaging spectrometers are powerful tools to quantify and to map the mineralogical composition of planetary surfaces, which is a key information in geology. The OMEGA imaging spectrometer onboard Mars-Express allows studies at a global scale with a spatial resolution varying from 300 m/pixel to 4 km/pixel. Because these distances are usually large compared to the scale of spatial heterogeneity of rocks and soils, each spectrum corresponds to a mixture of different components present in the area covered by one pixel. The objective of the hyperspectral data analysis is to identify mineralogical components among spectral mixtures, and to quantify them in order to produce global maps. Methods must be designed to process automatically millions of spectra. The general principle is to compare hyperspectral data with reference spectra of minerals and rocks. The purest spectral components of an image are the most similar to mineral spectra. An efficient method is statistical analysis by Minimum Noise Fraction (MNF [1]) combined with Pixel Purity Index (PPI [2]). For identification, compositions within an image are assumed pure enough to be compared with a monomineral spectrum.

Derived from text

Reflectance; Imaging Spectrometers; Planetary Surfaces; Thematic Mapping; Mineralogy; Planetary Mapping

20050167192 Chicago Univ., Chicago, IL, USA

Nickel Isotopic Composition of Fe-Ni Metal from Iron Meteorites and the Brenham Pallasite

Cook, D. L.; Wadhwa, M.; Clayton, R. N.; Janney, P. E.; Dauphas, N.; Davis, A. M.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The former presence of the short-lived radionuclide Fe-60 (t(sub 1/2) = 1.49 My) has been reported from numerous meteoritic components. Excesses of the daughter isotope, Ni-60, have been found in ordinary [1,2] and enstatite chondrites [3], which originated from primitive parent bodies, as well as eucrites [4] and iron meteorites [5], which formed in differentiated parent bodies. In addition to Ni-60, excesses of daughter isotopes of the short-lived radionuclides Pd-107(t(sub 1/2) = 6.5 My) and Mn-53(t1/2 = 3.7 My) have been reported from iron meteorites [6,7]. These short-lived nuclides and their decay products can provide high-resolution chronometry of iron meteorites and, in the case of Fe-60, may also have contributed to heating and differentiation on their parent bodies. Moreover, recent studies indicate that iron meteorites may contain nucleosynthetic anomalies for some elements [8]. Therefore, the five isotopes of Ni were analyzed in eight different iron meteorites to determine if any contained excess Ni-60 from the decay of 60Fe and to search for the presence of any nucleosynthetic anomalies. Evidence for the former presence of live Pd-107 and 53Mn has been reported for the Brenham pallasite [6,9]. Hence, it also was included in this investigation.

Derived from text

Nickel Isotopes; Iron Isotopes; Palladium Isotopes; Radioactive Isotopes; Chondrites

20050167343 Air Force Research Lab., Hanscom AFB, MA USA

Using Quasi-Linear Diffusion to Model Acceleration and Loss from Wave-Particle Interactions

Albert, J. M.; Sep. 2004; 7 pp.; In English

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Current research has reemphasized the importance of cyclotron resonant wave-particle interactions for radiation belt electrons. Whistler mode hiss, chorus, and EMIC waves can act in combination to cause acceleration and loss of radiation belt electrons at greater rates than previously appreciated. These processes can be described by quasi-linear theory, but calculating quasi-linear diffusion coefficients is computationally demanding. Recent advances have been made in computing bounce averaged quasi-linear pitch angle, energy, and mixed diffusion coefficients for hiss and EMIC in the high density plasmasphere; this paper outlines generalization of these techniques for chorus waves, prevalent in the low density region outside the plasmasphere. These coefficients are associated with a two-dimensional diffusion equation whose numerical solution by finite differencing methods requires care, for reasons having to do with the relation between the mixed and other diffusion coefficients, as discussed.

DTIC

Acceleration (Physics); Diffusion; Diffusion Theory; Losses; Wave Propagation; Wave-Particle Interactions

20050167740 State Univ. of New York, Plattsburgh, NY, USA

Chemical and Mineralogical Analyses of Particles from the Stratospheric Collections Coinciding with the 2002 Leonid Storm and the 2003 Comet Grigg-Skjellerup Trail Passage

Flynn, G. J.; Lanzirotti, A.; Sutton, S. R.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

NASA collected particles from the stratosphere at times coinciding with the 2002 Leonid Shower, associated with comet Tempel-Tuttle, and with Earth's crossing of the dust steam from comet Grigg-Skjellerup in 2003, using the same techniques employed for collection of interplanetary dust particles (IDPs). We compared these putative cometary particles with previously examined IDPs, the majority of which are believed to be from asteroids [1].

Derived from text

Interplanetary Dust; Asteroids; Chemical Analysis; Collection; Leonid Meteoroids

20050167741 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Chromium on Eros: Further Evidence of Ordinary Chondrite Composition

Foley, C. N.; Nittler, L. R.; Brown, M. R. M.; McCoy, T. J.; Lim, L. F.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations

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The surface major element composition of the near-earth asteroid 433-Eros has been determined by x-ray fluorescence spectroscopy (XRS) on the NEAR-Shoemaker spacecraft [1]. The abundances of Mg, Al, Si, Ca and Fe match those of ordinary chondrites [1]. However, the observation that Eros appears to have a sulfur abundance at least a factor of two lower than ordinary chondrites, suggests either sulfur loss from the surface of Eros by impact and/or radiation processes (space weathering) or that its surface is comprised of a somewhat more differentiated type of material than an ordinary chondrite [1]. A definitive match for an ordinary chondrite parent body has very rarely been made, despite the conundrum that ordinary chondrites are the most prevalent type of meteorite found on Earth. Furthermore, Eros is classified as an S(IV) type asteroid [2] and being an S, it is the second most prevalent type of asteroid in the asteroid belt [3].

Derived from text

Chromium; Chondrites; Near Earth Asteroid Rendezvous Mission; Asteroid Belts; X Ray Fluorescence; Asteroids; Chemical Analysis

20050167746 Coimbra Univ., Coimbra, Portugal

New Ar-Ar Age Determinations for the Lunar Mare Basalts Asuka 881757 and Yamato 793169

Fernandes, V. A.; Morris, A.; Burgess, R.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There are relatively few basaltic lunar meteorites available for study (7-12 depending if breccias are considered) and yet they represent important samples to gain a global perspective of lunar volcanism. Considering that the previously determined Ar-Ar ages for the lunar meteorites Asuka 881757 (Asuka) and Yamato 793169 (Yamato) showed relatively large variation (Table 1), the present work is an attempt to better understand their ages as well as acquire other information from these basalts.

Derived from text

Argon; Breccia; Basalt; Meteorites; Mineralogy; Lunar Maria; Chronology

20050167747 NASA Ames Research Center, Moffett Field, CA, USA, Instituto Nacional de Tecnica Aeroespacial, Torrejon de Ardoz, Spain

RIO Tinto Faulted Volcanosedimentary Deposits as Analog Habitats for Extant Subsurface Biospheres on Mars: A Synthesis of the MARTE Drilling Project Geobiology Results

Fernandez-Remolar, D. C.; Prieto-Ballesteros, O.; Rodriquez, N.; Davila, F.; Stevens, T.; Amils, R.; Gomez-Elvira, J.; Stoker, C.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Geochemistry and mineralogy on Mars surface characterized by the MER Opportunity Rover suggest that early Mars hosted acidic environments in the Meridiani Planum region [1, 2]. Such extreme paleoenvironments have been suggested to be a regional expression of the global Mars geological cycle that induced acidic conditions by sulfur complexation and iron

buffering of aqueous solutions [3]. Under these assumptions, underground reservoirs of acidic brines and, thereby, putative acidic cryptobiospheres, may be expected. The MARTE project [4, 5] has performed a drilling campaign to search for acidic and anaerobic biospheres in R o Tinto basement [6] that may be analogs of these hypothetical communities occurring in cryptic habitats of Mars. This Rio Tinto geological region is characterized by the occurrence of huge metallic deposits of iron sulfides [7]. Late intensive diagenesis of rocks driven by a compressive regimen [8] largely reduced the porosity of rocks and induced a cortical thickening through thrusting and inverse faulting and folding. Such structures play an essential role in transporting and storing water underground as any other aquifers do in the Earth. Once the underground water reservoirs of the Ro Tinto basement contact the hydrothermal pyrite deposits, acidic brines are produced by the release of sulfates and iron through the oxidation of sulfides [9].
Derived from text
Sediments; Biosphere; Geochemistry; Planetary Geology; Mars Surface; Mars Environment

20050167752 FOELDIX, Budapest, Hungary
Europa Analog Ice-splitting Measurements and Experiments with Ice-Hunveyor on the Frozen Balaton-Lake, Hungary
Foldi, T.; Hargitat, H.; Hegyi, S.; Hudoba, G.; Kovacs, Z.; Rosko, F.; Toth, S.; Pinter, A.; Berczi, S.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color and black and white illustrations
Contract(s)/Grant(s): MUI-TP-190/2004; MUI/TP-190/2005; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Lake Balaton is a 70 km long and 8 km wide lake in Hungary. Its geological setting is in a tectonic fault. The lake consists of two basins: the NE one and the SW one. The average depth is 4 meters, but this depth does not exceed the 5 meters, except in one place, in the well of Tihany, where it deepens to 16 meters. The movements of the water inside the lake allows no regular modeling, because in case of the classical weave propagation model the amplitude of surface-weaves is comparable with the average depth of the lake.
Derived from text
Ice; Tectonics; Geology; Lakes; Europa

20050167754 Universidad Autonoma de Madrid, Spain
Martian Acidic Environments Through Time: Opportunities for Life
Fairen, A. G.; Amils, R.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It has been proposed that a CO2 dominated atmosphere in early Mars would rendered mildly acidic oceans [1] by releasing free protons in the sequence H2O + CO2(g) H2CO3 H+ + HCO3 -. The presence of soluble iron in its waters contributed even more to oceanic acidification: hydrolysis of ferrous ion generates free protons by the equilibrium Fe2+ + 2H2O Fe(OH)2 + 2H+, and the acidification is much more effective if the iron is in the form of ferric ion, a product of iron photooxidation: Fe3+ + 3H2O Fe(OH)3 + 3H+. Moreover, jarosite minerals, as well as evaporite deposits containing magnesium sulphate salts, a typical sublimation residue, have been detected by the MER Opportunity in the sediments deposited at Meridiani Planum, a near-equatorial region of Mars. The amount of salts detected, up to 40% [2], leads us to expect that sulphate levels in ancient martian oceans were at least at the same order of magnitude as those derived from weathered ultramafic rocks on Earth. Following the Opportunity results, however, we can assume a Fe3+ enriched solution in equilibrium with jarosite at least locally and/or temporarily, so potentially displaying sulphate levels up to 13.5 mM [1].
Derived from text
Mars Environment; Acidity; Carbon Dioxide; Hydrolysis; Ferric Ions; Sedimentary Rocks; Rocks; Mineral Deposits; Mars Surface

20050167756 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Visible-Near Infrared Imaging Spectrometer Data of Explosion Craters
Farr, T. G.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 1 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In a continuing study to capture a realistic terrain applicable to studies of cratering processes and landing hazards on Mars, we have obtained new high resolution visible-near infrared images of several explosion craters at the Nevada Test Site. We

used the Airborne Visible-Infrared Imaging Spectrometer (AVIRIS) to obtain images in 224 spectral bands from 0.4-2.5 microns [1]. The main craters that were imaged were Sedan, Scooter, Schooner, Buggy, and Danny Boy [2]. The 390 m diameter Sedan crater, located on Yucca Flat, is the largest and freshest explosion crater on Earth that was formed under conditions similar to hypervelocity impact cratering. As such, it is effectively pristine, having been formed in 1962 as a result of the detonation of a 104 kiloton thermonuclear device, buried at the appropriate equivalent depth of burst required to make a 'simple' crater [2]. Sedan was formed in alluvium of mixed lithology [3] and subsequently studied using a variety of field-based methods. Nearby secondary craters were also formed at the time and were also imaged by AVIRIS. Adjacent to Sedan and also in alluvium is Scooter, about 90 m in diameter and formed by a high-explosive event. Schooner (240 m) and Danny Boy (80 m, Fig. 1) craters were also important targets for AVIRIS as they were excavated in hard welded tuff and basaltic andesite, respectively [3, 4]. This variation in targets will allow the study of ejecta patterns, compositional modifications due to the explosions, and the role of craters as subsurface probes.
Derived from text
Near Infrared Radiation; Explosions; Cratering; Craters; Infrared Spectrometers; Infrared Imagery; Hypervelocity Impact

20050167760 Maine Univ., Orono, ME, USA
Ice Sheet Modeling: Mass Balance Relationships for Map-Plane Ice Sheet Reconstruction: Application to Tharsis Montes Glaciation
Fastook, J. L.; Head, J. W.; Marchant, D. R.; Shean, D. E.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Deposits on the flanks of the large Tharsis Montes volcanoes (Arsia, Pavonis, and Ascraeus Mons) have been recognized to be of glacial origin [1,2]. These Amazonian-aged deposits display three distinct facies, ridged, knobby, and smooth [3], each of which can be associated with different glacial processes [1]. The outermost ridged facies is thought to be the imprint of ice-margin drop moraines recording the fluctuations of a stable cold-based ice sheet. Inside this is the knobby facies, interpreted as a sublimation till deposited as the ice sheet sublimated during a period of major contraction of the ice sheet. Finally, contained within both of these is the smooth facies which may contain debris-covered glacial ice, similar to rock glaciers found in the Dry Valleys of Antarctica [1]. The deposits form fans trending to the northwest from each of the volcanoes and have been described elsewhere [1-4]. Steady-state flowband profiles have been shown to produce reasonable ice sheet configurations of a few hundred to a few thousand meters thickness. However, flowband modeling [5,6] makes estimates of volumes difficult, and steady-state modeling does not allow for the possibility that these ice sheets never attained full equilibrium configurations during the transient climatic conditions that accompany the large oscillations in obliquity that dominate the Martian climate.
Derived from text
Ice; Glaciers; Mars Surface; Mass Distribution; Deposits; Antarctic Regions

20050167761 Chicago Univ., Chicago, IL, USA
Vapor Pressures and Evaporation Coefficients of Fe, Na and K over Chondrule Composition Melts
Fedkin, A. V.; Grossman, L.; Ghiorso, M. S.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The computation of evaporative changes in chondrule composition during melting requires accurate thermodynamic models of gas-liquidsolid systems for determination of the dominant evaporating species and their vapor pressures, and measurements of evaporation rates in experiments at controlled and known T and oxygen fugacity, fO2, to obtain evaporation coefficients. In this work, thermodynamic modelling of published results of evaporation experiments is used to obtain evaporation coefficients of Fe, Na and K from the silicate portion of chondrule melts.
Derived from text
Vapor Pressure; Evaporation Rate; Iron Oxides; Melts (Crystal Growth); Coefficients; Meteoritic Composition; Silicates

20050167769 International Space Science Inst., Bern, Switzerland
Characterization of Martian North Polar Geologic Units Using Mars Odyssey THEMIS Data
Fishbaugh, K. E.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The north polar basal unit (BU), lying stratigraphically between the polar layered deposits (PLD) and the Vastitas Borealis Formation (VBF) has been hypothesized to be an Amazonian aged, frozen deposit composed both of eolian material and material from ancient polar caps (smaller than the current cap) which have completely ablated [1]. Study of the origins of this unit [1-3] has led to important insight into north polar geologic history as a whole. Periodic migration of sand northward from lower latitudes to create the layers of the BU may have been controlled by the formation and erosion of the ice-rich, low latitude mantling layer described by [4,5]. Additionally, possibly greater cumulative amounts of time spent at higher obliquities during much of Mars past [6] may have contributed to the lack or smaller size of a polar cap during the time of BU formation. In this study, we begin an analysis of Mars Odyssey THEMIS data which lend further insight into the characteristics of this unit and its relationship with surrounding deposits.
Derived from text
Planetary Geology; Mars Surface; Polar Caps; Deposits; Ice; Paleontology

20050167770 International Space Science Inst., Bern, Switzerland
Effect of Flow on the Internal Structure of the Martian North Polar Layered Deposits
Fishbaugh, K. E.; Hvidberg, C. S.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The varying deposition rates of ice and particulates reflected in the alternating bright and dark layering of the martian polar layered deposits (PLD) has sparked an interest in correlating the PLD layering with changes in orbital parameters such as obliquity [e.g.,1, 2, 3]. If this correlation exists, the polar layers may be an invaluable record of Mars recent climate history as changes in orbital parameters are major regulators of climate. In order to attach particular layers or layer sequences to particular changes in orbital parameters, one must assume that the stratigraphic sequence has been preserved and that a timescale can be reconstructed. If the layers are subject to flow, the stratigraphy can be affected in several ways. As pointed out by Clifford et al. [3], flow can stretch and thin layers, the amount increasing with depth in the ice. This process leaves intact the climate record possibly recorded in the PLD, but the timescale needs to be adjusted (e.g., with flow models that assume a certain deposition rate and take the layer thinning into account). In some cases, ice flow may disturb the stratigraphic record. For example, large scale flow can create disconformities, and localized flow instabilities can lead to folding and boudinage. The goal of this study is to determine what effects flow might have on the internal layer structure of the north polar cap and whether these effects are observed in the data.
Derived from text
Planetary Geology; Fluid Flow; Stratigraphy; Polar Caps; Mars Surface

20050167771 Oregon State Univ., Corvallis, OR, USA
Elemental Abundance Distributions in Basalt Clays and Meteorites: Is It a Biosignature?
Fisk, M. R.; Storrie-Lombardi, M. C.; Joseph, J.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Volcanic glass altered by microorganisms exhibits distinctive textures differing significantly from abiotic alteration [1-4]. We have previously presented morphological evidence of bioweathering in sub-oceanic basalt glass [5] and olivine [6], and noted similar alterations in Nakhla [7]. We have also introduced an autonomous Bayesian probabilistic classification methodology to identify biotic and abiotic alteration in sub-oceanic basalts using elemental abundance data [8]. We now present data from multiple sub-oceanic sites addressing the more general question of utilizing elemental abundance distribution in clays as a valid biosignature for the exploration of putative clay alteration products in meteorites.
Derived from text
Volcanoes; Glass; Basalt; Meteorites; Morphology

20050167774 State Univ. of New York, Plattsburgh, NY, USA
Catastrophic Disruption of Hydrated Targets: Implications for the Hydrated Asteroids and for the Production of Interplanetary Dust Particles
Flynn, G. J.; Durda, D. D.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The outer half of the main-belt is dominated by asteroids that are classified as C-, P-, or D-type, based on their reflection spectra. These low-albedo asteroids are believed to be the parent bodies of the carbonaceous chondrite meteorites. A significant

fraction of the carbonaceous chondrite meteorites are hydrated, and some of the C-, P-, and D-type asteroids show evidence for hydration in their reflection spectra. Thus, a significant fraction of the targets for cratering and collisional disruption in the outer half of the main-belt are likely to be hydrated bodies. Nonetheless, most disruption experiments on natural rock targets have concentrated on anhydrous rocks, such as basalts. Tomeoka et al. [1] impacted a small target of the hydrated carbonaceous meteorite Murchison and compared the results to the disruption of Allende, an anhydrous carbonaceous meteorite. They found that Murchison disrupted far more easily than anhydrous meteorite targets, and suggested that the hydrated asteroids might contribute far more dust to the Zodiacal Cloud than would be expected based on their abundance in the main belt.
Derived from text
Interplanetary Dust; Hydration; Asteroids; Carbonaceous Chondrites; Carbonaceous Meteorites; Basalt; Cratering

20050167798 Centre de Spectrometrie Nucleaire et de Spectrometrie de Masse, Orsay, France
Friable Micrometeorites from Central Antarctica Snow
Duprat, J.; Engrand, C.; Maurette, M.; Gounelle, M.; Kurat, G.; Leroux, H.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We carried on the collection of micrometeorites (MMs) from central Antarctica snow. The MMs were recovered by melting and sieving snow samples from the vicinity of the French-Italian station CONCORDIA (Dome C, 75degS-123degE). Located on the east Antarctic plateau, 1100 kms inland, and at 3200 m altitude, the Dome C snow is well protected from terrestrial dust contamination. The results presented so far [1] included 40 particles extracted from about 1 ton of melted snow during the January 2000 expedition (DC00). We report here on complementary results from the collection performed in January 2002 (DC02) in which 3.6 tons of snow were processed. These micrometeorites constitute the CONCORDIA-Collection. The sorting of the particles is still ongoing and this is thus a progress report.
Derived from text
Micrometeorites; Snow; Antarctic Regions; Dust; Melting

20050167808 Southwest Research Inst., Boulder, CO, USA
Size-Frequency Distribution of Fragments from SPH/N-Body Simulations: Comparison with Observed Asteroid Families
Durda, D. D.; Bottke, W. F., Jr.; Nesvorny, D.; Asphang, E.; Richardson, D. C.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Size-frequency distributions (SFDs) are important diagnostic tools in understanding the results of a wide range of fragmentation events because (1) the overall shape of the SFD (average power-law slope index, size of largest remnant vs. smaller debris, etc.) characterizes the nature of the impact (catastrophic vs. cratering, size/speed of impactor, oblique vs. head-on) and (2) detailed features of the SFD (sizes at which slope changes occur, etc.) can offer important clues to internal structure (e.g., characteristic size of chondrules or other structural subunits). Here we investigate the morphology of size-frequency distributions resulting from impacts into 100-km diameter parent asteroids, represented by a suite of 160 SPH/N-body simulations conducted to study asteroid satellite formation [1], and compare these modeled SFDs with those of observed main-belt asteroid families.
Derived from text
Frequency Distribution; Size Distribution; Asteroids; Cratering; Slopes; Meteoritic Composition

20050167810 Albany Univ., Albany, NY, USA
Apollo 14 High-Ti Picritic Glass: Oxidation/Reduction by Condensation of Alkali Metals
Delano, J. W.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The role of graphite (C) in oxidation- reduction reactions during the ascent and eruption of picritic magmas on the Moon has been well-documented [e.g., 1-5], especially in the Apollo 17 orange glass (74220). The occurrence of sublimates on the surfaces of picritic glasses is also well-known [e.g., 6-9]. Electron microprobe analyses of the high- Ti (approx.16 wt% TiO2),

black (microcrystalline) picritic glasses from Apollo 14 show evidence for addition of alkali metals (i.e., Na, K) with associated reduction of FeO to metallic Fe.
Derived from text
Oxidation-Reduction Reactions; Glass; Alkali Metals; Titanium Oxides; Microcrystals

20050167812 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The First Six Months of Iapetus Observations by the Cassini ISS Camera
Denk, T.; Neukum, G.; Helfenstein, P.; Thomas, P. C.; Turtle, E. P.; McEwen, A. S.; Roatsch, T.; Veverka, J., et al.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Since Saturn arrival in June 2004, Iapetus has been studied intensively by the Cassini ISS camera [1] at various ranges. The first of two relatively close flybys in the primary mission occurred on Dec 31, 2004 at an altitude of approx.123,400 km over the northern leading hemisphere, resulting in images with a minimum pixel scale of 740 m. Detailed results of this flyby are given in [2], while this abstract covers the observations obtained earlier. Among the most important discoveries are: (a) Four giant impact basins with diameters between 390 and 550 km were detected, three of them are located in the dark terrain [3]. (b) Data revealed a \g1300 km long ridge that marks exactly Iapetus' equator within the dark terrain. Individual mountains within the western part of the ridge reach heights of approx.20 km over surrounding terrain [3]. (c) Impact craters were confirmed to be the main geological feature within the dark terrain and at high southern latitudes. (d) There are numerous craters with dark walls roughly facing towards the central parts of the dark hemisphere [3]. (e) Almost all parts of Iapetus have been imaged at least at low resolution (\h 60 km/pxl).
Author
Structural Basins; Flyby Missions; Iapetus; Mountains; Equators; Geology; Craters

20050167816 Universidad Rey Juan Carlos, Madrid, Spain
Geomorphologic Map of the Atlantis Basin, Terra Sirenum, Mars
dePablo, M. A.; Marquez, A.; Centeno, J. D.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Atlantis basin (Fig.1) is a depression of about 225 kilometers in diameter located at Terra Sirenum, at the martian highlands, centered at 35degS, 177degW. This basin, together with others like Gorgonum basin, forms the East side of the region that could be covered by the water of the ancient Eridania Lake [1] [2] that was the source of water of Ma'adim Vallis [1] [2]. The existence of tectonic, sedimentary, erosive and volcanic features in this site are indicative of the complex geologic and hydrological history of this martian basin. To have a better knowledgement of the geological history of this region is the objective of the geomorphologic map of the Atlantis basin here showed (Fig.2).
Derived from text
Geomorphology; Maps; Paleontology; Mars Surface; Highlands; Erosion

20050167821 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Relative Ages of the Highlands, Lowlands, and Transition Zone Along a Portion of the Mars Crustal Dichotomy from Densities of Visible and Buried Impact Craters
DeSoto, G. E.; Frey, H. V.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Understanding the fundamental age relationships of the different parts of the Mars Crustal Dichotomy is essential to fully understanding the events that shaped the early history and formation of the surface of Mars. A dominant question is what are the true relative ages of the Northern Lowlands and the Southern Highlands? Using MOLA data from the Mars Global Surveyor and Viking visual images, a dataset of both buried and visible crater diameters was created over a nine million sq km study area of a section of the dichotomy boundary stretching from Arabia Terra to Utopia Planitia. Cumulative frequency plots on a log-log scale were used to determine the relative ages for the Highlands, the Lowlands, and the Transition Zone, separately for the visible, the buried and the combined total (visible+ buried) populations. We find the overall Highland crater population in this area is slightly older than the Lowlands, consistent with previous global studies, but the Lowlands and Transition Zone are also very old and formed at roughly the same time. It appears that the formation of the Lowlands in this

region formed contemporaneously with a large-scale resurfacing event in the Highlands, perhaps caused by the process responsible for the Lowland formation.
Derived from text
Highlands; Dichotomies; Crusts; Mars Surface; Boundaries

20050167823 International Research School of Planetary Sciences, Pescara, Italy
A New Candidate Impact Site in Northeastern Sudan Detected from Remote Sensing
DiAchille, G.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: A new possible impact structure has been observed, in the northeastern Sudan (37deg55'E, 17deg57'N), close to the border with the Eritrea and the Red Sea. In this study are presented the evidence for the impact hypothesis, as derived from remotely sensed data, accurately compiled by GIS analysis. The formation of this feature is uncertain and the impact related origin will remain hypothetical without a field work and direct investigations. Only with a careful geological-geophysical survey it is possible to verify the impact hypothesis, nevertheless many of the typical impact-related morphological features are present and may hint at this possibility.
Derived from text
Morphology; Remote Sensing; Geological Surveys; Hypervelocity Impact; Geophysics

20050167824 Brown Univ., Providence, RI, USA
Detection of Gullies on Central Peaks and Crater Rims on Mars: Implications for the Origin of Gullies
Dickson, J. L.; Head, J. W.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Since the detection in MOC images of geologically recent gullies on Mars [1], several hypotheses have been proposed for their origin. These can be subdivided into models of groundwater seepage [1-3] and melting/ runoff of isolated snowpacks [4]. While these models have attempted to account for the concentration of gullies in the midlatitudes, few studies have examined their immediate geological context. Christensen [4] noted that MOC data have revealed gullies on isolated surfaces that would be unlikely locations for groundwater seepage. In this work, we present the results of our survey of geological environments of gullies revealed in MOC images. Our survey consisted of all 5,167 MOC narrow-angle images acquired between 30 S and 45 S through imaging phase R09 (September, 2003). We show examples of gullies found on central peaks and on crater rims, where there appears to be insufficient volume for a contained aquifer, a critical component of all seepage models. These examples also illustrate families of gullies with alcoves that emanate from different elevations, not distinct layers. This leads us to favor a surface melting/runoff origin for these examples.
Derived from text
Craters; Melting; Elevation; Drainage; Ground Water

20050167827 State Univ. of New York, Stony Brook, NY, USA
Constraining Lithospheric Stress and Strain on Mars from Mars Global Surveyor (MGS) Topography, Gravity and Crustal Thickness, 1, Viscous Rheology Solutions
Dimitrova, Lada L.; Holt, William E.; Haines, A. John; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The quantification of lithospheric dynamics on Mars is of fundamental importance to the understanding of Martian geologic history and surface morphology. The global stress field associated with gravitational potential energy differences (GPE) constitutes a significant fraction of the total stress field. We have obtained 0.25 x 0.25 degree data sets of MOLA topography and crustal thickness from [1] and [2] respectively. We calculate the GPE associated with the topography by vertically integrating vertical stress to a given depth using either Airy isostasy assumptions or the crustal thickness model of [2]. We use a finite element thin sheet approach to solve the full 3-D force-balance equations for vertically integrated deviatoric stress magnitudes and orientations within the lithosphere associated with horizontal gradients in GPE. We assume P(sub crust) = 2900 kg/cu m, P(sub mantle) = 3500 kg/cu m, g = 3.7 m/sq s and various lithospheric depths. Our solution

depends on the rheology only through the ratio of shear and bulk viscosities.
Derived from text
Crusts; Stress-Strain Relationships; Lithosphere; Rheology; Topography; Gravitational Fields; Finite Element Method; Force Distribution

20050167828 State Univ. of New York, Stony Brook, NY, USA
Constraining Lithospheric Stress and Strain on Mars from Mars Global Surveyor (MGS) Topography, Gravity and Crustal Thickness, 2, Elastic Rheology Solutions
Dimitrova, Lada L.; Holt, William E.; Haines, A. John; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The quantification of lithospheric dynamics on Mars is of fundamental importance to the understanding of Martian geologic history and surface morphology. The global stress field associated with gravitational potential energy differences (GPE) constitutes a significant fraction of the total stress field. In [1], we discuss deviatoric stress fields obtained based on MOLA topography and crustal thickness from [2] and [3] respectively for viscous rheologies. Given that flexure is important on Mars [4, 1], solutions for elastic rheologies are likely to be more important. We use a finite-element thin sheet approach to solve the full 3-D force-balance equations for vertically integrated deviatoric stress magnitudes and orientations within the lithosphere associated with horizontal gradients in GPE for elastic rheologies. We assume P(sub crust) = 2900 kg/cu m, P(sub mantle) = 3500 kg/cu m, g = 3.7 m/sq s and various elastic thickness. Our stress solutions depend on the rheology only through the ratio of shear and bulk moduli. The associated strain depends also on the shear moduli for the Martian crust and mantle. Our solutions depend on the elastic thickness. We use a reference elastic thickness of approx.92.84 km, a value which was defined in [1] as the maximum depth of the crust derived from the topography and crustal thickness from [2] and [3].
Derived from text
Planetary Crusts; Lithosphere; Stress-Strain Relationships; Rheology; Bulk Modulus; Finite Element Method; Gravitational Fields; Topography

20050167840 Oklahoma Univ., Norman, OK, USA
Impacts in Carbonate Target Rocks: A Paleomagnetic Study of the Weaubleau-Osceola and Alamo Breccia Impact Structures
Dulin, S. A.; Elmore, R. D.; Gardner, K. G.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There are many terrestrial craters that are associated with ancient bolide impacts in carbonate target rocks. These craters can be either well formed (Weaubleau-Osceola crater, Missouri [1]) or inferred from surrounding sedimentary deposits (Alamo Breccia, Nevada [2]). Often times it is difficult to accurately date the impact, because the deformed strata are not stratigraphically confined, or are bounded by an unconformity. Some of the sedimentalogical processes involved in bolide impacts are also complex. Paleomagnetic study of these craters can constrain the age of impact and can also provide insight on the sedimentary processes involved during deposition of bolide related beds. A paleomagnetic model of magnetization associated with carbonate impacts can be developed, and then applied to other carbonate impacts across the globe.
Derived from text
Paleomagnetism; Rocks; Carbonates; Bolides; Magnetization

20050169192 Texas Univ., Austin, TX, USA
Deep Moonquakes: Remaining Problems
Nakamura, Y.; [2004]; 1 pp.; In English; 2004 AGU Fall Meeting, 13-17 Dec. 2004, San Francisco, CA, USA
Contract(s)/Grant(s): NNG04GG62G
Report No.(s): P23A-0224; No Copyright; Avail: CASI; A01, Hardcopy

We have recently reexamined more than 9000 USA previously unidentified seismic events catalogued during the Apollo landing missions and positively identified for the first time about 30 deep moonquake nests on the far side of the Moon. Although only a few of them are currently locatable, the relative arrival times among stations for the rest and presence or absence of seismic signals at particular stations suggest that either (a) the region within about $40\deg$ of the antipode is aseismic or (b) the deep interior of the Moon severely attenuates or deflects seismic waves. Aside from the obvious question of how to distinguish between such hypothetical models, this effort raised several more general questions concerning the use

of deep moonquake signals to infer the structure and dynamics of the deep interior of the Moon. Among more important ones are: (1) How reliable are the seismic arrival picks from which to compute the seismic velocity variations in the Moon? (2) How do the possible lateral variations in seismic velocity affect the computed radial variation in seismic velocity at depth? (3) Can we tell more about the distribution and mechanism of deep moonquakes from the newly expanded database of identified deep moonquakes? Questions (1) and (2) are especially important because the inferred deep internal structure of the Moon depends critically on their answers. Answering these questions may demand additional data collected on future lunar missions, but some may be resolved with further examination of the existing data.
Author (revised)
Moonquakes; Seismic Waves; Geophysics

20050169213 Aerospace Corp., El Segundo, CA, USA
Energetic Electron Transport in the Inner Magnetosphere During Geomagnetic Storms and Substorms
McKenzie, D. L.; Anderson, P. C.; February 15, 2005; 17 pp.; In English
Contract(s)/Grant(s): NAG5-11696
Report No.(s): ATR-2005(7945)-1; No Copyright; Avail: CASI; A03, Hardcopy

We propose to examine the relationship of geomagnetic storms and substorms and the transport of energetic particles in the inner magnetosphere using measurements of the auroral X-ray emissions by PIXIE. PIXIE provides a global view of the auroral oval for the extended periods of time required to study stormtime phenomena. Its unique energy response and global view allow separation of stormtime particle transport driven by strong magnetospheric electric fields from substorm particle transport driven by magnetic-field dipolarization and subsequent particle injection. The relative importance of substorms in releasing stored magnetospheric energy during storms and injecting particles into the inner magnetosphere and the ring current is currently hotly debated. The distribution of particles in the inner magnetosphere is often inferred from measurements of the precipitating auroral particles. Thus, the global distributions of the characteristics of energetic precipitating particles during storms and substorms are extremely important inputs to any description or model of the geospace environment and the Sun-Earth connection. We propose to use PIXIE observations and modeling of the transport of energetic electrons to examine the relationship between storms and substorms.
Author (revised)
Magnetic Storms; Electron Transfer; Earth Magnetosphere

20050169225 Texas Univ., Austin, TX, USA
Farside Deep Moonquakes and Deep Interior of the Moon
Nakamura, Yosio; Journal of Geophysical Research; 2005; ISSN 0148-0227; Volume 110; 12 pp.; In English
Contract(s)/Grant(s): NNG04GG62G; NAG5-11619; Copyright; Avail: Other Sources

An effort to find farside deep moonquakes among the recently discovered nests of deep moonquakes has identified about 30 nests that are likely to be on the farside. Although only a few of them are locatable with currently available data and those few provide little new information about the deep interior of the Moon, the inferred distribution of the rest of these nests indicates that either the region of the Moon's deep interior within about 40 degrees from the antipode of the Moon is nearly aseismic or, alternatively, the very deep interior of the Moon severely attenuates or deflects seismic waves. Since this has important bearing on the origin and evolution of the Moon, future missions to the Moon need to be oriented toward resolving this uncertainty. Some limited data favor the attenuation/deflection hypotheses.
Author
Moonquakes; Geophysics; Lunar Evolution

20050169485 Ural State Technical Univ., Ekaterinburg, Russia
Dronino: An Ancient Iron Meteorite Shower in Russia
Grokhovsky, V. I.; Ustyugov, V. F.; Badyukov, D. D.; Nazarov, M. A.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Dronino is a huge iron meteorite shower recovered recently in Russia. The iron is a low Ni ataxite containing sulfide nodules. Based on trace element chemistry Dronino is classified as an ungrouped iron. Textural characteristics of the meteorite point out a reheating event and a following very fast cooling.
Derived from text
Iron Meteorites; Trace Elements; Sulfides; Heating

20050169495 University Coll., London, UK

Strain as an Indicator of Multiple Episodes of Uplift and Extrusion at Radially-fractured Centers on Venus

Grindrod, P. M.; Nimmo, F.; Stofan, E. R.; Guest, J. E.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: Radially-Fractured Centers (RFCs) are distinctive approx.1000 km-long radiating systems of graben, fissures and fractures usually arranged around a central topographic high [e.g. 1-3]. Two interpretations have been proposed for the formation of RFCs: (a) sub-surface dyke propagation at shallow depths causing radial fracture patterns at the surface [1-4]; and (b) surface uplift caused by the impingement of rising mantle diapirs during the corona-forming process [e.g. 5-8]. However it is likely that RFCs are a combination of both processes, with fractures due solely to uplift being less abundant and more centrally located than those associated with dyke emplacement [3].

Derived from text

Fracturing; Geological Faults; Coronas; Topography

20050169524 Pomona Coll., Claremont, CA, USA

Geological Evolution of the Ganiki Planitia Quadrangle (V14) on Venus

Grosfils, E. B.; Drury, D. E.; Hurwitz, D. M.; Kastl, B.; Long, s. M.; Richards, J. W.; Venechuk, E. M.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations

Contract(s)/Grant(s): NAG5-10157; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Ganiki Planitia quadrangle (25-50degN, 180-210degE) is located north of Atla Regio, south of Vinmara Planitia, and southeast of Atalanta Planitia. The region contains a diverse array of volcanic-, tectonic- and impact-derived features, and the objectives for the ongoing mapping effort are fivefold: 1) explore the formation and evolution of radiating dike swarms within the region, 2) use the diverse array of volcanic deposits to further test the neutral buoyancy hypothesis proposed to explain the origin of reservoir-derived features, 3&4) unravel the volcanic and tectonic evolution in this area, and 5) explore the implications of 1-4 for resurfacing mechanisms. Here we summarize our onging analysis of the material unit stratigraphy in the quadrangle, data central to meeting the aforementioned objectives successfully.

Derived from text

Planetary Evolution; Rock Intrusions; Geology; Deposits; Venus Surface; Stratigraphy; Tectonics

20050169531 NASA Ames Research Center, Moffett Field, CA, USA

Further Geophysical Studies of the Haughton Impact Structure

Glass, B. J.; Domville, S.; Lee, P.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The approximately 23 Ma Haughton impact structure, located at 75 deg 23 min N, 89 deg 39 min W in the Canadian Arctic, on Devon Island, Nunavut, Canada is a well-preserved impact structure with an original rim diameter estimated at about 23 - 24 km. Past studies, in the 1980s, did an initial survey of the Haughton structure, looking at its surface units, exposures, map surface geology, topographic and initial surveys of gravity and magnetic fields in profiles across the impact structure. A topological outer ring and the lack of a well-defined central peak was cited as evidence that Haughton was a multi-ring structure. However other authors consider it more likely that the Haughton structure is a central-peak basin with simply a limited extent, and/or full peak features having been removed through glaciations and subsequent years. The impact structure is located in approximately 2 km thickness of carbonate material on top of a gneissic basement. The impact structure itself can be described in terms of uplifted and moved blocks of altered gneissic and carbonate material with areas in the center of the crater covered with impact carbonate melts and/or reworked impact breccias. Additional information is included in the original extended abstract.

Author

Meteorite Craters; Geomagnetism; Earth Gravitation

20050169537 Wesleyan Univ., Middletown, CT, USA

Jarosite Mineralization in St. Lucia, WI: Preliminary Geochemical, Spectral, and Biological Investigations of a Martian Analogue

Greenwood, J. P.; Gilmore, M. S.; Merrill, M.; Blake, R. E.; Martini, A. M.; Varekamp, J.; Lunar and Planetary Science

XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have identified jarosite, gypsum, alunite, and iron oxides (primarily goethite) in the acid-sulfate alteration environment of the Qualibou Crater, Sulphur Springs Park, St. Lucia, W.I.. A similar mineral assemblage has been identified at the Opportunity landing site in Meridiani Planum [1]. Here we present results of our preliminary geochemical, spectral, and biological survey of jarosite mineralization and compare and contrast with the formation of jarosite on Mars.

Derived from text

Gypsum; Iron Oxides; Craters; Mineral Deposits; Geochemistry

20050169540 Ural State Technical Univ., Ekaterinburg, Russia

Structural Studies of Iron Meteorite Dronino

Grokhovsky, V. I.; Oshtrakh, M. I.; Milder, O. B.; Semionkin, V. A.; Kadushnikov, R. M.; Glazkova, S. A.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In 2003 a large iron meteorite shower called Dronino was found in Kasimovo region of Ryazan oblast in Russia. The Meteoritical Society s Meteorite Nomenclature Committee defined this meteorite as ungrouped ataxite [1]. Samples of meteorite Dronino were collected by the Meteoritic expedition of the Ural State Technical University - UPI in September 2003 at a depth of 1.5-2 m. The major part of meteorite fragments was oxidized, however, metal with massive sulphide inclusions was kept non-oxidized in large bulk samples. Samples of metal phase and sulphides were studied in this work using various techniques.

Derived from text

Iron Meteorites; Inclusions; Fragments; Sulfides

20050169541 Southwest Research Inst., Boulder, CO, USA

Joint Thermal and Collisional Modeling of the H-Chondrite Parent Body

Grimm, R. E.; Bottke, W. F.; Durda, D.; Enke, B.; Scott, E. R. D.; Asphaug, E.; Richardson, D.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Thermal and collisional models for meteorite parent bodies can provide important constraints on the compositional, structural, and dynamical evolution of asteroids. Previous thermal modeling has constrained the diameter of the H-chondrite parent body to approx.150-200 km, assuming heat generation by Al-26 decay in a rocky object [1-5]. This classic 'onion-shell' model is characterized by peak temperature (assessed from petrographic type) increasing and cooling rates decreasing toward the more insulated center of the body. Metallographic cooling rates [MCRs; 1,6] are broadly consistent with cooling in an object of this size, but the lack of a compelling inverse correlation with peak temperature suggests either that metamorphism occurred in smaller, unconsolidated bodies that were subsequently accreted into a final parent body [7], or the rocky onion-shell parent body was collisionally disrupted and reassembled [8] prior to cooling through 500 C, the metallographic blocking temperature. However, recent work applying Pb, Ar, and fission-track thermochronometers to selected H-chondrites has revived the concept that chondrites cooled in bodies with undisturbed onion-shell structures [4]. Here we review the cooling history recorded in these meteorites and introduce a new framework for modeling the effects of collisions on thermal evolution. We will suggest that an intermediate class of solutions may exist that exhibit features of both onion-shell and impact mixing models.

Derived from text

Temperature Distribution; Chondrites; Collisions; Meteorites; Petrography; Metamorphism (Geology)

20050169542 Arizona State Univ., Tempe, AZ, USA

Oxygen Isotope Distribution in Anorthite-Spinel-rich Inclusions from the Ningqiang Carbonaceous Chondrite

Guan, Yunbin; Lin, Yan-Ting; Leshin, Laurie A.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ningqiang is an anomalous carbonaceous chondrite, with petrologic and chemical affinities to CK and CV chondrites. Bulk and in situ oxygen isotope analyses have been reported for its chondrule, matrix, and type A calcium-aluminum-rich

inclusions (CAIs) [1-4]. In this study, we investigate the oxygen isotope compositions of another type of CAIs -- anorthite-spinel-rich inclusion (ASI) [5], in Ningqiang.
Derived from text
Carbonaceous Chondrites; Meteoritic Composition; Chondrule; Inclusions

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20050167057 NASA Marshall Space Flight Center, Huntsville, AL, USA
Thermodynamic Conditions Favorable to Superlative Thunderstorm Updraft, Mixed Phase Microphysics and Lightning Flash Rate
Williams, E.; Mushtak, V.; Rosenfeld, D.; Goodman, S.; Boccippio, D.; Atmospheric Research Special Issue; [October 2004]; 1 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

Satellite observations of lightning flash rate have been merged with proximal surface station thermodynamic observations toward improving the understanding of the response of the updraft and lightning activity in the tropical atmosphere to temperature. The tropical results have led in turn to an examination of thermodynamic climatology over the continental USA in summertime and its comparison with exceptional electrical conditions documented in earlier studies. The tropical and mid-latitude results taken together support an important role for cloud base height in regulating the transfer of Convective Available Potential Energy (CAPE) to updraft kinetic energy in thunderstorms. In the tropics, cloud base height is dominated by the dry bulb temperature over the wet bulb temperature as the lightning-regulating temperature in regions characterized by moist convection. In the extratropics, an elevated cloud base height may enable larger cloud water concentrations in the mixed phase region, a favorable condition for the positive charging of large ice particles that may result in thunderclouds with a reversed polarity of the main cloud dipole. The combined requirements of instability and cloud base height serve to confine the region of superlative electrification to the vicinity of the ridge in moist entropy in the western Great Plains.
Author
Lightning; Thermodynamics; Thunderstorms; Vertical Air Currents

20050167287 Army Research Lab., White Sands Missile Range, NM USA
A Case Study of the Persistence of Weather Forecast Model Errors
Sauter, Barbara; Jan. 2005; 48 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431731; ARL-TR-3418; No Copyright; Avail: Defense Technical Information Center (DTIC)

Decision makers could frequently benefit from information about the amount of uncertainty associated with a specific weather forecast. Automated numerical weather prediction models provide deterministic weather forecast values with no estimate of the likely error. This case study examines the day-to-day persistence of forecast errors of basic surface weather parameters for four sites in northern Utah. Although exceptionally low or high forecast errors on one day are more likely to be associated with a similar quality forecast the following day, the relationship is not considered strong enough to provide beneficial guidance to users without meteorological expertise. Days resulting in average forecast errors showed no persistence in the quality of the subsequent day's forecast. More sophisticated methods are needed to generate and portray weather forecast uncertainty information.
DTIC
Errors; Forecasting

20050167467 Pennsylvania State Univ., University Park, PA USA
Wind Direction Estimates from Synthetic Aperture Radar Imagery of the Sea Surface
Young, George S.; Jan. 2004; 6 pp.; In English
Contract(s)/Grant(s): N00014-04-1-0539
Report No.(s): AD-A432157; No Copyright; Avail: CASI; A02, Hardcopy

The SAR-signatures of synoptic-scale cold fronts, warm fronts, occluded fronts, and secluded fronts, including their mesoscale and microscale sub-structures have been documented. The basis for these findings is the analysis of some 6000 RADARSAT-1 SAR images from the Gulf of Alaska and from off the east coast of North America. This analysis yielded 158 cases of well defined frontal signatures: 22 warm fronts, 37 cold fronts, 3 stationary fronts, 32 occluded fronts, and 64 secluded fronts. Most synoptic-scale atmospheric fronts share two generic SAR-observable features. The first is a near zero order

change in the mean backscatter while the second is a near zero-order change in the character of the micro-alpha to meso-gamma-scale eddy SAR signatures. Cold front-specific SAR signatures include meso-gamma-scale lobe and cleft instability, meso-gamma-scale vortices, meso-gamma-scale Kelvin-Helmholtz instability, and convective signatures to the immediate rear of the cold front. Warm and occluded front-specific SAR signatures include pre-frontal jets, meso-beta-scale vortices, and meso-gamma or micro-alpha-scale banding aligned nearly perpendicular to the front associated with gravity waves.
DTIC
Estimates; Ocean Surface; Radar Imagery; Synthetic Aperture Radar; Wind Direction

20050167717 State Univ. of New York, Albany, NY, USA
[Summary of Research on Relationship Between Core Convective Structure and Intensity Change in Tropical Cyclones]
[2005]; 3 pp.; In English
Contract(s)/Grant(s): NAG5-11008; No Copyright; Avail: CASI; A01, Hardcopy

The downshear reformation of Tropical Storm Gabrielle (2001) was investigated using radar reflectivity and lightning data that were nearly continuous in time, as well as frequent aircraft reconnaissance flights. Initially the storm was a marginal tropical storm in an environment with strong 850-200 hPa vertical wind shear of 12-13 meters per second and an approaching upper tropospheric trough. Both the observed outflow and an adiabatic balance model calculation showed that the radial-vertical circulation increased with time as the trough approached. Convection was highly asymmetric, with almost all radar return located in one quadrant left of downshear in the storm. Reconnaissance data show that an intense mesovortex formed downshear of the original center. This vortex was located just south of, rather than within, a strong downshear left lightning outbreak, consistent with tilting of the horizontal vorticity associated with the vertical wind shear. The downshear mesovortex contained a 972 hPa minimum central pressure, 20 hPa lower than minimum pressure in the original vortex just three hours earlier. The mesovortex became the new center of the storm, but weakened somewhat prior to landfall. It is argued that dry air carried around the storm from the region of upshear subsidence, as well as the direct effects of the shear, prevented the reformed vortex from continuing to intensify. Despite the subsequent weakening of the reformed center, it reached land with greater intensity than the original center. It is argued that this intensification process was set into motion by the vertical wind shear in the presence of an environment with upward motion forced by the upper tropospheric trough. In addition, the new center formed much closer to the coast and made landfall much earlier than predicted. Such vertical shear-induced intensity and track fluctuations are important to understand, especially in storms approaching the coast. The structures of the highly sheared tropical storm Chantal During CAMEX-4 is also discussed.
Derived from text
Cyclones; Tropical Storms; Mesoscale Phenomena; Convection

20050167839 Observatoire de Paris-Meudon, France
Atmospheric Studies with OMEGA/Mars Express
Drossart, P.; Forget, F.; Encrenaz, T.; Melchiorri, R.; Fouchet, T.; Vinatier, S.; Bezard, B.; Combes, M.; Bibring, J. P.; Langevin, Y., et al.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 1 pp.; In English; See also 20050167788; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Extensive studies have been performed on the atmosphere of Mars from OMEGA/Mars Express data [1], in the visible/infrared spectral range (0.4-5microns) with several approaches: 1) a first order atmospheric pressure and minor constituents retrieval, in an automatic procedure to correct OMEGA IR reflectance spectra from atmospheric features; 2) minor constituents (CO, H2O) retrieval, with search for spatial variations related to local or global meteorological effects; 3) dust opacity study, both from limb observations and nadir pointing observations, aimed to retrieve the vertical or horizontal dust distribution respectively; and 4) limb emission, by fluorescent emission of CO2 and CO, observed at 4.3 and 4.6 microns.
Derived from text
Atmospheric Pressure; Meteorological Parameters; Mars Atmosphere; Infrared Radiation; Carbon Dioxide; Dust

20050167895 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands
Standard Environments for Ship Infrared Signature Comparison
Neele, F. P.; January 2005; 33 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): A01/KM/956; TNO Proj. 015.33838
Report No.(s): FEL-04-A179; TD-2004-0188; Copyright; Avail: Other Sources

The infrared signature of targets strongly depends on their environment, as well as on the configuration of the target itself. Therefore, an analysis of the susceptibility of targets, or ships, as in this report, for detection by infrared sensors is only useful if the variability of the infrared signature is accounted for by computing the signature in a wide variety of environments. The choice of environments follows from the areas of operation of the ship. In each area, a sufficient number of operationally relevant weather types must be defined, to bring out the extremes in infrared signature. For example, day-time clear-sky conditions will show the effects of solar warming, while night-time conditions are likely to emphasise any intrinsic hot spots due to internal heat production. This report presents standard environments that have been defined for the ships of the Royal Netherlands Navy. For five current areas of operation, a total of 40 standard environments have been defined. These are to be used in future studies of the effects of signature reduction measures and for the definition of staff requirements on the infrared signature of new ships.
Author
Infrared Signatures; Ships; Infrared Detectors; Reference Atmospheres

20050168118 National Center for Atmospheric Research, Boulder, CO, USA
Science Coordination in Support of the US Weather Research Program Office of the Lead Scientist (OLS) and for Coordination with the World Weather Research (WMO) Program
Gall, Robert; May 1, 2005; 7 pp.; In English
Contract(s)/Grant(s): NNM04AA35G
Report No.(s): NCAR-2003-324; No Copyright; Avail: CASI; A02, Hardcopy

This document is the final report of the work of the Office of the Lead Scientist (OLS) of the U.S. Weather Research Program (USWRP) and for Coordination of the World Weather Research Program (WWRP). The proposal was for a continuation of the duties and responsibilities described in the proposal of 7 October, 1993 to NSF and NOAA associated with the USWRP Lead Scientist then referred to as the Chief Scientist. The activities of the Office of the Lead Scientist (OLS) ended on January 31, 2005 and this report describes the activities undertaken by the OLS from February 1, 2004 until January 3 1, 2005. The OLS activities were under the cosponsorship of the agencies that are members of the Interagency Working Group (IWG) of the US WRP currently: NOAA, NSF, NASA, and DOD. The scope of the work described includes activities that were necessary to develop, facilitate and implement the research objectives of the USWRP consistent with the overall program goals and specific agency objectives. It included liaison with and promotion of WMO/WWW activities that were consistent with and beneficial to the USWRP programs and objectives. Funds covered several broad categories of activity including meetings convened by the Lead Scientist, OLS travel, partial salary and benefits support, publications, hard-copy dissemination of reports and program announcements and the development and maintenance of the USWRP website. In addition to funding covered by this grant, NCAR program funds provided co-sponsorship of half the salary and benefits resources of the USWRP Lead Scientist (.25 FTE) and the WWRP Chairman/Liaison (.167 FTE). Also covered by the grant were partial salaries for the Science Coordinator for the hurricane portion of the program and partial salary for a THORPEX coordinator.
Author
Research; Meteorology

20050168120 Wisconsin Univ., Madison, WI, USA
Determination of Cirrus Cloud Optical Properties Using Ground-Based Atmospheric Emitted Radiance Interferometer and Raman Lidar Measurements
DeSlover, Daniel H.; [2004]; 7 pp.; In English
Contract(s)/Grant(s): NNG04GBOlG; No Copyright; Avail: CASI; A02, Hardcopy

This final grant report presents three case studies from the Atmospheric Radiation Measurement First ISSCP Regional Experiment (ARM-FIRE) Water Vapor Experiment (AFWEX).
CASI
Cirrus Clouds; Optical Properties; Water Vapor; Radiance

20050168123 California Univ., Berkeley, CA, USA
Modeling of Isotope Fractionation in Stratospheric CO2, N2O, CH4, and O3: Investigations of Stratospheric Chemistry and Transport, Stratosphere-Troposphere Exchange, and Their Influence on Global Isotope Budgets
Boering, Kristie A.; Connell, Peter; Rotman, Douglas; [2005]; 4 pp.; In English
Contract(s)/Grant(s): NAG1-2191; NAG1-02083; No Copyright; Avail: CASI; A01, Hardcopy

Until recently, the stable isotopic composition of chemically and datively important stratospheric species, such as ozone (O3), carbon dioxide (CO2), nitrous oxide (N2O), and methane (CH4), was largely unexplored, despite indications from the few measurements available and theoretical studies that global-scale isotopic variations will provide a unique tool for quantifying rates of global-scale mass transport into, within, and out of the stratosphere and for understanding the mechanisms of chemical reactions involved in ozone production. The number and geographical extent of observations are beginning to increase rapidly, however, as access to the stratosphere, both directly and by remote-sensing, has increased over the last 10 years and as new analytical techniques have been developed that make global-scale isotope measurements by whole-air sampling more feasible. The objective of this study, begun in April 1999, is to incorporate into the Livermore 2D model the likely photochemical fractionation processes that determine the isotopic compositions of stratospheric CO2, N2O, CH4, and O3, and to use the model results and new observations from NASA field campaigns in 1996 and 1997 to investigate stratospheric chemistry and mass transport. Additionally, since isotopic signatures from the stratosphere are transferred to the troposphere by downward transport at middle and high latitudes, the isotopic compositions may also serve as sensitive tracers of stratosphere-totroposphere transport. Comparisons of model results with stratospheric and upper tropospheric observations from these campaigns, as well as with ground-based observations from new NOAA and NSF-sponsored studies, will help determine whether the magnitudes of the stratospheric fractionation processes are large enough to use as global-scale tracers of transport into the troposphere and, if so, will be used to help constrain the degree of coupling between the troposphere and the stratosphere.
Author (revised)
Fractionation; Atmospheric Composition; Atmospheric Chemistry; Photochemical Reactions; Isotope Ratios

20050169219 Civil Aerospace Medical Inst., Oklahoma City, OK, USA
Influence of Visibility, Cloud Ceiling, Financial Incentive, and Personality Factors on General Aviation Pilots' Willingness to Take Off Into Marginal Weather, Part 1, The Data and Preliminary Conclusions
Knecht, William; Harris, Howard; Shappell, Scott; April 2005; 44 pp.; In English
Contract(s)/Grant(s): FAA-AM-HRR-522-04
Report No.(s): DOT/FAA/AM-05/7-Pt-1; No Copyright; Avail: CASI; A03, Hardcopy

Adverse weather is the leading cause of fatalities in general aviation (GA). In this research, influences of ground visibility, cloud ceiling height, financial incentive, and personality were tested on 60 GA pilots willingness to take off into simulated adverse weather. Results suggested that pilots do not see weather as a monolithic cognitive construct but, rather, as an interaction between its separate factors. This was supported by the finding that the multiplicative statistical effect of visibility and ceiling could better predict takeoff than could the linear effect of either variable considered separately. Also found was a statistical trend toward financial incentive being able to predict takeoffs. However, none of the 10 personality tests (incorporating over 500 separate response items) could predict takeoff.
Author
Cloud Height Indicators; General Aviation Aircraft; Visibility; Weather; Aircraft Pilots; Aerospace Medicine; Personality Tests

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*.

20050166898 Scripps Institution of Oceanography, La Jolla, CA, USA
Penetration of UV Radiation in the Earth's Oceans
Mitchell, B. Greg; Lubin, Dan; [2005]; 5 pp.; In English
Contract(s)/Grant(s): NAG5-10644; No Copyright; Avail: CASI; A01, Hardcopy

This project was a collaboration between SIO/UCSD and NASA/GSFC to develop a global estimation of the penetration of UV light into open ocean waters, and into coastal waters. We determined the ocean UV reflectance spectra seen by satellites above the atmosphere by combining existing sophisticated radiative transfer models with in situ UV Visible data sets to improve coupled radiance estimates both underwater and within the atmosphere. Results included improved estimates of surface spectral irradiance, 0.3-1.0 micron, and estimates of photosynthetic inhibition, DNA mutation, and CO production. Data sets developed under this proposal have been made publicly available via submission to the SeaWiFS Bio-Optical

Archive and Storage System. Numerous peer-reviewed publications and conference proceedings and abstracts resulted from the work supported by this research award.
Author
Ultraviolet Radiation; Oceans; Underwater Optics; Ultraviolet Spectra; Reflectance; Sea Water

20050167133 Dartmouth Coll., Hanover, NH, USA
Iron and Osmium Isotopes from Stony Micrometeorites and Implications for the Os Budget of the Ocean
Chen, C.; Taylor, S.; Sharma, M.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Os isotopic composition of seawater and continental crust require that between 20 to 30% Os is unradiogenic and potentially derived from either hydrothermal alteration of mid-ocean ridge basalts or from dissolution of cosmic dust. Our recent results evaluating the Os flux from mid-ocean ridges indicate that ridge crest hot springs and off-ridge warm/cold springs are not a significant source of Os dissolved in the oceans. Thus, most Os appears to be derived from the dissolution of cosmic dust in seawater. The present study examines the mechanism through which Os might be getting dissolved in seawater by measuring Os and Fe concentrations and Fe isotopic composition of the most common silicate spherules, which appear to have undergone melting.
Derived from text
Iron Isotopes; Osmium Isotopes; Micrometeorites; Sea Water

20050169513 Tokyo Inst. of Tech., Tokyo, Japan
Effects of Oceans on Atmospheric Loss During the Stage of Giant Impacts
Genda, H.; Abe, Y.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The recent works on the planetary formation show that several tens of Mars-sized protoplanets are formed through a successive accretion of planetesimals in the terrestrial planet region [its time scale is approx. 10(exp 5)-10(exp 6) years. Then, these protoplanets collide each other as their orbit crosses due to gravitational perturbations among them (its time scale is approx. 10(exp 7)-10(exp 8) years. Therefore, it is generally thought that several giant impacts of Mars-sized protoplanet occur at the late stage of the terrestrial planet formation.
Derived from text
Oceans; Perturbation; Impact

51
LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance of animals and plants in space and related environmental conditions. For specific topics in life sciences see *categories 52 through 55*.

20050165772 National Inst. of Information and Communications Technology, Japan
Measurement of Brain Activity by Near Infrared Light
Eda, Hideo; Review of the National Institute of Information and Communications Technology, Volume 50, Nos. 3/4; September/December 2004, pp. 63-76; In Japanese; See also 20050165771; Copyright; Avail: Other Sources

Non invasive brain measurement systems are widely used for the brain research. There are two kind of equipment. Ones measure electro-magnetic signal from the brain by EEG or MEG. Others measure hemodynamic response by fMRI or NIRS. Development of analysis and research tool is also important for the brain research. NIRS calculates changes in hemoglobin parameters. We compared images by fMRI with images by NIRS. These agreed quite well.
Author
Brain; Hemodynamic Responses; Hemoglobin; Electroencephalography

20050165773 National Inst. of Information and Communications Technology, Japan

Visual Information and Eye Movement Control in Human Cerebral Cortex

Kato, Makoto; Review of the National Institute of Information and Communications Technology, Volume 50, Nos. 3/4; September/December 2004, pp. 37-43; In Japanese; See also 20050165771; Copyright; Avail: Other Sources

Acquiring visual information such as reading a sentence, it is important to associate and visual image processing with an eye movement control. To elucidate mechanisms for processing brain information, it is necessary to make a functional map on a cerebral cortex in detail by measuring brain activity non-invasively using recently developed instruments. The present paper introduces a brain-mapping study to identify a functional region for eye movement control in the precentral area of the human cerebral cortex by using functional MRI. In this study, the eye movement regions were separated from the eye blinking regions, because both regions were activated during tasks conventionally used to examine the eye movement regions. Furthermore, problems about the functional mapping in the human brain are discussed with general problems in measurements for neuronal activity.

Author

Cerebral Cortex; Eye (Anatomy); Eye Movements; Visual Perception

20050165777 National Inst. of Information and Communications Technology, Japan

Controlling Intermolecular Interactions using Nano-Structural Molecules

Otomo, Akira; Yokoyama, Shiyoshi; Furumi, Seiichi; Nakahama, Tatsuo; Mashiko, Shinro; Review of the National Institute of Information and Communications Technology, Volume 50, Nos. 3/4; September/December 2004, pp. 77-84; In Japanese; See also 20050165771; Copyright; Avail: Other Sources

Controlling intermolecular interactions is one of the key issues for applying optical materials based on isolated electron system (eg. organic molecules and quantum dots) to photonic devices. We describe controlling technique of intermolecular interactions using nano-molecular structure and novel scattering laser emission from nano particle emissive media. We also report laser applications of liquid crystals used as a photonic crystalline framework.

Author

Molecular Interactions; Molecular Structure; Laser Outputs; Optical Materials; Laser Applications

20050166851 People's Liberation Army, China

Effects of Acute Hypoxia on Expression of Heat Shock Protein 70 in Cochlea of Guinea Pigs

Wang, Hong-Nan; Wu, Wei; Wang, Xi-Jun; Song, Jiang-Shun; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 25-27; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

The object of this research was to investigate the changes of the expression of heat shock protein 70 (HSP70) in the cochlea of guinea pigs under acute hypoxia. Different degrees of acute hypoxia were imposed on guinea pigs and slices of the cochlea were examined by immunohistochemistry to detect HSP70. In normal situation, HSWO is expressed in guinea pig cochlea, especially in spiral ganglion and Corti's organ, under acute hypoxia, this expression was strengthened, and the degree of this strengthening showed no correlation with degree of hypoxia. These results suggest that acute hypoxia can strengthen the expression of HSWO in guinea pig cochlea, and the degree of hypoxia has no effects on the degree of this strengthening. The expression of HSWO in the cochlea may be a kind of protection to the structure and the function of the inner ear.

Author (revised)

Guinea Pigs; Cochlea; Hypoxia

20050166856 Institute of Space Medico-Engineering, Beijing, China

Simulation of the Rat Tibial Bone Density Changes with the Finite Element Method

An, Mei-Yan; Ma, Ai-Jun; Li, Ying-Hui; Wan, Yu-Min; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 55-57; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

The objective of this research was to calculate changes of rat tibial density induced by mechanical load with the finite element method. A three-dimensional computer model was formed by processing the industrial CT image of rat tibia: bone remodeling results were predicted by using the internal bone remodeling theory presented by Beaupre in conjunction with the finite element method. The increments of the elements density and its distribution plot were obtained. The simulation results agree well with the results of the biological experiment, so the simulation results were proved to be accurate.

Author

Rats; Tibia; Bone Mineral Content

20050166857 Academia Sinica, Beijing, China

Random Amplified Polymorphic DNA Analysis of Tomato from Seeds Carried in Russian Mir Space Station

Lu, Jin-Ying; Liu, Min; Xue, Huai; Pan, Yi; Zhang, Chun-Hua; Nechitailo, Galina S.; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 72-74; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

The objective of this research was to identify the variation of hereditary substance of tomato offspring from seeds under long-duration spaceflight condition. The tomato seeds carried in Russian Mir space station for six years, and the ground-based control were planted on the ground. The leaves of plants were used to do random amplified polymorphic DNA (RAPD) analysis. Forty random primers were used in this study, among which 31 primers generated the same DNA band type, and 9 primers generated different DNA band types. Forty primers amplified 269 DNA bands, among which 29 DNA bands were polymorphic ones with a percentage of polymorphism of 10.8%. Compared with the control, plants from seeds carried in space station generated different band types. Band types were different among five plants from seeds carried in space station. The number of polymorphic bands generated by plant No. 5 compared with the control was the most, and that by plant No. 2 was the least. Long-duration spaceflight can cause variation of hereditary substance DNA of tomato.

Author (revised)

Long Duration Space Flight; Biological Effects; Tomatoes; Mutations; Long Term Effects

20050166862 Institute of Space Medico-Engineering, Beijing, China

Development of a Prototype of Space Vegetable-cultivating Facility for Ground-based Experiments

Guo, Shuang-Sheng; Liu, Xiang-Yang; Han, Li-Jun; Zhu, Jung-Tao; Wang, Xiao-Xia; Wei, Min; Al, Wei-Dang; Yang, Jing-Song; Tang, Yong-Kang; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 37-40; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

To develop a ground-based experimental prototype of space vegetable-cultivating facility (GEPSVF), so as to solve the main key techniques related to higher plant cultivation in space environmental conditions, and to further lay a foundation for future development and application of the prototype of space vegetable-growing facility. Based on detailed demonstration and design of technique plan, the blueprint design and machining of components, whole facility installment, debugging, trial operations and verification experiments were done. The parameters in the growing chamber such as temperature, relative humidity, wind velocity, total pressure, O2 partial pressure, CO2 partial pressure and water content of the growing media were totally and effectively controlled; the light source was electronic fluorescent lamp; the average vegetable-producing output reached 60 g(fresh weight)/d. The prototype could operate stably; its actual performance indexes achieved the expected ones basically; some of its operating principles can adapt to space microgravity condition. Therefore, the prototype is a good beginning for future development of space vegetable-producing facilities.

Author

Closed Ecological Systems; Space Environment Simulation; Vegetables; Research Facilities; Cultivation

20050166863 Institute of Space Medico-Engineering, Beijing, China

Development of a Special Controlled-releasing Long Effect Fertilizer Used in Controlled Ecological Life Support System

Al, Wei-Dang; Guo, Shuang-Sheng; Xiao, Jian; Fu, Lan; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 41-46; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

The objective of this research was to develop a special controlled-releasing long effect fertilizer (SCRLEF) for growing higher plant in controlled ecological life support system (CELSS). First, a plan was designed. According to requirements, some original fertilizers were chosen and compounded in proper proportions, and a granule product was obtained and encapsulated in certain materials to form SCRLEF. Then, experiments were done by measuring the content and releasing-rate of the fertilizer, and cultivating plants with the fertilizer. The fertilizer contains nutrients for plant growing, such as: N 18.0%, P2O5 14.3%, K2O 12.6%, Ca 2.6%, S 3.5%, Mg 0.12%, and other micro-nutrients. The granules of the SCRLEF are uniform in size with diameters form 2.5 mm to 4.0 mm. Under 20 - 25 C, the cumulative amounts of released nutrients from the fertilizer in 10 d, 20 d, 30 d, 40 d, and 50 d, are 7.9%, 21.6%, 40.5%, 50.2%, 60.9% respectively, within 10 d, 20 d, 30 d, 40 d, 50 d. By cultivating lettuce with the fertilizer, we found that the vegetable could grow normally, and there wasn't any deficiency symptom in the plants within 45 d. The design consideration of the SCRLEF is reasonable. The fertilizer provides total nutrients for plant growing, and can be used to supply the required nutrients for the plants grown in the CELSS.

Author (revised)

Closed Ecological Systems; Fertilizers; Cultivation; Time Lag

20050166868 Beijing Univ. of Traditional Chinese Medicine, Beijing, China

Protective Effect of Danzhi-xiaoyao San on Rat Brain Energy or Material Metabolism Dealt with D-galactose

Cai, Da-Yong; Chen, Jin-Xing; Zhang, Wei; Wang, Xue; Sun, Li-Ping; Zhang, Jia-Jun; Huang, Qi-Fu; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 32-36; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

The object of this study was to research the mechanism of Danzhi-xiaoyao San (DZXYS) for treating Alzheimer's disease model of rats dealt with D-galactose. An Alzheimer's disease-like model of rats has been set up with sc. D-galactose 150.0 mg/kg/D x 49 d. Comparing with Acricept in 0.54 mg/kg/D dosage as a positive control drug, DZXYS in 12.636 g/kg/D x 49 d dosage has been administrated orally to treat the injury in the Alzheimer's disease-like model of rats. The energy charge in the cerebral tissues had been detested with waters liquid chromatography; the protein content and DNA content in the cerebral tissues had been detested with ultraviolet assay, the relative content of aldose reductase-mRNA is detested with RT-PCR. The difference was analyzed between the control rats without D-galactose, the model rats dealt with D-galactose, the model rats treated with Aricept and the model rats treated with DZXYS, it is significant as P \h 0.05. DZXYS can not affect the energy charge in their cerebral tissues. DZXYS can increase the protein content from 0.3139 +/- 0.019468 to 0.3213 +/- 0.015528 (n(sub i) = 10, P \g0.05) in their cerebral tissues. 3) DZXYS can increase the total DNA content from 1.093 +/- 0.267 to 1.488 +/- 0.341 (n(sub i)=10, P \h0.01) in their cerebral tissues. 4) DZXYS can increase the content of AR-mRNA in their cerebral tissue from 0.732 +/- 0.159 to 1.418 +/- 0.277 (n(sub i) = 5, P \h0.01). It suggests that DZXYS could be effective in human Alzheimer's disease for its stabling gene expression, maintaining protein characteristics, recovering signal transduction in the Alzheimer's disease-like model rats dealt with D-galactose.

Author (revised)

Gene Expression; Rats; Diseases; Drugs; Brain

20050167156 Houston Univ., TX, USA

Microbially Induced Precipitates: Examples from CO3, Si-, Mn- and Fe-rich Deposits

Chafetz, H. S.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Microbially induced precipitates studied from a wide range of warm to hot water spring accumulations provide insight with regard to recognition of possible extraterrestrial microbial fossils. In general, hot spring deposits exhibit a change of precipitate morphology with the evolution of the spring waters from orifice toward the downflow terminus. Nevertheless, the accumulations have a number of features in common as well as some attributes that are not universally exhibited. Among the most obvious microbial precipitates are the stromatolitic bacterial shrubs that are common in the CO3-, Si-, Mn-, and Fe-rich deposits. The shrubs, commonly up to 4 cm high, are highly irregular in morphology, that is they do not display any regular repeating pattern that would be an indication of a mineral habit. In addition to the shrub morphology, these features exhibit either bacterial fossils and/or micron-sized pores (the former sites of bacteria). The bacterial fossils and the micron-sized pores are absent in the immediately enveloping mineral deposits.

Derived from text

Microorganisms; Deposits; Carbon Dioxide; Silicon; Manganese; Iron; Precipitates

20050167206 Garvan Inst. of Medical Research, Darlinghurst, Australia

Discovery of Novel Mammary Developmental and Cancer Genes Using ENU mutagenesis

Ormandy, Christopher J.; Oct. 2004; 8 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0241

Report No.(s): AD-A431370; No Copyright; Avail: CASI; A02, Hardcopy

Discovery of novel mammary developmental and cancer genes using ENU mutagenesis This project seeks to discover new genes involved in mammary gland carcinogenesis, by screening for reduced latency to palpable mammary tumors in response to the myc oncogene, that is produced by the loss of a second gene knocked out by random ENU mutagenesis. This project draws upon the large scale recessive ENU mutagenesis project at the John Curtin School Australian National University. We have successfully imported, rederived and cleared from Quarantine the bi-transgeneic inducible myc model of mammary carcinogenesis devised by Prof. Lewis Chodosh. We have established and expanded the colony and we have begun production of animals to be mated with ENU mutagenised animals. We are currently approximately 2 months behind our statement of work, due mainly to a delay experienced in the importation process. On the positive side the construction of a very large new mouse facility at the Australian National University is ahead of time and is due for commissioning in April

next year, which should decrease the time required for pedigree screening and-expansion in 2004 and 2005.
DTIC
Breast; Cancer; Mammary Glands; Mutagenesis; Mutations; Oncogenes

20050167230 California Univ., Santa Cruz, CA USA
Functional Disruption of the Netrin-1 Guidance Cue Leads to Disruption in Mammary Gland Development and Increased Tumor Incidence
Hinck, Lindsay; Jul. 2004; 5 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0336
Report No.(s): AD-A431578; No Copyright; Avail: CASI; A01, Hardcopy

My laboratory discovered a mammary receptor for netrin-l called neogenin, and I proposed to examine the stromal phenotype associated with the loss of function of neogenin using transplant analysis. Analysis of homozygous null mammary tissue versus wildtype revealed no changes in tissue morphology due to the loss of neogenin function during adolescent development. The investigation is still underway as additional stages of mammary gland development are analyzed. These experiments will extend our study of netrin-l and its receptor neogenin during mammary gland development, and potentially yield insights into the role netrin-l plays in mediating stromal/epithelial interactions during normal breast growth and malignant breast disease.
DTIC
Cues; Mammary Glands; Neoplasms; Tumors

20050167231 Texas Univ., San Antonio, TX USA
Y Chromosome Aberrations in Prostate Cancer
Naylor, Susan L.; Sep. 2004; 44 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9469
Report No.(s): AD-A431579; No Copyright; Avail: CASI; A03, Hardcopy

We hypothesize that chromosomal loss of the Y chromosome in prostate cancer is a specific tumorigenic event. Transfer of the Y chromosome by microcell mediated chromosome transfer into PC-3 cells resulted in suppression of tumor growth. However, these PC-3 hybrids containing the Y chromosome did grow in soft agar indicating a lack of correlation between in vitro and in vivo tumor growth. Prom hybrid cells with fragments of the Y chromosome we concluded suppression of tumorigenesis correlates with either the short arm of the Y or two small regions on the q arm. The data from the functional assay was correlated with data from deletions in patient material. Using a complete genomic microarray specific for the Y chromosome that we constructed from BAC clones, we performed array CGH (comparative genomic hybridization) of prostate tumor samples. These studies indicate there is a small region near on the short arm of the Y chromosome near the centromere that is deleted in 50% of tumor cells. The region of functional suppression and the region of deletion coincide indicating that Y chromosome loss is a significant step in prostate cancer.
DTIC
Cancer; Chromosome Aberrations; Chromosomes; Prostate Gland

20050167232 Georgetown Univ. Hospital, Washington, DC USA
Molecular Characterization of Resistance
Clarke, Robert; Jul. 2004; 117 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0256
Report No.(s): AD-A431580; No Copyright; Avail: CASI; A06, Hardcopy

This is a final report of an IDEA Award to study the molecular mechanisms driving acquired antiestrogen resistance. We have identified several genes associated with resistance to ICI 182,780 (Fulvestrant. Faslodex). Additional studies with NFkB reversal with parthenolide have now been completed and submitted for publication (accepted pending minor revisions). Further functional studies on the role of IRF-1 using a dominant negative construct have been published (Bouker et al Cancer Res 64:4030, 2004) and we have collaborated on an additional study that has identified a new estrogen receptor variant in our hormone resistant cells (Han et al. J Mol Endocrinol 32: 935, 2004). This award (entire period) has resulted in the publication of 9 full papers, two reviews, 7 abstracts, and we have two additional papers to be submitted within the next month. Thus, we have made substantial progress in defining initial components of a broader antiestrogen signaling network that is directly associated with acquired antiestrogen resistance.
DTIC
Breast; Cancer; Mammary Glands

20050167233 Columbia Univ., New York, NY USA

Association Between Offspring's hCG Genotype and Breast Cancer Risk in Mothers: A Novel Approach

Ahsan, Habibul; Jun. 2004; 5 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0354

Report No.(s): AD-A431586; No Copyright; Avail: CASI; A01, Hardcopy

We proposed to examine the novel hypothesis that the hCG genotype of a woman's off spring is associated with her breast cancer risk. Using the existing Metropolitan New York Registry (MNYR) resources, a case-control study was designed to examine the hypothesis whether first-born offspring's hCGbeta 5 genotype (i.e., placental hCGbeta 5 genotype during first FTP) is associated with a woman's breast cancer risk. To date, the three tasks in the approved Statement of Work for year 1 have been accomplished, and we are in the process of laboratory analyses.

DTIC

Breast; Cancer; Mammary Glands; Progeny; Risk

20050167237 Delaware Univ., Newark, DE USA

Applications of Nanoparticles/Nanowires and Carbon Nanotubes for Breast Cancer Research

Panchapakesan, Balaji; Sep. 2004; 26 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0701

Report No.(s): AD-A431597; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this research is to develop a new technique of using carbon nanotubes for breast cancer detection, diagnosis and killing of cancer cells. This can be achieved by fabrication of single wall carbon nanotubes, separation of carbon nanotubes, fimcfl'onalfzation of antibodies on carbon nanotubes and studying the interaction of carbon nanotubes on cancer cells. This research investigated the effects of ftmctionalization of carbon nanotubes (CNTs) with a primary monoclonal mouse immunoglobin (IgG) specific to the cell-surface receptors of breast cancer cells. Co-localization for CNTs in combination with the primary antibody conjugated to the secondary was determined to be 90%. Specific functionalization of antibodies on carbon nanotubes surfaces were achieved by using an amine terminated PEG molecule that specifically attaches to the primary antibody specific to the cell surface receptors of the breast cancer cell, Preliminary studies on the electrical measurements of the primary mouse IgG incubated with cNTs show a decrease in conductance compared to that of bare CNT field effect transistors (cNTFETs). This observed change in conductance is being currently used as the basis to develop a biosensor for single cell cancer detection systems.

DTIC

Breast; Cancer; Carbon Nanotubes; Mammary Glands; Nanoparticles; Nanowires

20050167238 Colorado Univ., Aurora, CO USA

NSAIDS and the Osteogenic Response to Mechanical Stress in Premenopausal Women

Kohrt, Wendy M.; Oct. 2004; 8 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0805

Report No.(s): AD-A431601; No Copyright; Avail: CASI; A02, Hardcopy

The primary aim of this randomized, double-blinded, placebo-controlled trial is to determine the effects of NSAID (ibuprofen) use on the osteogenic response to 9 months of exercise training in 102 women. The scientific rationale for this study centers on the knowledge that the osteogenic response to mechanical stress is a prostaglandin (PG)- dependent process and that NSAIDs inhibit PG synthesis. There is evidence that regular NSAID use inhibits the normal bone formation response to mechanical loading, increases risk of fracture, and impairs bone healing. The approved statement of work for this project includes 4 years of recruiting, testing, and training subjects as well as completing sample assays, data analysis, and manuscripts.

DTIC

Bones; Cytogenesis; Females; Osteogenesis

20050167245 Texas Univ. Health Science Center, San Antonio, TX USA

Investigation of the AKT/PKB Kinase in the Development of Hormone-Independent Prostate Cancer

DEGraffenried, Linda A.; Feb. 2005; 5 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0218

Report No.(s): AD-A431635; No Copyright; Avail: CASI; A01, Hardcopy

Our laboratory has been interested in the role of Akt in the development of hormoneindependent cancers. Using a breast

cancer cell model, we previously demonstrated that tumors with a constitutively active Akt are resistant to anti-hormone therapy. In this study we have expanded upon our preliminary observations in the breast model into in vitro prostate cancer models to determine the molecular and biological mechanisms underlying these findings. In our first year of this study, we found that treatment with an Akt inhibitor prevented the progression of LNCaP cells to a state of androgen-independence. The results of these studies could have a significant impact on clinical approaches for the treatment of recurrent prostate cancer. Currently, progression of prostate cancer to androgen independence remains the primary obstacle to improved survival with this disease. In order to improve overall survival, novel treatment strategies that are based upon specific molecular mechanisms that prolong the androgen-dependent state and that are useful for androgen-independent disease need to be identified. The results of our studies suggest that targeting the Akt pathway may provide such a strategy, resulting in increased survival among patients with recurrent disease.
DTIC
Cancer; Hormones; Prostate Gland

20050167246 Winston-Salem State Univ., Winston-Salem, NC USA
A Treatment Stage Specific Approach to Improving Quality of Life for Women with Ovarian Cancer
Avis, Nancy E.; Miller, Brigitte; Oct. 2004; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0734
Report No.(s): AD-A431636; No Copyright; Avail: CASI; A02, Hardcopy

Our primary objective is to identify the issues that are of greatest concern to women in each of three treatment stages: newly diagnosed with ovarian cancer, in-treatment, and post-treatment. A longitudinal, repeated measures design will be used to assess changes in problem areas and quality of life from diagnosis to recurrence among women newly diagnosed with ovarian cancer. The CARES-SF and FACT-O questionnaires will be administered to participants following diagnosis and prior to chemotherapy, during chemotherapy, following chemotherapy, and after recurrence. Data collection for the study will last 28 months (patient accrual will last 25 months and follow-up will continue an additional 3 months). Data for the study will be collected through in-person interviews, and mailed questionnaires (with possible telephone follow-up) from women treated at the Wake Forest University Baptist Medical Center (WFUBMC) and Forsyth Medical Center (FMC).
DTIC
Cancer; Females; Ovaries

20050167249 Pittsburgh Univ., Pittsburgh, PA USA
Dendritic Cell-Based Immunotherapy of Breast Cancer: Modulation by CpG
Baar, Joseph; Sep. 2004; 26 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0372
Report No.(s): AD-A431640; No Copyright; Avail: CASI; A03, Hardcopy

Breast cancer is the most common non-skin cancer in women and the American Cancer - Society estimates that there will be 215,990 new cases of invasive breast cancer and 40,110 deaths from MBC in the USA in 2004. Thus, patients with MBC who fail conventional therapies are candidates for clinical trials using novel therapeutic approaches, including immunotherapy. Dendritic cells (DC) are potent antigen-presenting cells that prime antitumor cytotoxic T lymphocytes against tumor-associated antigens and bacterial DNA oligodeoxynucleotides containing unmethylated CpG sequences (CpG DNA) further augment the immune priming functions of DCs. We hypothesize that CpG DNA-stimulated DCs will prime a more potent anti-tumor immune response than non-stimulated DCs. Our 3 specific aims are 1) to study the mechanism of antitumor immunity mediated by the vaccination of TS/A mammary tumor-bearing BALB/c mice with CpG DNA-stimulated DCs primed in vitro with necrotic TS/A cells, 2) to determine optimal conditions for CpG DNA stimulation and tumor priming of human DCs, and 3) to design a Phase I/II clinical trial of DC + CpG DNA therapy for breast cancer.
DTIC
Breast; Cancer; Mammary Glands; Modulation

20050167251 Georgetown Univ., Washington, DC USA
Therapeutic Effect of Targeted Hyaluronan Binding Peptide on Neurofibromatosis
Underhill, Charles B.; Zhang, Lurong; Sep. 2004; 17 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0708
Report No.(s): AD-A431642; No Copyright; Avail: CASI; A03, Hardcopy

To test our hypothesis that the HA binding peptide (HABP/tachyplesin) may be a new anti-neurofibromatosis agent, we

utilized phage display approach to define its binding target. The results demonstrated that 1) HABP/tachyplesin the binds to collagen-like domain of Clq, a key component in the complement pathway; 2) HABP/tachyplesin appears to activate the classical complement cascade, since it triggered several down-stream events including the cleavage and deposition of C4 and C3 and the formation of C5b-9; 3) The HABP/tachyplesin binding to Clq and activation of classical complement cascade can be blocked if the tumor cells are treated with hyaluronidase or a large excess of hyaluronan, indicating that hyaluronan or related glycosarninoglycans were involved in this process; 4) Treatment of tumor cells with HABP/tachyplesin and serum results in an increase in membrane permeability as indicated by the ability of FITC-dextran to enter the cytoplasm; 5) The combination of HABP/tachyplesin and human serum can markedly inhibit the proliferation of tumor cells and this effect is attenuate if the serum is heat-inactivated or if hyaluronidase is added. This represents a new anti-tumor mechanism. We will continue to examine the action mechanism of HABP and-to test if the in vitro anti-tumor effect of HA binding peptide can be translated in vivo against the cell growth of neurofibromatosis.
DTIC
Diseases; Genetics; Peptides; Therapy

20050167252 Massachusetts Univ. Medical Center, Worcester, MA USA
Prostate Cancer Cell Growth: Role of Neurotensin in Mediating Effect of Dietary Fat and Mechanism of Action
Carraway, Robert E.; Oct. 2004; 43 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0528
Report No.(s): AD-A431644; No Copyright; Avail: CASI; A03, Hardcopy

Aims: (a) study mechanism of neurotensin(NT)-enhanced prostate cancer(PC) growth; (b)test if NT released from gut contributes to the PC-growth effect of fatty diets. In PC3 cells, NT transactivated EGF receptor (EGFR), liberating HB-EGF from cell-surface by a protease-dependent and PKC-dependent mechanism. Activation of EGFR led to activation of MAP-kinase, P13-kinase, AKT and p7O-S6-kinase, and in 24 hrs to enhanced DNA synthesis. NT and EGF stimulated cellular release 3H-AA. Inhibitors of Lipoxygenase (LOX) blocked basal and NT- induced DNA synthesis, suggesting that EGF and NT acted by way of PLA2, S-LOX and 12-LOX (present by western blot). NT receptor function was modulated by antioxidants and calcium channel blockers, which indirectly blocked inositol phosphate formation. In the presence of a Gs stimulus, NT enhanced cAMP production, giving an inhibition of DNA synthesis. Thus, NT effects involve EGFR, protein kinases, LOXs and adenylyl cyclases, and its effects depend on the hormonal milieu. An NT-knockout-nude mouse strain was developed and PC3 cell xenografts were found to grow faster in NT(++) mice than in NT(--) mice given a high fat diet. Our results suggest that NT released during fat ingestion stimulates PC growth via effects involving EGFR, protein kinases, LOXs and calcium channels.
DTIC
Cancer; Diets; Mediation; Neurotransmitters; Prostate Gland

20050167253 New York Univ., New York, NY USA
Development and Novel Uses of Antibodies in Epithelial Ovarian Cancer
Meruelo, Daniel; Sep. 2004; 20 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0728
Report No.(s): AD-A431645; No Copyright; Avail: CASI; A03, Hardcopy

We studied the therapeutic value of Sindbis vectors for advanced metastatic ovarian cancer by using two mouse models; a SCID xenograft model growing human ES-2 ovarian cancer cells, and a syngeneic C57BL/6 model growing mouse MOSEC ovarian cancer cells. Imaging, histological, and molecular data demonstrated that Sindbis vectors systemically and specifically kill metastasized tumors in the peritoneal cavity, leading to significant suppression of the carcinomatosis in both animal models. Utilization of different bioluminescent markers for imaging studies demonstrated an excellent correlation between vector and tumor localization in vivo. Sindbis vector suppression of murine MOSEC tumor cells indicate that Sindbis tumor specificity is not attributable to a species difference between human tumor and mouse normal cells. Sindbis virus infects mammalian cells using the 67-kDa laminin receptor (LAMR). Immunohistochemical staining indicates that LAMR is elevated in tumor vs. normal cells. Down-regulated expression of LAMR with siRNA significantly reduces the infectivity of Sindbis vectors. Thus, tumor overexpression of the LAMR may explain the specificity and efficacy that Sindbis vectors. Incorporation of cytokine genes such as interleukin-12 and interleukin-15 genes enhances the vector's efficacy. Sindbis viral vectors may be promising agents for both specific detection and suppression of metastatic ovarian cancer.
DTIC
Antibodies; Cancer; Gene Therapy; Ovaries

20050167256 Naval Health Research Center, San Diego, CA USA

Marine Corps NBC Warfare: Determining Clinical Supply Requirements for Treatment of Battlefield Casualties from Chemical and Biological Warfare

Hill, Martin; Galameau, Mike; Pang, Gerry; Konoske, Paula; May 2003; 35 pp.; In English; Original contains color illustrations

Report No.(s): AD-A431652; NAVHLTHRSCHE-03-13; No Copyright; Avail: Defense Technical Information Center (DTIC)

The growing threat posed by the possible use of biological and chemical agents by terrorists or renegade nations increases the need for Marine Corps and Navy health care providers to be prepared to treat victims of biochemical agents on the battlefield. This study reviewed Marine Corps medical supply blocks for biological and chemical warfare casualties - Authorized Medical Allowance Lists (AMALs) 687 and 688. Treatment profiles were created for 42 biochemical patient types using the Joint Readiness Clinical Advisory Board treatment briefs as a guide. Those treatment profiles were then assigned medical supplies, establishing the clinical requirements for the proposed AMAL updates. In November 2002, a panel of 30 subject matter experts was convened to review and validate the recommended changes. As a result of this review, three new items were added to AMAL 687, the NBC Individual Kit, and one item deleted. Four items were removed from the existing NBC Unit AMAL 688, and 17 new items were added. Included among the items added to both AMALs were new antibiotics to combat the threat of bacterial-based biological agents, such as anthrax and plague.

DTIC

Casualties; Chemical Warfare; Supplying

20050167257 Boston Univ., Boston, MA USA

Living with Early Prostate Cancer: Decisions and Outcomes

Clark, Jack A.; Aug. 2004; 53 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0026

Report No.(s): AD-A431653; No Copyright; Avail: CASI; A04, Hardcopy

To examine men's perceptions of life transitions associated with prostate cancer through an analysis of their narratives, obtained in in-depth, qualitative interviews; compare men's narratives of perceived transitions with respect to quality of life outcome states, i.e., good vs. poor prostate cancer-related quality of life. Phase 1: interview participants in our quality of life survey of previously treated patients, stratified by quality of life. Phase 2: interview members of our prospective cohort who have completed 36-month follow-up, stratified by quality of life states and observed changes in urinary, bowel, and sexual function. Phase 3: prospectively interview patients with new diagnoses of early prostate cancer prior to treatment and 12 months later. Comparative analyses, with comparisons between strata and the three cohorts, will characterize the structure and content of patients' narratives of prostate cancer, including specific changes in identity and interpersonal relationships, that are linked to quality of life outcomes. Interviews conducted so far include: Phase 1, 24; Phase 2, 25; Phase 3, 38. Survey instrument to identify quality of life strata in prospective cohort was completed by 235 of 269 eligible patients (87%). Analysis of completed interviews is in progress; no reportable findings as yet.

DTIC

Cancer; Prostate Gland

20050167272 California Univ., Los Angeles, CA USA

Increasing Adherence to Follow-Up of Breast Abnormalities in Low-Income Korean American Women: A Randomized Controlled Trial

Maxwell, Annette E.; Sep. 2004; 13 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0676

Report No.(s): AD-A431691; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this study is to design an intervention to assist Korean American women who have been identified with a potential breast abnormality through the Breast Cancer Early Detection Program (BCEDP) and who have missed their first follow-up appointment (at risk women). Intervention activities will include reminder phone calls or home visits by a trained peer counselor to explain the importance of follow-up procedures, emotional support, help with transportation to follow-up appointments, translations organizing care for children or grandchildren during medical appointments, and other assistance to overcome barriers to follow-up identified during the initial phase of the study. We will collect extensive process measures including number and type of intervention activities requested and delivered in order to estimate the feasibility for institutionalizing intervention activities. We will conduct chart reviews and a follow-up survey to evaluate the effectiveness of the intervention in increasing adherence to follow-up procedures. Human Subject approval for exploratory interviews with

patients and providers was obtained from UCLA on 3/19/2003. Human Subject approval from the DOD is pending.
DTIC
Abnormalities; Breast; Cancer; Females; Income; Mammary Glands

20050167273 Hamilton Regional Cancer Centre, Hamilton, Ontario Canada
The Role of Protein Elongation Factor EEF1A2 in Breast Cancer
Lee, Jonathan M.; Sep. 2004; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0671
Report No.(s): AD-A431692; No Copyright; Avail: CASI; A02, Hardcopy

The overall goal of the project is to explore the idea that protein elongation factor EEF1A2 has an important causal role in breast tumor development and that EEF1A2 gene amplification and protein overexpression can be used as a breast cancer prognostic factor. In addition, we proposed to test the idea that EEF1A2 expression modulates sensitivity to cisplatin and taxol and that EEF1A2-inactivation could be used as a treatment for breast cancer. In the one-year period since funding has been received, we have made progress in the following areas: 1) We have determined that approximately 25% of primary human breast tumor highly express EEF1A2; 2) We identified two human breast cancer cell lines that highly express EEF1A2 (MCF7 and BT474) and two that do not (MCF10A and BT549); 3) We, created MCF10A and BT549 variants that highly express EEF1A2 and determined that EEF1A2 enhances the in vitro growth of theses variants compared to control; 4) We have created an EEF1A2 transgenic mouse; 5) We have created antisense oligonucleotides (AS) and siRNA that specifically inactivate EEF1A2; 6) We determined that the AS and siRNA inhibit the growth of MCF7 in vitro.
DTIC
Breast; Cancer; Elongation; Mammary Glands; Proteins

20050167275 Beth Israel Deaconess Medical Center, Boston, MA USA
Bisphosphonate-Based Contrast Agents for Radiological Imaging of Microcalcifications
Palmer, Matthew R.; Sep. 2004; 4 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0744
Report No.(s): AD-A431695; No Copyright; Avail: CASI; A01, Hardcopy

The overall objective of this project is to develop biochemical markers for calcium that serve as contrast agents in advanced imaging procedures. We have had significant delays in starting this project and so a no-cost extension was recuested and granted in August 2004. No reportable outcomes are yet available.
DTIC
Biochemistry; Breast; Calcium; Cancer; Imaging Techniques; Mammary Glands; Radiology

20050167276 Thomas Jefferson Univ., Philadelphia, PA USA
A New Explanation for the Roles of Fhit Protein in the Progress of Breast Cancer
Wang, Ya; Sep. 2004; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0650
Report No.(s): AD-A431696; No Copyright; Avail: CASI; A02, Hardcopy

Alteration of the Fragile Histidine Triad (FHIT) gene, encompassing the FRA3B fragile site at chromosome 3p14.2, especially reduction or deletion of its expression, is involved in many breast cancers. Little is known about the biological function of the Fhit in breast cancer progression. The major goal of this proposal is to test the hypothesis that the over-activated ATR pathway is irradiated Fhit(-/-) cells promote the homologous recombination repair (HRR) of DNA DSBs, resulting in more Fhit(-/-) cells surviving with deletion or translocations at fragile sites (malignant feature). In the past year with this grant support we found that the over-activated ATR pathway regulated checkpoint contributes the radioresistance of Fhit(-/-) cells and ATR is linked to HRR but not non-homologue end joining repair. These results will provide theory guidance for improving clinical treatment of breast cancers in which Fhit is deleted or reduced by combining traditional therapy with blocking the ATR pathway.
DTIC
Breast; Cancer; Deoxyribonucleic Acid; Histidine; Mammary Glands; Proteins

20050167283 Pennsylvania State Univ., University Park, PA USA

Effects of Moderate Aerobic Exercise Combined With Caloric Restriction on Circulating Estrogens and IGF-I in Premenopausal Women

Williams, Nancy I.; Oct. 2004; 23 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0361

Report No.(s): AD-A431725; No Copyright; Avail: CASI; A03, Hardcopy

This proposal entitled 'Effects of moderate aerobic exercise combined with caloric restriction on circulating estrogens and IGF-1 in premenopausal women' will provide important contributions regarding the primary prevention of breast cancer in women. This study has examined the effects of exercise training combined with caloric restriction, resulting in weight loss, on two hormonal biomarkers for breast cancer i.e., circulating estrogens and insulin-like growth factor I (IGF-I). As expected, exercise training 4 times per week combined with an 20-30% decrease in caloric intake over four menstrual cycles has produced significant increases in aerobic capacity (28-33%), weight loss ranging from 1.0 to 9 kg, and loss of body fat ranging from 5 to 12% of initial percent fat. Light conditioning resulted in significant gains in aerobic capacity (33%), but only produced a trend toward a decrease in body fat percent (-3.1%), and no changes in body weight. Despite the highly significant changes in body composition and body weight in the exercising group, preliminary results indicate no significant changes in serum estradiol or serum estrone. ICF-I did not change significantly either, indicating that chronic exercise and dieting do not result in favorable changes in two hormonal biomarkers for breast cancer.

DTIC

Aerobes; Breast; Cancer; Circulation; Estrogens; Females; Hormones; Mammary Glands; Menstruation; Physical Exercise; Weight Reduction

20050167285 Drexel Univ., Philadelphia, PA USA

Annexin II - Mediated Ca++ Influx Regulates Endothelial Cell (EC) Apoptosis and Tumor Angiogenesis

Sharma, Mahesh C.; Oct. 2004; 12 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0761

Report No.(s): AD-A431727; No Copyright; Avail: CASI; A03, Hardcopy

Angiostatin (AS), the first four kringle domain (Kl-4) of plasminogen (PLG) , blocks angiogenesis and breast cancer progression almost 95 % in xenograft model. Despite great therapeutic potential in breast cancer its mechanism of action is unclear. We previously reported that AS ligand binds to endothelial cell surface annexin II and blocks PLG bindings. Emerging role of annexin II in cancer prompted us to investigate its possible mechanism in breast cancer. In this study we report that that annexin II gene and protein abundantly expressed in highly invasive and metastatic breast cancer cells MDA-MB231 but not in non invasive MCF-7 cells. Annexin, II expression is regulated by proangiogenic growth factors. Growth factors also phophorylate tyrosine residue of annexin II in MDA-MB231 cells indicating the involvement of signal transduction mechanism. MDA-MB231 cells activated PLG to plasmin (PL) in time dependent manner whereas MCF-7 cells lacking annexin II expression failed to activate PLG indicating that MDA-MB231 cells require annexin II for PLG activation and may be involved in invasion and migration. Our data indicates that MDA-MB231 cells induced invasion through ECM in PLG dependent manner but MCF-7 failed to invade and migrate suggesting specific role of annexin II mediated PL generation in invasion and migration. It is possible to block breast cancer invasion and migration by blocking annexin II and may be an attractive target.

DTIC

Angiogenesis; Apoptosis; Breast; Cancer; Endothelium; Enzymes; Mammary Glands; Tumors

20050167286 Naval Health Research Center, San Diego, CA USA

The Effects of Exercise, Heat, and Microclimate Cooling on Terminal Stroke Volume in Men and Women

Heaney, Jay H.; Buono, Micheal J.; Hodgdon, James A.; Jan. 2000; 6 pp.; In English

Contract(s)/Grant(s): Proj-M0096

Report No.(s): AD-A431729; NAVHLTHRSCHC-00-01; No Copyright; Avail: Defense Technical Information Center (DTIC)

We have previously reported that in lieu of the more common end-of-test criteria such as core temperature \h 39 deg C, and heart rate (HR) \h 180 bpm (2, 3), volitional fatigue for men exercising in the heat appears to occur with a reduction in stroke volume (SV) to a value of approximately 75 ml/beat/min (1). Since it has been established that females have a lower absolute SV (4) it is doubtful that a terminal stroke volume (TSV) of 75 ml/beat/min would be observed in females. It was hypothesized that using either body surface area (BSA), which would account for an increased peripheral blood circulation and the exchange between the skin and the environment, or fat free mass, which represents the body mass to be perfused would provide a physiological metric to normalize SV results between males and females. Additionally, we observed that while the

use of a microclimate cooling garment (ice vest) attenuated the rate of cardiovascular drift, the fall in terminal SV (TSV) was independent of temperature and ice vest usage for males exercising in the heat. This paper provides results from acomparison evaluation of male and female SV responses to exercising in the heat both with and without the use of microclimate cooling.
DTIC
Cooling; Females; Human Beings; Males; Microclimatology; Physical Exercise; Stroke Volume; Temperature Effects

20050167289 Virginia Univ., Charlottesville, VA USA
Increasing Mammographic Breast Density in Response to Hormone Placement Therapy and Breast Cancer Risk
Harvey, Jennifer A.; Oct. 2004; 43 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0442
Report No.(s): AD-A431736; No Copyright; Avail: CASI; A03, Hardcopy

Hormone replacement therapy (HRT) slows bone loss and improves quality of life for many women, but its use is also associated with a small increased risk of developing breast cancer (1-3). The estrogen plus progesterone arm of the Women's Health Initiative recently closed due to the increased risk of breast cancer without a benefit in prevention of cardiovascular disease or stroke (4). Many women will still choose to use HRT to treat hot flashes and to improve perceived quality of life despite the small increase in breast cancer risk. Currently, it is not possible to predict which women using HRT are at increased risk of developing breast cancer. On the mammogram, HRT is known to slow the normal involution of the breast and causes an increase in mammographic density in 17-73% of women (Figure 1) (5-8). This effect is more common with use of estrogen with progestin compared to estrogen alone(7). Women with increased mammographic density are also known to be at increased risk for developing breast cancer (9). We therefore hypothesize that women who have an increase in mammographic density in response to HRT are at higher risk for developing breast cancer than those women who do not have a change in mammographic appearance in response to HRT.
DTIC
Breast; Cancer; Hormones; Mammary Glands; Risk; Therapy

20050167290 Georgetown Univ., Washington, DC USA
Role of a Novel Splice Variant of the Steroid Receptor Coactivator AIB1 in Breast Cancer
Riegel, Anna T.; Aug. 2004; 24 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0254
Report No.(s): AD-A431739; No Copyright; Avail: CASI; A03, Hardcopy

In this proposal we have investigated the hypothesis that overexpression of a novel truncated version of AIBl (Delta3AIBl) that we have found to be overexpressed in breast cancer is important for tumor development by impacting upon nuclear hormone receptor function. We have examined the hypothesis that the novel AIBl variant has an altered function that changes its interaction with nuclear receptors such as the estrogen or progesterone receptor. We propose that changes in the level of expression of the novel AIBl variant will support tumor progression and may well have prognostic significance for breast cancer. We have now determined that Delta3AIBl is overexpressed relative to the full-length protein in breast cancer tumor samples and cell lines. We have also determined that Delta3AIBl is a significantly more active coactivator that full-length AIBl on the estrogen and progesterone receptor (J. Biol. Chem. 276, 39736-39741, 2001). Delta3AIBl also plays a role in tamoxifen resistance and its overexpression makes tamoxifen a much more potent estrogen (Oncogene 23, 403-409, 2004). In addition, a surprising finding is that overexpression of Delta3AIBl can also potentiate EGF signaling. This implies that Delta3AIB1 can also drive hormone and non-hormone mediated proliferation in breast cancer.
DTIC
Breast; Cancer; Estrogens; Females; Hormones; Mammary Glands; Steroids

20050167291 Tulsa Univ., OK USA
Evaluation of Cavity Ringdown Spectroscopy as a Potential Noninvasive Breath Diagnostic for Breast Cancer
Miller, George P.; Oct. 2004; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0757
Report No.(s): AD-A431741; No Copyright; Avail: CASI; A02, Hardcopy

Every woman over 50 is recommended to have mammograms to monitor for breast cancer, The goal is to detect breast cancer as early as possible. The problem with the technique are well known and range from the exposure to X-rays, the difficulty of analysis, to patient resistance. Normal human breath contains a complex mixture of volatile organic compounds (VOCs). A number of these VOCs have been identified as candidate markers of various cancers (e.g. formaldehyde in breast

cancer). Although breast analysis has been shown to have great potential as a diagnostic tool, most of the compounds of interest are exhaled in picomolar concentrations. Real-time breath analysis for these compounds is not possible with existing technology. Cavity ringdown spectroscopy (CRDS) measurement of the rate of absorption of a sample within a closed optical cavity, rather than the standard measurement of the obsorbed signal strength over a given sample path. It maintains much of the simplicity of classical absorption spectroscopy, but has been demonstrated to provided an increase in sensitivity of up 10,000 times. The objective is to evaluate the potential of CRDS to provided real-time formaldehyde concentrations in exhaled breath for the purpose of the detection of breast cancer.
DTIC
Breast; Cancer; Cavities; Formaldehyde; Mammary Glands; Organic Compounds; Spectroscopy; Volatility

20050167292 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Effect of Pretreatment With Human Butyrycholinesterase Scavengers on the Toxicokinetics and Binding of Nerve Agents in Guinea Pigs and Marmosets
Langenberg, Jan P.; Jan. 2005; 132 pp.; In English
Contract(s)/Grant(s): DAMD17-00-2-0032
Report No.(s): AD-A431742; No Copyright; Avail: CASI; A07, Hardcopy

An effective therapy against intoxication with nerve agents has been developed involving combined administration of atropine, oxime and anticonvulsant. Administration of the therapeutic agents almost immediately after intoxication is a prerequisite for their efficacy, which renders this approach less satisfactory under field conditions. The treatment is a fortiori much less effective if the nerve agent forms an inhibited acetylcholinesterase (AChE) that is, or rapidly becomes, resistant to reactivation by an oxime. Furthermore, even if the treatment would protect against the lethal effects of nerve agent intoxication, the combined administration of atropine, oxime and anticonvulsant does not prevent the occurrence of post-exposure incapacitation.
DTIC
Guinea Pigs; Monkeys; Nerves; Pretreatment; Scavenging

20050167293 Utah Univ., Salt Lake City, UT USA
Optimization of Breast Cancer Treatment by Dynamic Intensity Modulated Electron Radiotherapy
Leavitt, Dennis D.; Oct. 2004; 18 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0435
Report No.(s): AD-A431743; No Copyright; Avail: CASI; A03, Hardcopy

Since electron arc dose calculations using Monte Carlo are quite time-consuming, we have investigated 'gross optimization' techniques that will allow determination of a set of starting parameters that can converge to final values within a few iterations. This will allow us to determine the final optimized leaf settings for each arc segment within a reasonable time. Included in this 'gross optimization' will be use of precalculated fluence maps reflective of the treatment head geometry, so that the initial parameter set can be determined using Monte Carlo calculations only within the individual patient anatomy. These techniques will make determination of the final leaf settings very straightforward. Additionally, beam data sets have been verified for the clinical range of field sizes and energies. Lastly, we are working with Varian Medical Systems to determine a transition path from our one-of-a-kind electron arc configuration into a supportable system that can be readily available to the general radiotherapy community.
DTIC
Breast; Cancer; Mammary Glands; Monte Carlo Method; Radiation Therapy

20050167294 Fox Chase Cancer Center, Philadelphia, PA USA
Facilitating Treatment Decision Making, Adjustment and Coping in Men Newly Diagnosed With Prostate Cancer
Diefenbach, Michael A.; Nov. 2004; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0006
Report No.(s): AD-A431744; No Copyright; Avail: CASI; A02, Hardcopy

This study evaluated the efficacy of a patient-spouse centered cognitive-affective counseling session (CARE: cognitive affective reactions and expectations), to facilitate treatment decision-making for localized prostate cancer (PrCa). CARE identified treatment-related values and goals and focused on improving knowledge about treatment options. A time and attention matched General Health Information (GHI) session provided nutrition information. Couples (N=300) were enrolled after diagnosis with PrCa, but before a definite treatment decision was made. Data were assessed separately for patients and

spouses at baseline, at 6-months, and at 12 months post intervention. Both sessions were well accepted among participants. The goal of CARE to facilitate treatment decision making was best achieved for spouses and among those patient/partners who chose a non-invasive treatment option. Partners were more distressed about the treatment decision compared to patients, especially in the CARE condition and when considering invasive procedures. We interpret this result as an indication that participants in CARE processed the relevant information and that momentarily higher levels of distress were the 'cost' of such processing. At 6-mo this effect disappears, underscoring its temporal nature. The results demonstrate the usefulness of integrating a brief counseling session into the decision-making process, and that increases in perceived difficulty of decision-making are short-term.
DTIC
Cancer; Decision Making; Human Beings; Males; Prostate Gland

20050167295 Winston-Salem State Univ., Winston-Salem, NC USA
Quality of Life and Functional Status Across the Life Courses (Behavioral Center of Excellence Award)
Naughton, Michelle J.; Oct. 2004; 75 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0447
Report No.(s): AD-A431747; No Copyright; Avail: CASI; A04, Hardcopy

This Behavioral Center of Excellence in Breast Cancer contains three separate, but related research projects focused on breast cancer patients' quality of life and functional status. There is also a Biostatistic's Core Facility supporting all three studies. The three projects are: Project 1) Menstrual Cycle Maintenance and Quality of Life Following Treatment for Breast Cancer: A Prospective Study. This is a study of women aged 45 years and younger diagnosed with a first breast cancer. Project 2) Investigating Mechanisms to Explain Age Associated Differences in Quality of Life Among Breast Cancer Patients. This study examines psychosocial and clinical factors associated with patient's (aged 18-80 + years) coping and quality of life during the first 18 months postdiagnosis. Project 3) Research on Optimal Recovery Practices in Breast Cancer (RESTORE). This is a randomized exercise intervention trial with a lymphedema prevention program. Project 1 is a continuation of a study that was initiated in January of 1998. Projects 2 and 3 are new protocols, which will begin patient recruitment in the fall of 2002. All three studies have the potential to greatly improve the functional status and life quality of breast cancer patients during treatment ad beyond.
DTIC
Breast; Cancer; Clinical Medicine; Mammary Glands; Quality

20050167303 Pittsburgh Univ., Pittsburgh, PA USA
Gadd45 Mediates the BRCA1-Induced Cell Cycle Arrest
Zhan, Qimin; Aug. 2004; 41 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0414
Report No.(s): AD-A431787; No Copyright; Avail: CASI; A03, Hardcopy

Breast cancer is the most frequent malignancy in women. More than half of the hereditary human breast cancer can be attributed to mutations in the breast susceptibility gene BRCA1 (1-3). BRCA1 has been implicated in cellular response to DNA damage, including cell cycle checkpoints, apoptosis and DNA repair (4-10) . These biological events are thought o maintain genomic stability. Deregulation of genomic fidelity is closely associated with malignant transformation and tumorigenesis. However, the molecular mechanism by which BRCA1 plays a role in maintaining genomic integrity remains to be elucidated. This is to define the molecular pathway, which mediates BRCA1's role in the control of cell cycle G2-M checkpoint. The proposed studies will provide the understanding of how BRCA1 participates in maintenance of genomic stability and prevents the onset of breast cancer, as well as provide the insight to development of novel new anticancer drugs. Our previous findings indicate that BRCAl transcriptionally activates Gadd45, a p53-regulated and DNA damage-inducible gene that may play an important role in cell cycle G2-M checkpoints, apoptosis and DNA repair in response to DNA damage (11-17). Therefore, we speculated that the role of BRCA1 in cell cycle G2-M checkpoint might be mediated through Gadd45. Therefore, two major tasks have been proposed in this study. (1). To define the role Gadd45 in BRCAl-induced cell cycle G2-M arrest. (2). To determine the biochemical and molecular mechanism by which BRCAl regulates Gadd45.
DTIC
Breast; Cancer; Genes; Mammary Glands

20050167304 Minnesota Univ., Minneapolis, MN USA
Prevention of Breast Cancer in IGFBP
Yee, Douglas A.; Jun. 2004; 5 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0349
Report No.(s): AD-A431788; No Copyright; Avail: CASI; A01, Hardcopy

In this proposal, we hypothesize that inhibition of IGF action by IGFBP-1 will prevent breast cancer in a SV40 Tag transgenic model of breast cancer. We will test this hypothesis with two specific aims: 1) to inhibit IGF action at the mammary epithelial cell by creating transgenic mice that express IGFBP-l under the control of the whey acidic protein (WAP) promoter and 2) to test the ability of IGFBP-l to suppress tumorigenesis by mating these animals with C3/Tag transgenic mice. To date, we have generated two founder lines containing the IGFBP-l transgene and several Fl and F2 animals were analyzed. Unfortunately, while the transgene was clearly integrated into these animals, we were unable to detect expression of IGFBP-l protein. We also generated animals with an insulator sequences. Despite defining 7 additional founder lines, we were unable to demonstrate expression of IGFBP-l mRNA or protein.
DTIC
Breast; Cancer; Insulin; Mammary Glands; Prevention

20050167305 Henry Ford Health System, Detroit, MI USA
Hormone Receptors in Breast Cancer Prognosis - Racial and Quantitative Effects
Tammemagi, Carl M.; Dec. 2004; 48 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0287
Report No.(s): AD-A431789; No Copyright; Avail: CASI; A03, Hardcopy

The study purpose was to develop an understanding of race/ethnic disparities in breast cancer survival, with an emphasis on hormone receptor differences. A cohort of 924 breast cancer patients was followed (median 10.0 years). Clinicopathologic and survival data were abstracted from medical records and our institutional and SEER Tumor Registries. Detailed comorbidity data was gathered. Breast cancer estrogen receptor (ER) status measured in the continuous scale did not carry more predictive information than ER status dichotomized at 10 femtomoles/mg (standard) in predicting cancer progression/recurrence and survival. The association between ER and progression/recurrence and survival did not differ between Black and Whites. Comorbidity was an important determinant of survival. Adverse comorbidities occur significantly more in Blacks compared to Whites and explained important amounts of survival disparity. Adverse presenting symptoms were an important independent predictor of reduced survival. Black patients tended to have more adverse symptoms, and they explained a small amount of survival disparity. The findings indicate that Current dichotomous methods of evaluating ER are appropriate. Comorbidity/symptoms data might be useful in identifying susceptible patients requiring increased monitoring, more aggressive treatment and management of comorbidities. This is expected to lead to improved survival in general and the reduction of disparity.
DTIC
Breast; Cancer; Hormones; Mammary Glands; Prognosis

20050167306 Georgetown Clinical Research Inst., Washington, DC USA
Effect of Depleting Tumor-Associated Macrophages on Breast Cancer Growth and Response to Chemotherapy
Tsan, Min-Fu; Oct. 2004; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0768
Report No.(s): AD-A431790; No Copyright; Avail: CASI; A02, Hardcopy

Tumor-associated macrophages (TAM) may comprise up to 50% of the tumor mass in breast cancer and are capable of producing estrogen and angiogenic cytokines that regulate the growth and angiogenesis of breast cancer. The goal of this project is to determine whether depletion of TAM, achieved by intra-tumoral injection of lposome-encapsulated dichioromethylene diphosphonate (clodronate), can slow tumor growth and improve the outcome of breast cancer treatment. Preliminary studies so far have revealed that daily intra-tumoral injection of liposome-encapsulated clodronate had no effect on the growth of subcutaneous breast cancer (4T1) model in mice. Whether liposome-encapsulated cloronate depletes tumor-assocaited macrophages in this model is currently under investigation.
DTIC
Angiogenesis; Breast; Cancer; Chemotherapy; Depletion; Estrogens; Macrophages; Mammary Glands; Tumors

20050167307 Columbia Univ., New York, NY USA

Estrogen Metabolism Genes and Breast Cancer: An Innovative Approach

Ahsan, Habibul; Jul. 2004; 37 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0213

Report No.(s): AD-A431792; No Copyright; Avail: CASI; A03, Hardcopy

We proposed to examine associations of CYP17, CYPl9, CYP1BI, and COMT polymorphisms and breast cancer risk using an innovative family-based design among families participating in the Metropolitan New York Breast Cancer Registry (MNYBCR), one of the six sites for National Cancer Institute (NCT)-initiated Cooperative Family Registry for Breast Cancer Studies (CFRBCS) project. To date, we have accomplished all tasks in the approved Statement of Work as planned. We found the CYPl9 allele with 11 TTTA repeats to be associated with breast cancer risk in these families. We also found that maternal (but not paternal) carrier status of CYPl9 alleles with 11 repeats tended to be associated with breast cancer risk in daughters (independent of the daughters' own genotype), suggesting a possible in-utero effect of CYPl9 We found no association of a woman's breast cancer risk with either her own or her mother's genotype of CYP17, CYP1BI, or COMT gene. To date, all the work has been completed and we have published two manuscripts to report the findings.

DTIC

Breast; Cancer; Estrogens; Genes; Mammary Glands; Metabolism

20050167308 Fox Chase Cancer Center, Philadelphia, PA USA

Cognitive-Affective Predictors of the Uptake of, and Sustained Adherence to, Lymphedema Symptom Minimization Practices in Breast Cancer Survivors

Miller, Suzanne M.; Aug. 2004; 15 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0382

Report No.(s): AD-A431794; No Copyright; Avail: CASI; A03, Hardcopy

Approximately 20-30% of women develop lymphedema (LE) following breast cancer treatment; this condition has been associated with psychological distress and diminished quality of life. Effective symptom management requires that women not only recognize early signs of this condition, but that they uptake and maintain precautionary practices over their lifetime. Yet, the limited data available indicate that knowledge and use of symptom minimization precautions are poor, particularly over time. Unfortunately, little is known about how breast cancer survivors perceive their LE risk status, and the cognitive-affective factors that promote the uptake of; and adherence to, LE symptom minimization precautions. Further, the moderating role of individual differences in attentional style has not been explored. Guided by the Cognitive-Social Health Information Processing (C-SHIP) model, we will conduct a longitudinal study, to assess the barriers and facilitators associated with knowledge about, and adherence to, LE symptom-minimization practices among breast cancer survivors currently unaffected by LE. We will explore the mediating role of cognitive-affective variables, and the moderating role of attentional style, on knowledge, uptake and adherence over time. Toward this end, we will survey levels of knowledge, and the practice of symptom minimization precautions at baseline, and again at 6-, and 12-month follow-up.

DTIC

Breast; Cancer; Mammary Glands; Optimization; Predictions; Procedures; Signs and Symptoms

20050167309 Mount Sinai School of Medicine, New York, NY USA

Inherited Susceptibility to Breast Cancer in Healthy Women: Mutation in Breast Cancer Genes, Immune Surveillance, and Psychological Distress

Bovbjerg, Dana H.; Oct. 2004; 8 pp.; In English

Contract(s)/Grant(s): DAMD17-98-1-8333

Report No.(s): AD-A431795; No Copyright; Avail: CASI; A02, Hardcopy

The purpose of the research supported by this IDEA grant award, is to test the possibility that variability in the strength of immune surveillance mechanisms against cancer (operationally defined by assessment of natural killer cell activity) may be a factor in determining the penetrance of mutations in breast cancer susceptibility genes. Two possible explanations for variability in NK cell activity are being investigated: 1) stress-induced immune suppression, and 2) inherited deficits in immune surveillance. This year, we have collected data on 40 women for a total of 224 participants to date out of a planned 240. We have therefore requested a final one-year no-cost extension of the award to allow completion of data collection, analysis, and preparation of presentations and- publications in accordance with the program of work.

DTIC

Breast; Cancer; Genes; Mammary Glands; Mutations; Oncogenes; Surveillance

20050167311 Georgetown Univ. Hospital, Washington, DC USA

High-Resolution Speckle-Free Ultrasound Imaging System-A Potential Solution for Detecting Missed Breast Cancer

Freedman, Matthew T.; Oct. 2004; 22 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0599

Report No.(s): AD-A431798; No Copyright; Avail: CASI; A03, Hardcopy

The Imperium Inc transmission ultrasound system is a highly promising novel method for imaging the breast. In this pilot project, we are to work with Imperium to advise and help them modify their existing system for non-destructive testing into one suitable for breast imaging, perform a physics evaluation and perform a small clinical pilot feasibility trial. The initiation of this project was delayed by non-approval of the human use portion of the project. We have received US Army Human Use approval for study of tissue samples. We provided technical advice to Imperium, and have performed physics tests and in imaging of pieces of animal tissue obtained in a supermarket. Imperium has improved the machine during this past year, but the most up to date version is now at the company since it is still under' development. Thus we are not ready to start human studies. We have requested approval to image animal tissues since these can - be brought to the company and imaged there. DTIC

Breast; Cancer; Detection; High Resolution; Imaging Techniques; Mammary Glands; Ultrasonics

20050167312 Arizona Univ., Tucson, AZ USA

Relationship Between Mammographic Density and IGF Levels Among Hispanic and Non-Hispanic White Women

Arendell, Leslie; Chen, Zhao; Aug. 2004; 5 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0272

Report No.(s): AD-A431799; No Copyright; Avail: CASI; A01, Hardcopy

The purpose of this study is to use information collected from the parent study, the Women's Breast and Bone Density study (WBBD)to investigate the relationship between breast density and IGF levels in pre and postmenopausal Hispanic and non-Hispanic White women. The parent study was completed by the May 31, 2003. In all, recruitment was a lower than expected for the Hispanic women, but all recruitment goals were either met or exceed in the non-Hispanic White women. The total numbers are: 60 premenopausal Hispanic women, 75 premenopausal non-Hispanic White women, 28 postmenopausal Hispanic women, and 78 postmenopausal White women. The serum and plasma samples have been collected for the Insulin-like Growth Factor (IGF) and Insulin-like Growth Factor Binding Protein (IGFBP) assays used in this study (including IGF-1, IGFBP-3, and Free IGF-1), however, the actual analysis will be completed in October 2003 -November 2003. The. mammographic density measurements are currently being finalized and will be merged with the data collected from questionnaires, physical measurements, and the dual energy x-ray absorptiometry (DXA) scan. When the laboratory analyses are complete, the results of those tests will be merged with the clean WBBD data so that the analysis can be completed and manuscripts written.

DTIC

Females; Hormones; Insulin; Mammary Glands

20050167313 Virginia Univ., Charlottesville, VA USA

Improved Ultrasonic Imaging of the Breast

Walker, William F.; Aug. 2004; 106 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0443

Report No.(s): AD-A431806; No Copyright; Avail: CASI; A06, Hardcopy

Ultrasonic imaging is currently used in the breast to distinguish between fluid filled cysts and solid masses, and more rarely, to differentiate between malignant and benign lesions. The utility of ultrasound is limited because microcalcifications (MCs) are not typically visible and because benign and malignant masses often exhibit only subtle image differences. We have invented a new technique that uses modified ultrasound equipment to form images of ultrasonic angular scatter. This method provides a new source of image contrast and should enhance the detectability of MCs and improve the differentiation of benign and malignant lesions. This method yields high resolution images with minimal statistical variability. We have formed images in tissue mimicking phantoms and found that angular scatter offers a new and useful source of image contrast. We have also initiated clinical studies and found that normal soft tissues exhibit significant variations in angular scatter. We have made significant technical advances in image acquisition and signal processing. In the past year we have implemented a new Synthetic Aperture approach to angular scatter imaging that yields significantly better resolution and contrast than earlier approaches. Improved visualization of MCs and benign/malignant differentiation would improve patient care by enhancing

diagnosis and improving the localization of needle and core biopsy procedures. These advances may in turn reduce unneeded biopsies and improve biopsy accuracy.
DTIC
Breast; Cancer; Imaging Techniques; Mammary Glands; Ultrasonics

20050167317 Cancer Therapy and Research Foundation, San Antonio, TX USA
Clonal Hematopoiesis as a Marker of Genetic Damage Following Adjuvant Chemotherapy for Breast Cancer: Pilot Study to Evaluate Incidence
Coltman, Charles A., Jr; Sep. 2004; 121 pp.; In English
Contract(s)/Grant(s): DAMD17-97-1-7088
Report No.(s): AD-A431823; No Copyright; Avail: CASI; A06, Hardcopy

A serious late complication associated with breast cancer treatment is the increased risk for development of therapy-related hematologic malignancies. The goal of this biologic study is to determine whether dose-intensive adjuvant regimens for breast cancer induce genetic damage to hematopoietic stem cells, defined by the emergence of clonal hematopoiesis. Clonal hematopoiesis has been proposed as an early marker of. hematopoietic stem cell damage, preceding the acquisition of critical, recurring genetic alterations associated with the development of therapy-related myelodysplastic syndromes and acute leukemia. Clonal hematopoiesis is being evaluated by two different methods, the X-linked HUMARA clonality and microsatellite instability assays. Positive clones will be further analyzed for MLL and RAS alterations. Study accomplishments to date: a) Clonal hematopoiesis biological protocols (S9719 and S0012) written and approved for study by DOD, CTEP and CTSU; b) clonality assays developed and standardized; c) S9719 biologic study incorporated into S0012 , new clinical treatment protocol on 12/l5/2001, due to the early closure of the companion clinical protocol, S9623; d) as of October 15, 2004 504 samples have been submitted for study, including 29 patients registered to 5 S9719 (completed) and 168 patients registered to S0012; e) to increase assay sensitivity, the manual. HUMASA method was modified to the ABI-3100 automated platform and a similar revision is in progress for the MSI assay; and f) the amendment to add paclitaxel, and eliminate estrogen receptor status and offer clonal hematopoiesis testing was made mandatory in 2003, substantially increasing patient accrual.
DTIC
Breast; Cancer; Chemotherapy; Damage; Genetics; Hematopoiesis; Mammary Glands; Markers; Signs and Symptoms

20050167319 Howard Univ., Washington, DC USA
Anti-Estrogen Regulation of Macrophage Products that Influence Breast Cancer Cell Proliferation and Susceptibility to Apoptosis
Bremner, Theodore; Aug. 2004; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0408
Report No.(s): AD-A431834; No Copyright; Avail: Defense Technical Information Center (DTIC)

We have characterized the regulation of gene expression in MCF-7 breast cancer cells and THP-l macrophages as a model of epithelial cell-stromal cell interaction in breast cancer progression. THP-1 macrophages enhanced the proliferation of MCF-7 cells, protected them against tamoxifen killing, and induced the expression of several MCF-7 angiogenesis-related genes, including IL-8 (interleukin-8), OPN (osteopontin), MDK (Midkine), TGFRl/2/3 (TGF receptors 1, 2, 3), and 1D3 (inhibitor of differentiation 3). Pre-treatment of THP-l macrophages with 1 mM aspirin abrogated their protection of MCF-7 cells against tamoxifen killing, while down-regulating several angiogenesis-related genes in the macrophages. Reciprocally, MCF-7 cells altered the expression of angiogenesis-related genes in the macrophages: THP-1 macrophages expressed both vascular endothelial growth factor (VEGF) and pigment epithelium-derived factor (PEDF) genes when cultured alone; however, in the presence of MCF-7 cells, PEDF expression was dramatically down-regulated. Because PEDF is a potent inhibitor of angiogenesis, the ability of MCF-7 cells to suppress PEDF expression in tumor-associated macrophages, while sustaining VEGF expression, may be a mechanism by which tumor cells regulate macrophage function to promote tumor growth.
DTIC
Apoptosis; Breast; Cancer; Cells (Biology); Estrogens; Macrophages; Mammary Glands; Regeneration (Physiology)

20050167321 Delaware Univ., Newark, DE USA
Large Scale Genomic Monitoring or Profiling Using a DNA-Based Memory and Microarrays
Chen, Junghuei; Wang, Yuzhen; Deaton, Russell; Dec. 2004; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431849; No Copyright; Avail: Defense Technical Information Center (DTIC)

We describe a new method consisting of enzymatic manipulation of genomic DNA or mRNA with DNA microarrays that is capable of monitoring or profiling any organisms presented in a biological sample without priori knowledge of genomic sequences. The method we have developed seeks to store all genomic DNA information in the bacterial communities found in a patch of soil, water or air sample. The goal is to use genomic information at the population or community scale to monitor and detect the existence of new biota (such as pathogens) in the environment. The scope of organisms with their genomic DNA sequenced is fairly small. Thus, much information at the genomic level is not available with conventional techniques. In addition, many organisms are not amenable to laboratory analysis. However, bio-agents used by terrorist group will be a major threat to our national security. The DNA-based memory potentially provides a way to access information from all organisms in a community (airports, train terminals, etc.) to assess impact by human and non-human biomaterials, does not require explicit sequence knowledge, and is quick, flexible, and inexpensive to implement. Thus, it could provide a holistic view of the genomic status of the whole environment.
DTIC
Deoxyribonucleic Acid; Genome

20050167323 Army War Coll., Carlisle Barracks, PA USA
The Reserve's Medical Role for Homeland Security
Magrane, John R., Jr; Mar. 2005; 35 pp.; In English
Report No.(s): AD-A431856; No Copyright; Avail: Defense Technical Information Center (DTIC)

After September 11, 2001, people around the globe became increasingly attuned to the possibility of Weapons of Mass Destruction (WMD) being used in concert with terrorist activities. Traditionally, bombs and explosives have been the terrorist's method of choice, although they increasingly desire to employ more elaborate methods such as dirty bombs, biological agents, and the use of chemicals. Such threats require local responders to use response strategies that meet these asymmetric challenges. Given these conditions, the nation has put forth considerable effort to create a response model that can address medical-specific challenges related to a large-scale attack or disaster in the homeland. Natural disasters also threaten the security of the homeland, as evidenced by the unforeseen catastrophe created by the December 26, 2004 tsunami in the Indian Ocean region. This paper addresses the Department of Defense's (DoD) role in Consequence Management (CM) and the interoperability of medical assets between the Active Component (AC) and U.S. Army Reserve that could be employed in support of a CBRNE or natural disaster. Under law (U.S. Code: Title 10, Section 12304), the Reserve Forces are not allowed to participate in natural disaster relief unless directed by the President. Considering that the DoD is fully immersed in CM and the distribution of Active and Reserve assets in the Medical Reengineering Initiative (MRI), such restrictions need to be absolved. The scope of this paper will address only catastrophic events that would warrant the involvement of the DoD and the medical assets it could provide. The National Guard's medical capabilities are so few that they would not markedly increase DoD's ability to respond to a disaster and so will not be addressed. Also, relatively smaller events for medical support are not considered and are not applicable to the intended theme of the paper.
DTIC
Emergencies; Interoperability; Management Methods; Medical Services; Reserves; Security

20050167329 Michigan Univ., Ann Arbor, MI USA
Influence of Nutrition and Physical Forces on Bone Structure/Function Properties
Goldstein, Steven A.; Oct. 2004; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0809
Report No.(s): AD-A431879; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this research program is to contribute towards two major objectives in support of advancing our ability to prevent or treat bone failure or fragility: 1. Developing and characterizing methods of evaluating bone properties in animal models that goes beyond measures of bone density and global mechanical properties. 2. Evaluating the influence of physical forces and nutritional status on bone biomechanical integrity. Specifically, it was the purpose of this study to apply a hierarchical approach to quantifying the properties of murine bone to the level of the extracellular matrix. Furthermore, the study was designed to test hypotheses concerning the interplay between vitamin D and calcium nutritional support and physical forces. Progress during the third year has followed the proposed statement of work. 394 animals have been completed and nearly all the vertebra, femurs and tibias have been evaluated geometrically, morphologically and mechanically. Genetic strain has a significant influence on properties, but exercise has had little effect. Nutrition is also important. From a histologic perspective, the tissue constituency is unaffected, suggesting only geometric variations, not inherent material changes.
DTIC
Bones; Nutrition

20050167331 Minnesota Univ., Minneapolis, MN USA
Mechanisms of Alcohol Induced Effects on Cellular Cholesterol Dynamics
Wood, W. G.; Sep. 2004; 58 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0583
Report No.(s): AD-A431885; No Copyright; Avail: Defense Technical Information Center (DTIC)

Cholesterol is important in regulation of cell structure and function. Equally important is the role that cholesterol plays in vascular disease. The focus of this grant has been on mechanisms of alcohol induced disruption of cellular cholesterol transport and distribution. We demonstrate that many of the systems involved in regulating cholesterol transport are perturbed by ethanol (HDL, apoA-I, LDL, PC-PLC, PC-PLD) . The Golgi complex plays an important role in protein and lipid trafficking and our new data confirm that the Golgi complex is perturbed by ethanol. Moreover, we are now able to measure the distribution of cholesterol in the Golgi complex and we showed that ethanol induce movement of cholesterol out of the Golgi complex with a greater effect on the cis-medial region as compared with the trans-Golgi region. Current work is elucidating the consequences of ethanol-induced cholesterol depletion in the Golgi complex on Golgi function. An overriding conclusion of the work accomplished is that ethanol at concentrations observed in problem drinkers and alcoholics (e.g., an individual consuming either 6 beers, or 6 one shots of whiskey, or 6 glasses of wine) has a profound and multifaceted effect on cellular regulation of cholesterol.
DTIC
Alcohols; Cholesterol

20050167332 Tulane Univ., New Orleans, LA USA
Phosphatidylinositol 3-Kinase and Protein Kinase C as Molecular Determinants of Chemoresistance in Breast Cancer
Parker, Amanda; Beckman, Barbara; Burow, Matthew E.; Jul. 2004; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0432
Report No.(s): AD-A431891; No Copyright; Avail: Defense Technical Information Center (DTIC)

Using an isogenic model of breast cancer resistance we have previously demonstrated that generation ceramide is inversely correlated with apoptosis in chemoresistant MCF-7 cells. Additionally, we have shown that the NF-kB pathway is an important determinant for MCF-7 cell survival, and that expression of the NF-kB inhibitory protein, IkB, was diminished in chemoresistant cells. To elucidate the connections between these two factors and cell survival, we used a super. repressive form of lkB. We found that lkB-SR decreased survival in both chemosensitive and chemoresistant MCF-7 cells and enhanced TNFalpha-induced cell death. Overexpression of the p65 and p50 NF-kB subunits did not significantly alter viability, either alone or with cytotoxic treatment, suggesting that control of NF-kB signaling by lkB is a main mechanism of pro-survival NF-kB signaling. Interestingly, ceramide treatment inhibited NF-kB activity, through preventing the degradation of lkB, an effect that may contribute to the cytotoxicity of ceramide. Finally, we show that the cytotoxic effect of exogenous ceramide treatment is selective for cancer cells as treatment of non-transformed breast epithelial cells did not significantly decrease viability. This work provide evidence for the importance of the NF-kB transcriptional pathway in breast cancer cell survival, and suggests that targeting NF-kB signaling (through ceramide treatment) is a potential therapeutic treatment in breast cancer.
DTIC
Breast; Cancer; Chemotherapy; Drugs; Mammary Glands; Proteins

20050167333 Loma Linda Veterans Association for Research and Education, Loma Linda, CA USA
Gene Therapy for Fracture Repair
Baylink, David J.; Dec. 2003; 75 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0685
Report No.(s): AD-A431895; No Copyright; Avail: Defense Technical Information Center (DTIC)

In the first year of this study, we have developed gene therapy approaches for fracture repair by: 1) identifying regulatory sequences providing maximum transgene expression by two gene therapy vectors in the bone cells that mediate fracture repair; 2) developing vector delivery techniques for optimal therapeutic gene expression in the healing fracture; and 3) identifying therapeutic gene candidates to augment and accelerate fracture repair. Maximum transgene expression in primary and transformed bone cells was obtained using the non-specific murine leukemia (MLV) -based long terminal repeat and the lentiviral cytomegalovirus promoters, and the gene-specific elongation factor 1a promoter with the lentiviral-based vector. Using the MLV-based vector, surgical techniques have been developed to deliver gene therapy to the fracture site and optimize transgene expression for optimal therapeutic effect. These techniques have benefited healing by augmenting BMP-4 mediated bone formation in the fracture gap. The healing fracture tissues of four individual subjects have been examined for gene expression by microarray analysis at both 3 days and 11 days healing to identify therapeutic gene candidates. Several hundred

genes and expressed sequence tags displayed statistically significant changes in expression at each time. Several candidates are currently undergoing confirmation of expression and further functional characterization.
DTIC
Bones; Fractures (Materials); Fracturing; Gene Therapy

20050167334 Coriell Inst. for Medical Research, Camden, NJ USA
Epidermal Growth Factor (EGF) Receptor Intron 1 CA Repeat Polymorphisms in African-American and Causcsian Males: Influence on Prostate Cancer Risk or Disease Progression and Interaction with Androgen Receptor CAG Repeat Polymorphisms
Moscatello, David K.; Sep. 2004; 32 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0080
Report No.(s): AD-A431896; No Copyright; Avail: CASI; A03, Hardcopy

We are investigating the effect of a polymorphic epidermal growth factor receptor (EGFR) gene intron 1 CA repeat on prostate cancer (CaP) development, alone or in combination with a known androgen receptor gene CAG repeat polymorphism. We will characterize these repeats in DNA from African-American and Caucasian men with CaP. The data will be analyzed for any correlation using both parameters with clinical outcome (age of onset, rapid progression, or metastasis). The Human Subjects Protocol was approved by the US Army -Medical Research and Materiel Command Human Subjects Research Review Board (USAMRMC HSRRB) on 24 -November of 2003. However, the resignation of the individual who was to recruit subjects at the Cooper Hospital/ University Medical Center this year and the failure of my clinical collaborator to train a new coordinator in a timely manner has resulted in additional delays in initiating subject recruitment. Fortunately new clinical collaborators affiliated with a major research institution have agreed to participate in the study. Since no subjects have entered the study, there is no data to report. A new Human Subjects Protocol has been submitted to the IRB and DOD HSRRB to indicate the new clinical personnel, and' we anticipate initiating subject recruitment shortly.
DTIC
Africa; Cancer; Diseases; Epidermis; Polymorphism; Prostate Gland; Proteins; Risk

20050167337 Johns Hopkins Univ., Baltimore, MD USA
Development of a Mouse Model for Determination of the Role of the Catechol Metabolites of Estradiol in Mammary Tumorigenesis
Yager, James D.; Aug. 2004; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0570
Report No.(s): AD-A431900; No Copyright; Avail: CASI; A02, Hardcopy

The purpose of the proposed research is to develop a catechol-o-methyltransferase knockout (COMTKO)-estrogen receptor/Wnt-1 (ERKO/Wnt-1)-mouse model for use in studies on the role of estrogen catechol metabolites in mammary tumorigenesis. The scope of the project involves: 1) Through genetic crossing, introduce the COMT KO genotype into the ERKO/Wnt-1 mice; 2) Initiate studies to determine the effects of the absence of COMT on estrogen catechol metabolite, glutathione-estrogen quinone adduct levels (which reflect oxidative metabolism of estrogen catechol to estrogen quinones), oxidative DNA damage levels, mammary gland development and tumorigenesis in the resulting COMTKO/ERKO/Wnt-1 female mice. ERKO/Wnt-1 mice were obtained after notification of award; COMTKO mice were on-hand. However, unanticipated difficulties were encountered. The COMTKO mice went through a period where their breeding stopped. Additional breeding pairs were obtained from the originator of the strain at Rockefeller University. These mice began breeding and at that point, the first aim could proceed, although we were already about 6 months behind given the time required to obtain additional breeding pairs, time in quarantine, and time for them to adapt and produce off-spring for the desired crosses. As detailed in the progress report, breeding is now proceeding. The project period has been extended 1 year to 20 August, 2005.
DTIC
Catecholamine; Estrogens; Hormones; Mammary Glands; Metabolism; Metabolites; Mice; Models; Quinones

20050167339 Cold Spring Harbor Lab., New York, NY USA
Using RNA Interference to Reveal Genetic Vulnerabilities in Human Cancer Cells
Siolas, Despina; Hannon, Gregory J.; Jul. 2004; 28 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0529
Report No.(s): AD-A431908; No Copyright; Avail: CASI; A03, Hardcopy

Many eukaryotic organisms respond to double stranded RNA (dsRNA) by initiating a sequence specific silencing pathway known as RNA intereference or RNAi. The ability to exploit RNAi as an experimental tool for cancer has evolved in lock-step with an elucidation of the underlying biochemical mechanism of this regulatory pathway. Due in part to the triggering of non-sequence specific responses by dsRNAs of greater than 30-50 nucleotides, the experimental use of RNAi in mammalian systems awaited a detailed understanding of the RNAi mechanism. Studies in a multitude of organisms led to the development of a methodology for experimentally programming the RNAi machinery in mammalian cells by direct delivery of chemically synthesized siRNAs. A second approach for triggering RNAi in mammalian cells came about using DNA vectors encoding short hairpin RNAs (shRNAs), modeled roughly after endogenous microRNAs.
DTIC
Cancer; Diseases; Genetics; Ribonucleic Acids; Vulnerability

20050167340 Pittsburgh Univ., Pittsburgh, PA USA
Anticancer Therapeutic Potential of VEGI, an Antiangiogenic Cytokine
Li, Luyuan; Oct. 2004; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0250
Report No.(s): AD-A431909; No Copyright; Avail: CASI; A03, Hardcopy

Vascular endothelial growth inhibitor (VEGI) is an endothelial cell-specific gene and a potent inhibitor of angiogenesis and tumor growth. We are now able to produce large quantities of one of the isoforms of VEGI, VEGI-192, in E. coli. The anticancer activity of VEGI-192 was evaluated with a Lewis lung cancer murine tumor model. Systemic administration of the recombinant protein to tumor-bearing C57BL black mice by intraperitoneal injection at 20 mg/Kg, two times a week, gave rise to a marked inhibition of tumor growth. Similar efficacy was observed in the treatment of both early and late stages of the established tumors. As much as 50% inhibition of the tumor growth rate was achieved when the tumor volumes reached nearly 5% of the body weight at the time of the initiation of the treatment. Inhibition of tumor formation was also observed when the recombinant protein was given at the time of cancer cell inoculation. Immunohistochemical analysis of the tumor vasculature indicated that VEGI treatment specifically eliminated endothelial cells. Vascular smooth muscle cells in contrast were largely unaffected, and remained associated with a residual vascular structure consisting of blood vessel basement membrane. These results demonstrate the potential of recombinant VEGI-192 as a therapeutic agent for cancer treatment.
DTIC
Angiogenesis; Cancer; Cardiovascular System; Endothelium; Lungs; Therapy

20050167341 Maryland Univ., Baltimore, MD USA
HER2 Regulation of Angiopoietin-2: A Mechanistic Factor in Metastasis
Carter, Bradford W.; Oct. 2004; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0240
Report No.(s): AD-A431916; No Copyright; Avail: CASI; A03, Hardcopy

HER2 overexpression is a poor prognostic indicator in breast cancer. HER2 amplification is associated with early tumor dissemination, rapid tumor progression, and increased invasiveness, implying that HER2 has a significant role in the metastatic phenotype. We have demonstrated that two key steps in the metastatic mechanism, angioinvasion and transendothelial migration, are augmented by HER2 expression, and we have linked Angiopoietin-2, a vascular destabilizing protein, to expression of HER2. The objective of this research is to determine if the metastatic advantage of HER2 expressing cancer cells is imparted by Angiopoietin-2 production, and further to determine if overexpression of HER2 is linked to Angiopoietin-2 expression. The scope of this research begins with two assays to test 1) angioinvasion and 2) endothelial cell retraction, a key step in tumor-cell transendothelial migration. Using several strategies, the research protocol tests tumor cell production of Angiopoietin-2 or blockade of Angiopoietin-2 to determine if Angiopoietin-2 modulates the metastatic steps in question. Further, breast cancer specimens are tested for concurrent expression of HER2 and Angiopoietin-2, and also correlated with stage and grade of the tumor. In addition, concurrent expression of related receptors (Epidermal Growth Factor receptor, HER3, and HER4) are also tested for correlation of Angiopoietin-2 expression.
DTIC
Breast; Cancer; Endothelium; Mammary Glands; Metastasis

20050167350 Pittsburgh Univ., Pittsburgh, PA USA

Estrogens, Genetic Polymorphisms and Breast Cancer Risk

Okobia, Michael N.; Bunker, Clareann H.; Kuller, Lewis; Ferrell, Robert E.; Anyanwu, Stanley N.; Ezeome, Emmanuel R.; Uche, Emmanuel E.; Jul. 2004; 6 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0551

Report No.(s): AD-A431937; No Copyright; Avail: CASI; A02, Hardcopy

This study is aimed at evaluating the role of polymorphisms in the genes encoding enzymes responsible for the biosynthesis and degradation of estrogens and its metabolites in susceptibility to breast cancer in Nigerian women. A case-control study is being undertaken to investigate the exposure level to estrogen and its metabolites in these women by examining the genotype frequencies of the genes encoding aromatase, estrogen hydroxylase and catechol-O-methyltransferase, the three major enzyme systems involved in the biosynthesis and degradation of estrogen and its metabolites. Polymorphisms in these genes have been reported to influence breast cancer risk in African American women. Since Nigerian women share common genetic ancestry with African American women, it is biologically plausible to speculate that similar genetic factors may be acting to determine breast cancer risk in both populations. The first 20 months of the study (i.e., August 2002 and April 2004) was spent in recruiting 500 study participants from Nigeria and transferring study documents and biological samples from Nigeria to the University of Pittsburgh. Data entry was accomplished in May and June 2004 and descriptive data analysis is currently on going. DNA extraction is underway. Genotyping will be completed in the final year.

DTIC

Biosynthesis; Breast; Cancer; Estrogens; Genetics; Mammary Glands; Metabolites; Polymorphism; Risk

20050167351 Winston-Salem State Univ., Winston-Salem, NC USA

Developing a Training Program in Breast Cancer Research to Decrease the Disparity of Morbidity and Mortality in Underserved/Minority Women

Flack, Sylvai A.; Oct. 2004; 12 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0458

Report No.(s): AD-A431938; No Copyright; Avail: CASI; A03, Hardcopy

Winston-Salem State University (WSSU) a designated Historically Black College and University (HBCU) is committed to resolving some of the economic, social and health problems in the community in which the university is located. Breast cancer deaths and complication occur disproportionately in minority women than majority women within this community. This proposal is designed to develop a sustainable breast cancer training program at WSSU. Four faculty post docs from the School of Health Sciences are developing research skills by engaging in breast cancer research with professors at Johns Hopkins University who are experts in this area. In order to accomplish this project an interdisciplinary committee of doctors, nurses, educators, researchers and professors who have engaged in breast cancer research led by the researchers from JHU, are guiding the faculty through this development. The objectives of this training program are to allow the trainees the opportunity to develop fundable research proposals, to conduct successful clinical research projects, and to publish and to train other WSSU researchers. The faculty post docs will be able to apply their knowledge to assist minority elderly women to learn how to discover signs of cancer before the cancer become hard to treat. The knowledge gained will allow these researchers to participate in the training of other researchers in the area of breast cancer. Consistent with year 3 objectives, the faculty post docs have attended several training activities, submitted research abstracts and grant applications, presented in scientific conferences, and are continuously designing the program for future WSSU researchers.

DTIC

Breast; Cancer; Clinical Medicine; Education; Females; Mammary Glands; Medical Science; Mortality

20050167352 Army War Coll., Carlisle Barracks, PA USA

The Need to Develop a National Health Strategy - A Report on the Industry

Williams, Harry B.; Mar. 2005; 51 pp.; In English

Report No.(s): AD-A431940; No Copyright; Avail: Defense Technical Information Center (DTIC)

The quality of health care in terms of treatment, system responsiveness, and health inequalities among the population in the USA is not commensurate with its cost. Although some argue that the USA can claim a quality of health care among the highest in the world, costs in fact are soaring out of proportion to the quality of care provided to the population as a whole. Government and private industry spending on health care threatens an impending national fiscal crisis as Americans age but live longer with chronic diseases while engaging in unhealthy lifestyles that cause problems such as obesity. The U.S. must control costs while ensuring broad access to high quality care. Development now of a National Health Strategy provides the

best chance to produce the needed fundamental change in time to avert approaching fiscal disaster.
DTIC
Health; Industries; Management Systems; Medical Services

20050167355 North Carolina Univ., Chapel Hill, NC USA
A Population-Based Investigation of the Role of Focal Adhesion Kinase (FAK) and E-Cadherin Expression in Breast Cancer Promotion, Progression, and Therapeutic Response
Deming, Sandra L.; Oct. 2004; 15 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0349
Report No.(s): AD-A431945; No Copyright; Avail: CASI; A03, Hardcopy

Presented within this final report are the results of-the grant entitled 'A population based investigation of the role of Focal Adhesion Kinase (FAK) and Ecadherin expression in breast cancer promotion, progression, and therapeutic response'. In regards to the specific aims of the grant, immunohistochemical staining has been completed for both FAK and E-cadherin expression. Furthermore, scoring and analysis has been completed on 629 of the samples stained for FAK and 572 samples stained for e-cadherin, providing information on the prevalence of FAK and e-cadherin expression as well as their association with other known risk and prognostic factors in breast cancer. Data collection for vital status and cause of death is complete, as is the analysis addressing the roles of FAK and e-cadherin expression in breast-cancer specific survival. The data suggest that neither FAK expression nor e-cadherin expression is significantly associated with stage of disease. In terms of 5-year survival, FAK, but not e-cadherin, expression is a significant prognostic indictor of breast cancer specific survival.
DTIC
Adhesion; Breast; Cancer; Histochemical Analysis; Mammary Glands; Populations; Staining; Therapy

20050167363 Virginia Commonwealth Univ., Richmond, VA USA
Protection Against Pathogens via Biocidal Polymers
Wynne, Kenneth J.; Apr. 2005; 4 pp.; In English
Contract(s)/Grant(s): N00014-03-1-0682
Report No.(s): AD-A431961; No Copyright; Avail: CASI; A01, Hardcopy

The goal for this project was to establish feasibility for a surface modifying additive concept whereby the surface of coatings could be made antimicrobial. Proof of principle was established via the synthesis and testing of a generation 1 (Gen-1) polyurethane antimicrobial surface modifying additive that killed challenges of P. aeruginosa (Gram negative) and S. aureus (Gram positive) in 30 minutes or less.
DTIC
Additives; Antibiotics; Antiinfectives and Antibacterials; Microorganisms; Pathogens; Pesticides; Polyurethane Resins; Protection; Pseudomonas; Staphylococcus

20050167366 New York Univ., New York, NY USA
Evaluation of DNA Methylation as a Target for Intraductal Therapy for Ductal Carcinoma in Situ of the Breast
Skinner, Kristin A.; Aug. 2004; 5 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0569
Report No.(s): AD-A431965; No Copyright; Avail: CASI; A01, Hardcopy

Ductal carcinoma in situ(DCIS), the preinvasive form of infiltrating ductal breast cancer, accounts for 20-30% of breast cancers and is treated surgically. In DCIS, the malignant cells are confined within the basement membrane. DCIS is a local disease, and so an ideal candidate for local therapies. DNA methylation is one mechanism for tumor suppressor gene inactivation. It is an early event in the course of malignant progression. Because methylation is a potentially reversible mechanism for tumor suppressor gene inactivation, it is an intriguing target for molecular therapeutics. Drugs, such as 5-azadeoxycytidine (DAC), are available that can reverse methylation changes and prevent neoplasia in vivo. Hypothesis: DNA Methylation is altered in DCIS aid is a therapeutic target for intraductal therapy. Specific Aim 1: Document the methylation status of tumor suppressor genes in DCIS. Specific Aim 2: Document the feasibility of an intraductal approach to DCIS. Specific Aim 3: Identify the dose(s) of DAC with biologic activity and acceptable side effects when delivered intraductally to patients with DCIS (phase I trial). The ultimate goal of this proposal is to evaluate DNA methylation as a target for intraductal therapy. The results of this study could revolutionize the way we treat DCIS.
DTIC
Breast; Cancer; Deoxyribonucleic Acid; Mammary Glands; Methylation; Targets; Therapy

20050167367 California Univ., Los Angeles, CA USA

Antiangiogenic Steroids and Growth Factor Receptors in Human Breast Cancer Therapy

Pietras, Richard J.; Aug. 2004; 11 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0381

Report No.(s): AD-A431966; No Copyright; Avail: CASI; A03, Hardcopy

With 2,000,000 new cases worldwide annually, breast cancer is the most common malignancy in women. Genesis of these cancers depends, in part, on formation of a good blood supply, a process termed angiogenesis. Vascular endothelial growth factor (VEGF) stimulates growth of endothelial cells, and this critical protein is produced by breast cancers. High levels of VEGF secretion occur in tumors expressing EGF and HER-2 growth factor receptors. Anti-bodies to HER-2 receptor elicit direct anti tumor effects but also reduce VEGF secretion from tumors and, thereby, decrease angiogenesis. Optimal suppression of tumor growth may be achieved by combining anti-growth factor receptor therapies with agents that disrupt tumor angiogenesis, such as squalamine, a steroid that blocks VEGF-induced activity. This study probes the notion that treating both the tumor and the tumor-associated vasculature may be more effective than treating cancer cells alone. We are assessing specific binding and biologic activities of squalamine using vascular endothelial cells, with evidence for localization of squalamine in caveolae signaling domains. Moreover, we are evaluating the efficacy of squalamine alone and combined with other biologic agents, such as Herceptin and 204, in blocking growth and progression of human breast cancer xenografts in vivo.

DTIC

Angiogenesis; Breast; Cancer; Cardiovascular System; Mammary Glands; Steroids; Therapy

20050167369 Baylor Coll. of Medicine, Houston, TX USA

Interaction of Dietary Genistein, Equol, and Aromatase Inhibitors on Growth of Estrogen-Dependent Human Breast Cancer (MCF-7Ca) Cell in Athymic Mice

Chen, Mercy; Oct. 2004; 18 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0307

Report No.(s): AD-A431970; No Copyright; Avail: CASI; A03, Hardcopy

We conducted a range-finding experiment to determine the appropriate dosage of androstenedione and Letrozole that will be used in the silastic implants. Next we evaluated effect of dietary genistein on the growth of estrogen-dependent breast tumors using an intratumoral aromatase expressing postmenopausal breast cancer (MCF-7Ca) model. For the range-finding experiment, ovariectomized athymic mice were divided into five treatment groups (15 mice per group); negative control (MCF-7Ca); 5 mg androstenedione (AD); 1 mg letrozole (LET), AD + LET, and 2 mg LET, AD + LET. For the interaction of genistein with Letrozole, ovariectomized athymic mice were divided into seven treatment groups (15 mice per group); negative control (MCF-7Ca); 5 mg androstenedione (AD); 1 mg letrozole (LET), AD + LET, AD + LET +250 ppm GEN, AD + LET +500 ppm GEN; AD + LET + 1000 ppm GEN. We identified an appropriate dosage of Letrozole and found that dietary genistein will stimulate the growth of MCF-7Ca tumors in the presences of Letrozole. Therefore, caution is necessary for postmenopausal women with estrogen-dependent breast cancer consuming dietary genistein.

DTIC

Breast; Cancer; Diets; Estrogens; Inhibitors; Mammary Glands; Mice

20050167370 Michigan Univ., Ann Arbor, MI USA

Structure-Based Approach for Discovery of Small Molecules Inhibitors Targeted at Bcl-2

Wang, Shaomeng; Sep. 2004; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0256

Report No.(s): AD-A431973; No Copyright; Avail: Defense Technical Information Center (DTIC)

Overexpression of Bcl-2 has been observed in 70% of breast carcinomas and the expression levels of Bcl-2 proteins correlate with resistance to a wide spectrum of chemotherapeutic drugs and radiation therapy. In this IDEA grant, we propose an effective structure-based approach to discover small molecule inhibitors of Bcl-2 through structure-based 3D-database search over large chemical databases of synthetic compounds or natural products. Using this powerful approach, we have discovered 10 classes of structurally diverse, non-peptidic, drug-like, small-molecule inhibitors of Bcl-2. Our studies showed that the most promising small-molecule inhibitors of Bcl-2 we have discovered potently bind to Bcl-2 protein, inhibit cell growth and induce apoptosis in breast cancer cells with high levels of Bcl-2 proteins and display good selectivity in normal cells with low levels of Bcl-2 proteins. One of the most potent Bcl-2 inhibitors achieves a significant anti-tumor activity in

vivo and represents a highly promising anti-cancer agent for further evaluation.
DTIC
Breast; Cancer; Chemotherapy; Drugs; Inhibitors; Mammary Glands; Molecules

20050167371 California Univ., San Francisco, CA USA
Preclinical Mouse Models of Neurofibromatosis
Shannon, Kevin M.; Oct. 2004; 48 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0638
Report No.(s): AD-A431974; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report describes the fourth year of research effort by a Consortium of investigators who are working to develop, characterize and utilize strains of mice that accurately model tumors that develop in persons with NF1 and NF2. This Consortium has made substantial progress toward accomplishing the goal of generating models of NF1 and NF2-associated tumors for biologic and preclinical therapeutic trials and of exploiting these mice to address biologic and preclinical questions. The Consortium published the proceedings of a successful conference on the pathologic classification of murine NF-associated neural tumors that was organized in the prior fund year. Many of the novel strains that have been developed have been shared widely with the research community. The investigators have collaborated closely and have shared expertise and reagents extensively. This NF Consortium is a member of the Moue Models of Human Cancer Consortium of the National Cancer Institute and is participating fully in the activities of the group. The current award will support these collaborative studies through 2005.
DTIC
Cancer; Mice

20050167372 California Univ., Irvine, CA USA
Automated Area Beam Equalization Mammography for Improved Imaging of Dense Breast
Molloi, Sabee; Aug. 2004; 24 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0541
Report No.(s): AD-A431975; No Copyright; Avail: CASI; A03, Hardcopy

In mammography, dense breast regions persistently suffer from reduced contrast-to-noise ratio (CNR) because of degraded contrast from large scatter intensities and relatively high noise. Area x-ray beam equalization can improve image quality by increasing the x-ray exposure to under-penetrated regions without increasing the exposure to other breast regions. Optimal equalization parameters with respect to image quality and patient dose were determined through computer simulations and validated with experimental observations on a step phantom and an anthropomorphic breast phantom. The parameters important in equalization digital mammography were considered: attenuator material (Z=13 to 92), beam energy (22 to 34 kVp), and equalization level. A Mo/Mo digital mammography system was used for image acquisition. A prototype 16x 16 piston driven equalization system was used for preparing patient-specific equalization masks. Simulation studies showed that a molybdenum attenuator, a tube voltage of approximately 26-2g kVp, and an equalization level of 20 were optimal for improving contrast, CNR, and figure of merit (FOM=CNR exp 2/exposure). Experimental measurements using these parameters showed significant improvements in contrast, CNR, and FOM. Moreover, equalized images of a breast phantom showed improved image quality. These results indicate that area beam equalization can improve image quality in digital mammography.
DTIC
Breast; Calcification; Detection; Imaging Techniques; X Ray Absorption

20050167373 Massachusetts General Hospital, Boston, MA USA
Growth Mechanisms of Schwann Cell Tumors in NF2
Stemmer-Rachamimov, Anat O.; Jul. 2004; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0716
Report No.(s): AD-A431976; No Copyright; Avail: Defense Technical Information Center (DTIC)

Patients with Neurofibromatosis 2 (NF2) develop multiple schwannomas that can cause significant morbidity and mortality and numerous, small, neoplastic Schwann cell tumorlets in the cauda equina that do not grow and are clinically silent. Since NF2 gene inactivation has been shown to occur in both tumorlets and schwannomas, our hypothesis is that additional genetic or epigenetic events are required for the development of frank, symptomatic schwannomas. The purpose of this study is to identify with oligonucleotide expression microarray analysis, the growth-associated factors that drive the

growth of symptomatic schwannomas. We collected and histologically examined tissues from 4 NF2 autopsies and identified specimens as schwannomas, tumorlets and normal peripheral nerves. RNA was extracted, amplified and checked from representative samples from each autopsy. The two autopsies with the superior RNA quality (as judged by Agilent Bioanalyzer system) were used for the microarray study. Laser captured tissues (to ensure the exclusion of adjacent normal tissues) of 7 schwannomas, 8 tumorlets and 2 nerves from these 2 autopsies were hybridized on Affymetrix U133 chips. Lists of differentially expressed genes in the tumorlets and schwannomas were compiled using multiple software programs and multiple analysis methods. Validation by RT PCR and immunohistochemistry is ongoing.
DTIC
Tumors

20050167375 House Ear Inst., Los Angeles, CA USA
Establish an In Vitro Model for the Study of NF2 Gene Function and Gene Therapy
Andalibi, Ali; Jul. 2004; 53 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9491
Report No.(s): AD-A431978; No Copyright; Avail: CASI; A04, Hardcopy

Two vestibular schwannoma cell lines, HEl-193 and HEl-182, as well as one vestibular nerve schwann cell line, HEl-286, were established using retroviral-mediated transfer of the HPV E6-E7 genes. HEI-193 cells, have a unique splice site mutation of the NF2 gene, while the NF2 gene in HEl-182 cells does not appear to be mutated. HEI-286 cells are expected to have the wildtype NF2 gene. Both immunocytochemistry and molecular biology techniques were used to demonstrate that these cell line are of Schwann cell origin. Comparison of the primary tumor with HEl-193 revealed the same NF2 mutation and an identical pattern of allele loss at multiple loci, indicating that the established cell line had maintained many of the properties of the original tumor. The immortalized cell lines were non- tumorigenic in severe combined immunodeficient (SCID) mice and/or nude mice, but did show altered growth properties such as higher proliferation rate and independence of Schwann cell growth factors. As part of our analysis, we also performed microarray analysis of gene expression in the cell lines as well as in tumors, including the original 193 tumor. The results obtained to date will help in our future studies aimed at elucidating the molecular pathogenesis of NF2.
DTIC
Gene Therapy; In Vitro Methods and Tests; Mutations

20050167378 Georgetown Univ., Washington, DC USA
Fas/FasL System in c-Myc Expressing Mammary Carcinoma Cells
Coticchia, Christine M.; Jun. 2004; 22 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0246
Report No.(s): AD-A431981; No Copyright; Avail: CASI; A03, Hardcopy

The c-Myc oncogene is amplified or overexpressed in the majority of human breast cancers where it contributes to genomic instability, abrogation of cell cycle check points, cell proliferation, and apoptosis. In search of survival pathways that abrogate c-Myc's apoptotic function, our lab has uncovered a novel survival-signaling pathway that regulates Akt activation. In mammary carcinoma cells that overexpress c-Myc, calcium and calmodulin mediate EGF-induced activation of Akt. Inhibition of calmodulin with W7 leads to a rapid abrogation of ligand initiated activation of Akt. This phenomenon was observed in a number of mouse mammary carcinoma cell lines and human mammary epithelial cells regardless of c-Myc expression, however only c-Myc overexpressing cells underwent apoptosis when calmodulin was inhibited by W7, suggesting that calmodulin was providing a fundamental survival signal in those cells. Calmodulin and calmodulin-dependent kinase's (CaM kinases) role in the mammary epithelium is virtually unknown. A novel CaM kinase, Pnck (pregnancy upregualted nonubiquitous CaM kinase) was recently discovered and its expression profile has been described. Pnck is upregulated in the mouse mammary gland during development and in late stage pregnancy in a subset of epithelial cells that appear to be undergoing differentiation. Pnck is again upregulated in the mouse mammary glands undergoing postlactational involution, suggesting that Pnck expression is correlated with differentiation and apoptosis. In human breast tumors, Pnck expression was upregulated, but not in adjacent benign tissue, as well in a subset of human breast cancer cell lines. Interestingly, in mouse mammary tumors, Pnck was upregulated in MMTV-c-Myc derived tumors, but not other MMW-oncogene derived tumors, suggesting that Pnck may be expressed in a c-Myc associated manner.
DTIC
Breast; Cancer; Enzymes; Mammary Glands; Phosphorus

20050167379 City of Hope Medical Center, Duarte, CA USA
Training Program in Breast Cancer Research
Shively, John; Oct. 2004; 15 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0203
Report No.(s): AD-A431983; No Copyright; Avail: CASI; A03, Hardcopy

The objective of the City of hope breast cancer training program is to develop a new generation of basic and clinical scientists trained to do research on breast cancer and its prevention. The program will draw predoctoral trainees from the CoH graduate school and post doctoral trainees from the basic sciences and clinical oncology disciplines at CoH. Those who show-a genuine interest in breast cancer research, as determined by a written application, are admitted into the program in a competition held each year for available slots. Trainees are required to work in labs that study fundamentals of cancer biology and are required to develop a research program that focuses on a specific problem in breast cancer. In addition to performing their breast cancer research, the fellows are required to attend and participate in courses on 1) the biology and pathology of breast cancer, 2) breast cancer prevention and treatment, 3) the ethical conduct of basic and clinical research, 4) biostatistics, 5) genetic predisposition of breast cancer and counseling, and 6) the quality of life and pain management in breast cancer. Trainees attend a biweekly seminar/journal club course in which they present their research and one recent paper to each and their mentor. They receive a critical review of both presentations and benefit from the others presentations on breast cancer. DTIC

Biometrics; Breast; Cancer; Education; Health; Mammary Glands; Medical Science; Schools

20050167390 Medical Univ. of South Carolina, Charleston, SC USA
The Role of Insulin-Like Growth Factor (IGF) in IGF-Mediated Tumorigenesis
Harbeson, Caroline E.; Rosenzweig, Steven A.; Jul. 2004; 12 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0392
Report No.(s): AD-A432027; No Copyright; Avail: CASI; A03, Hardcopy

The insulin-like growth factor (IGF) system has been shown to play an important role in the progression of a number of cancers, including breast cancer. IGF-1 binds with high affinity to a family of proteins known as the IGF binding proteins (IGFBPs), which act as natural inhibitors of IGF-1 through sequestration from the IGF-1 receptor. The purpose of this proposal is the development of IGF antagonists based on the structure of the IGFBPs. Knowledge of the mechanism of IGFBP action is currently unclear, therefore we have taken a photoaffinity labeling approach to identify the IGF binding domains on the IGFBPs. Previous data collected in the lab indicate that the carboxy terminus of IGFBP-2 is involved in high affinity binding to IGF-1; these experiments are being repeated with IGFBP-3 and IGFBP-5 to extend these findings. Current photoaffinity labeling data indicate that the midregion of the IGFBP-3 protein is involved in IGF-1 binding. This information will be used in the rational design of therapeutic IGF antagonists for use in the treatment of breast and other cancers.
DTIC

Breast; Cancer; Insulin; Mammary Glands

20050167391 Naval Medical Research Inst., Portsmouth, VA USA
Managing Referrals to Boost Success Under Revised Financing at Naval Medical Center Portsmouth
Patterson, Greg S.; Apr. 2004; 35 pp.; In English
Report No.(s): AD-A432028; No Copyright; Avail: CASI; A03, Hardcopy

This study looks at three clinics; Cardiology, Orthopedics and Gastroenterology, and seeks ways to minimize the number of referrals to the civilian network while treating as many beneficiaries as possible within the MTF. The purpose of this study is to validate the gains or losses that have been made through the implementation of business plans by NMCP and to provide a foundation for subsequent and more detailed studies that would examine the methods and procedures implemented to manage referrals. In summary, the three clinics, Orthopedics, Gastroenterology and Cardiology, have greatly reduced the number of referrals sent to the network. However, the significance of this change is not fully realized until the existing referrals expire. The Statistics used in this study were derived from SPSS statistical software program, which provided a one-way analysis of variance and descriptive statistics for the dependent variables, referral visits and referral costs. As NMCP continues on its path toward reducing the number of referrals to the network, it must continue to track referrals and their associated costs. In the next few months, I firmly believe the clinics will start to achieve a further decrease in costs as evidenced by the reduction in referrals to the network.
DTIC

Management Systems; Medical Services

20050167392 North Carolina Univ., Chapel Hill, NC USA
Growth-Promoting and Angiogenic Functions of Adenosine in Breast Cancer
Spychala, Jozef; Dec. 2004; 61 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0351
Report No.(s): AD-A432030; No Copyright; Avail: CASI; A04, Hardcopy

Adenosine is a potential novel factor in breast cancer progression and this project has been designed to evaluate local adenosine tumor-promoting activity experimentally. We have aimed at testing growth and angiogenic properties of cells that differ in adenosine production rates in xenograft model using immunocompromized mice. During the 3-year period we have accomplished several specific goals successfully. We have generated cell variants that differ in their capacity to produce endogenous adensine. We have determined that their growth rate as xenografts depends on the number of cells injected orthotopically into mice. At 2.5 x 106 cells per site we have seen decreased growth of eN(-) cells. In addition, we have demonstrated that eN specifically interacts with Tenascin C and cells with suppressed eN expression have enhanced motility on Tenascin C. Furthermore, using protein expression profiling we have determined that high eN expression coincides with mesenchymal phenotype and that HDAC inhibitor TSA reverses epithelial expression profile in breast cancer cells. However some goals have not been accomplished within the proposed time frame. Given the importance of proposed research we are continuing our work toward accomplishing these goals using other funding sources.
DTIC
Adenosines; Angiogenesis; Breast; Cancer; Mammary Glands

20050167393 Ben Taub General Hospital, Houston, TX USA
Hospital Bed Utilization: Increasing Throughout
Larsen, Stephen D.; Nov. 2003; 96 pp.; In English
Report No.(s): AD-A432032; No Copyright; Avail: CASI; A05, Hardcopy

Ben Taub General Hospital is experiencing numerous emergency center ambulance diversions. The diversions are a symptom of lack of bed availability or slow patient throughput. Patient throughput is a function of appropriateness of admissions, accelerated post-acute transfers, and expedited care. Further, enhanced discharge processes such as earlier physician rounds can reduce diversions but has little effect on throughput when measured in days. The purpose of this study is to determine if the hospital can alleviate bed capacity constraints. Descriptive and inferential analyses were conducted for each group of variables affecting patient throughput. The average length of stay of 5.87 days was used to calculate the potential for increased throughput. Inappropriate admissions, specifically 388 observation patients, block 56 other patients from beds per year. Thirty-two medically stable long stay patients impede 704 patients from inpatient care per year. Finally, expediting the care itself holds the promises of 10,761 additional patients per year.
DTIC
Hospitals; Management Systems; Medical Equipment; Medical Services

20050167394 Womack Army Medical Center, Fort Bragg, NC USA
A Business Case Analysis of the Conversion of Resource Sharing Agreement Workload at Joel Health Clinic
Ginder, Philip W.; Mar. 2004; 82 pp.; In English
Report No.(s): AD-A432033; No Copyright; Avail: CASI; A05, Hardcopy

The Joel Resource Sharing Clinic at Womack Army Medical Center will dissolve upon implementation of the next generation of TRICARE contracts. Three courses of action were identified to accommodate the workload performed under the current contract: two in which the health care is produced by hiring or contracting personnel to see the beneficiaries at Womack, and one in which the care is purchased in the contractor's network. A business case analysis was conducted on each course of action, and non-financial considerations were also identified. The financial analysis discovered an increase in Womack' 5 three-year purchased network care costs of $12.? to $15.3 million should Womack enroll the Joel Resource Sharing beneficiaries (beneficiaries are currently enrolled with the contractor). The study recommends that the beneficiaries remain enrolled to the contractor and reassigned to a primary care manager in the local community.
DTIC
Commerce; Health; Management Systems; Medical Services; Workloads (Psychophysiology)

20050167395 Duke Univ., Durham, NC USA
CBP and Extracellular Matrix-Induced Apoptosis in p53 (-) HEMECs: A Model of Early Mammary Carcinogenesis
Seewaldt, Victoria L.; Sep. 2004; 168 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0375
Report No.(s): AD-A432034; No Copyright; Avail: CASI; A08, Hardcopy

Interactions between normal mammary epithelial cells (HMECs) and extracellular matrix (ECM) are important for mammary gland homeostasis and loss of ECM-sensitivity is an early event in mammary carcinogenesis. The purpose of this grant is to investigate how the CREBP-binding protein (CBP) might target the elimination of damaged HMECs. We have observed that 1) suppression of CBP results in apoptosis-resistance through impaired laminin expression and 2) CBP promotes induction of interferon-regulated genes during apoptosis. These findings will provide novel targets for chemoprevention and are being used to develop markers for response to current prevention strategies.
DTIC
Apoptosis; Breast; Cancer; Carcinogens; Epithelium; Mammary Glands

20050167396 Biopraxis, Inc., San Diego, CA USA
Reactive Topical Skin Protectant
Grow, Ann I.; Jun. 2004; 16 pp.; In English
Contract(s)/Grant(s): DAMD17-01-C-0057
Report No.(s): AD-A432035; No Copyright; Avail: CASI; A03, Hardcopy

Biopraxis is developing a method for production of novel catalysts from inexpensive precursors, at high yield, under mild conditions. Under an earlier program, Biopraxis demonstrated that catalysts produced by this method can effectively neutralize the agent simulants diisopropyl fluorophosphate (DFP) and 2-chioroethyl ethyl sulfide (CEES). Government testing identified a formulation that exhibited excellent efficacy against both GD and HE), reducing nerve agent penetration by 93.1% and mustard penetration by 81.5% in comparison with the not reactive TSP. Accordingly, the Government awarded a follow-on program. The program was cut short due to funds being diverted for the Iraq war. The best formulation that had been identified by that time did not allow any detectable GD penetration in 2Ohours (99.96% reduction) and was projected to take more than 950 hours to reach breakthrough (a 16,502% increase). This same formulation also showed excellent efficacy against HD; i.e., a 217% increase in the time to breakthrough, and a 59% reduction in penetration by 2Ohours, in comparison with the non-reactive TSP. Since the catalysts are solid particulates, formulations may contain mixtures of catalysts that are superior for decontaminating different agents.
DTIC
Reactivity

20050167397 Rochester Univ., NY USA
Chemotherapy Agents and the Inhibition of Neuronal Birthing in the Brain-The Cause of 'Chemo Brain'
Gross, Robert A.; Nov. 2004; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0277
Report No.(s): AD-A432036; No Copyright; Avail: CASI; A02, Hardcopy

Patients undergoing chemotherapy can experience a decline in cognitive abilities. While well described from a clinical perspective, little is known of the neurological substrate for this difficulty, commonly known as chemo brain.' We hypothesize that the cognitive difficulties experienced by patients undergoing chemotherapy are the result of impaired neurogenesis, especially in the hippocampus. We further hypothesize that agents that do not cross the blood-brain barrier will not show reduced rates of neurogenesis, in contrast to agents that readily cross into the central nervous system (CNS). Our objective is to compare the effect of drugs that enter the CNS (Cytoxan and 5-FU) with agents that do not (Adriamycin and Taxol) with respect to their ability to impair the birthing of new neurons in the hippocampus of adult mice. By testing whether chemotherapeutic agents that enter the CNS can reduce neurogenesis, we hope to develop an animal model of chemo brain' that will allow further studies. Furthermore, if we can show that inhibition of neurogenesis is a correlate of behavioral decline after chemotherapy, we will have provided evidence that modification of chemotherapeutic regimens specifically, using strategies to prevent CNS entry of drugs - would be of great importance in improving the quality of life in cancer patients.
DTIC
Brain; Cancer; Central Nervous System; Chemotherapy; Cognition; Hippocampus; Neurology; Neurophysiology

20050167398 Georgetown Univ., Washington, DC USA
Discovery of Novel Metastasis Genes in Breast Cancer
Wellstein, Anton; Jul. 2004; 52 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0398
Report No.(s): AD-A432037; No Copyright; Avail: CASI; A04, Hardcopy

Under this proposal we plan to identify genes that drive the homing of invasive primary breast cancer to its metastatic

sites. For the discovery of such genes, in vivo phage display of breast cancer cDNA libraries is used. Validation is achieved by expression monitoring in histological sections as well as by functional assays. In the current series of studies we validated the breast cancer library. We obtained the first results from the in vivo selection. We report those data here
DTIC
Breast; Cancer; Genes; Mammary Glands; Metastasis

20050167399 Brookhaven National Lab., Upton, NY USA
Structural Studies on Intact Clostridium Botulinum Neurotoxins Complexed with Inhibitors Leading to Drug Design
Swaminathan, Subramanyam; Feb. 2005; 54 pp.; In English
Contract(s)/Grant(s): DAMD17-02-2-0011
Report No.(s): AD-A432038; No Copyright; Avail: CASI; A04, Hardcopy

In this third annual report we present our progress on two different areas. We have identified two ganglioside binding sites in tetanus toxin. While one is common to botulinum toxins, the other is unique for tetanus. The second unique site also binds a tri-peptide which suggests that this peptide could be used as an inhibitor for tetanus, at least. We have determined the structure of the C fragment of botulinum neurotoxin type B. We have identified a number of inactive mutants of BoNT/E-LC. Some of these mutants may be potential candidates for vaccines. Most importantly, for the first time we have shown that Glu335Gln mutant of BoNT/E-LC is an apoenzyme devoid of zinc.
DTIC
Bacteria; Clostridium Botulinum; Drugs; Ganglia; Inhibitors; Toxins and Antitoxins

20050167400 Air Force Hospital, Lackland AFB, TX USA
Cost Analysis of Dental Services at Wilford Hall Medical Center
Richards, Jonathan E.; Aug. 2004; 63 pp.; In English
Report No.(s): AD-A432041; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of the project was to construct a model to conduct true cost analysis for services at Wilford Hall Medical Center. Various accounting methodologies were evaluated to determine the best method based on performance and available data. A generic model for evaluating the true cost of providing a service was created using activity based costing techniques. The model was then used to calculate the cost of providing primary dental services at the Kelly Dental Clinic, one of the four dental clinics at Wilford Hall. The total cost of providing primary dental care services at the Kelly Clinic for FY 2003 was $2, 255,374.23, or $105.71 per Dental Weighted Value (DWV).
DTIC
Cost Analysis; Dentistry

20050167405 Torrey Pines Inst. for Molecular Studies, San Diego, CA USA
Development of Peptide Antagonists of Chemokine Receptors Involved in Breast Cancer Metastasis
Blondelle, Sylvie E.; Sep. 2004; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0654
Report No.(s): AD-A432047; No Copyright; Avail: CASI; A02, Hardcopy

In two separate reports, breast cancer cells were shown to express functionally active chemokine receptors which may promote metastasis, and an anti-human CXCR4 chemokine receptor monoclonal antibody was found to reduce the level of lung metastasis by 61-68 percent. Based on these findings supporting the role for chemokine ligand-receptor interactions in promoting metastasis of breast cancer, we develop small molecule antagonists to CXCR4. This was accomplished by screening in a competitive assay synthetic combinatorial libraries (SCLs) made up of D-amino acid peptides for their ability to antagonize CXCR4 receptor function using HeLa cells and PBMC cells (used as standard), and breast cancer cells (MDA-MB-231, known to express CXCR4), and a monoclonal antibody anti-CXCR4 known to block chemotaxis induced by CXCL12 (formerly known as SDF1-a). The SCL approach, particularly when generated in a positional scanning (PS) format, allows the direct identification of the key residue(s) of active peptide sequence(s) from the library screening. Following the screening of a library, candidate sequences were synthesized and their inhibitory activity on the binding of anti-CXCR4 antibody was evaluated as well as their ability to abrogate the migratory response of cells induced by SDF-1a.
DTIC
Breast; Cancer; Ligands; Mammary Glands; Metastasis; Peptides

20050167407 West Virginia Univ., Morgantown, WV USA

Augmentation of the Differentiation Response to Antitumor Antimalarials

Rayhim, Rayhana; Strobl, Jeannie S.; Jul. 2004; 42 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0622

Report No.(s): AD-A432050; No Copyright; Avail: Defense Technical Information Center (DTIC)

We have shown that the quinoline antimalarials chloroquine (CQ) and hydroxychloroquine (HCQ) inhibit proliferation and induce differentiation in breast cancer cell lines without toxicity to normal MCF-lOA cells. The purpose of this project is to derive more efficacious antitumor agents that enhance the differentiation response by using CQ and HCQ in combination with the demethylating agent, 5-Aza-2'-deoxycytidine (5-Aza-dC; Aza), or with the differentiating agent, all-trans-Retinoic acid (ATRA). Cell survival, cellular differentiation, histone H3 and/or histone H4 acetylation status, and HDAC protein and activity were measured to show that combination of Aza or ATRA with the quinolines augmented the antiproliferative effect, differentiation response, and acetylation status of either CQ or HCQ alone. A new and highly sensitive assay for histone acetylation by mass spectrometry was developed to illustrate the specific lysine sites that get modified (acetylated/deacetylated) by the most promising combination of chemotherapeutic agents. This approach will be pivotal in further developing more effective and less toxic therapeutic agents for breast cancer intervention.

DTIC

Augmentation; Breast; Cancer; Combinatorial Analysis; Mammary Glands

20050167411 California Univ., Los Angeles, CA USA

Targeting the Estrogen Receptor for Ubiquitination and Degradation in Breast Cancer Cells

Sakamoto, Kathleen M.; Oct. 2004; 68 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0220

Report No.(s): AD-A432056; No Copyright; Avail: CASI; A04, Hardcopy

The ubiquitin-proteasome pathway involves the assembly of a multiubiquitin chain on a substrate, which then targets the appended protein for degradation by the 26S proteasome. In this application, we propose to develop a suite of heterobifunctional compounds known as Protacs (for Proteolysis -Targeting Chimeric Molecules) that can be used to target the degradation of any protein in the cell by artificially tethering it to a ubiquitin ligase. Specifically, we propose to investigate a Protac that is comprised of a peptide epitope derived from IkappaBalpha (IkBa) linked to estradiol (E2). The IkBa peptide binds specifically to the ubiquitin ligase SCF(exp beta-TRCP) whereas estradiol binds specifically to ER, The underlying hypothesis of the work proposed here is that Protac (and subsequent Protacs) will serve as a molecular bridge that links ER toSCF(exp beta-TRCP). This linkage, in turn, will promote ubiquitination and degradation of ER, which is expected to inhibit the growth of hormone-responsive breast cancer cells. The specific aims are: (1) that a cell permeable Protac will enter breast cancer cells; (2) that Protac will activate turnover of ER in breast cancer cells; and (3) that Protacs will have an effect on the growth of breast cancer cells.

DTIC

Breast; Cancer; Degradation; Estrogens; Hormones; Mammary Glands

20050167412 California Univ., San Diego, La Jolla, CA USA

Biological and Genetic Analysis of a New Model for Breast Premalignancy

MacLeod, Carol L.; Sep. 2004; 21 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0666

Report No.(s): AD-A432058; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this project was to gain further understanding of premalignant hyperplasia and its role in progression to breast cancer. Most human and mouse model breast cancer research has focused on tumors and metastsis, whereas the biology of premalignant lesions has not been thoroughly studied. We established a new mouse model of premalignant hyperplasia using six serially transplantable, stable, hyperplastic outgrowth cell lines to analyze neoplastic lesions within the intact microenvironment of the mammary gland. These cell lines were ideally suited to DNA micro array to identity changes in gene expression between premalignant cells growing in the mammary gland and tumors that arise from these tissues. Our studies have defined genes differentially expressed in the transition from normal to premalignant mammary disease as well as from premalignant to malignant mammary cancer. The genes related to the malignant transition in our system have also been identified as potential regulators of human breast cancer. The lines developed in this study can be utilized to develop chemoprevention and therapeutic protocols for breast cancer in the future.

DTIC

Bioassay; Breast; Cancer; Genetics; Mammary Glands; Metastasis

20050167418 Army Medical Materiel Development Activity, Fort Detrick, MD USA

A Medical Logistics Officer Training Needs Assessment Utilizing Feedback from Operation Iraqi Freedom

Waddick, James L.; Jan. 2004; 115 pp.; In English; Original contains color illustrations

Report No.(s): AD-A432074; No Copyright; Avail: Defense Technical Information Center (DTIC)

This study solicited feedback from Army medical logistics officers on the effectiveness of their previous institutional, operational, and self-development training in preparing them to accomplish their missions during the initial Operation Iraqi Freedom deployment (OIF 1). Additionally, the study sought to identify the potential benefit of additional training on key medical logistics tasks and training events. To answer these questions, the study employed a descriptive, cross-sectional methodology. Data was collected through distributing an 83-item questionnaire to individual officers (n=563), resulting in a 40.8% response rate (n=232). The results found the most effectively trained tasks related to the operation of a medical logistics supply support activity (e.g. manual supply procedures, warehouse operations, and inventory management). The least effectively trained tasks were operation and connectivity of medical logistics automated systems; these areas also encompass those with the greatest reported additional benefit. These results largely match the conclusions of existing OIF 1 after action reviews. The study results may be used to refine the current medical logistics officer's training model to address the training needs identified by the first hand feedback of OIF 1 participants. Further research is required to determine longitudinal trends in training needs or differences based on active/ reserve component group membership.

DTIC

Education; Feedback; Logistics; Medical Services; Personnel Development

20050167419 Greater San Antonio Hospital Council, TX USA

A Regional Strategic Human Resources Plan for Hospitals and Health Systems in South and Central Texas

Pesnell, Mark E.; Apr. 2004; 79 pp.; In English

Report No.(s): AD-A432076; No Copyright; Avail: CASI; A05, Hardcopy

As the baby boom generation ages and advances toward retirement, the healthcare workforce in south central Texas will experience large increases in demand for health services combined with an anticipated smaller workforce. To address these future anticipated stresses on the healthcare workforce, a strategic human resources plan should be adopted. This graduate management project has resulted in analyses of the internal and external environment and a corresponding initial strategic plan for human resources in the region. The plan suggests possible implementation and control strategies necessary for the south central Texas region to use to gain and sustain a competitive advantage in human resources in the healthcare market.

DTIC

Health; Hospitals; Human Resources

20050167421 University of Health Sciences, Kansas City, MO USA

Promoter Switching and Transcription Factor Usage During Breast Adipocyte Differentiation Role in Aromatase Expression and Activity

Mizinga, Kemmy M.; Sep. 2004; 8 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0652

Report No.(s): AD-A432079; No Copyright; Avail: CASI; A02, Hardcopy

During the last 12-months, most work proposed under Specific Aim 1 was substantially completed. Aim 1: aromatase mRNA translational efficiency will be determined by, monitoring its distribution in both translationally active polysomes and translationally inactive monosome or messenger ribonucleotide particles (mRNPs). This approach will enable us to establish if promoter switching allows a given aromatase mRNA species to be translated more efficiently, thereby resulting in higher amounts of aromatase protein under these circumstances. Cellular amounts of aromatase mRNA-total and Promoter-specific will be determined by competitive reverse transcriptase polymerase chain reaction (RT-PCR). A murine cell-culture model of fibroblast-to-adipocyte differentiation was validated and used to demonstrate aromatase gene promoter-switching. Validation of a human cell culture model to be used in further studies is nearly complete. The pace of progress was adversely affected by the loss of a technician who departed in February 2004 to relocate out of state. Efforts to find a suitably qualified replacement were unsuccessful until October 2004. Completion of work proposed under Specific Aim 1, and Aims 2 and 3 during the current no-cost extension period will be greatly facilitated by the addition of a technician who has already been engaged to start work on November 29, 2004.

DTIC

Adipose Tissues; Breast; Cancer; Mammary Glands; Proteins; Switching

20050167422 Naval Medical Research Inst., Bethesda, MD USA

Expanding the National Naval Medical Center's Patient Appointment Call Center: An Analysis

Tolentino, Dennis C.; Jun. 2004; 47 pp.; In English; Original contains color illustrations

Report No.(s): AD-A432080; No Copyright; Avail: Defense Technical Information Center (DTIC)

The new TRICARE contracts will shift the burden of providing outpatient appointing services from the contractors to Military Treatment Facilities (MTF). Through the Patient Appointment Call Center (PACC), the MTEs at Bethesda and Annapolis are ready for this transition while MTFs at Patuxent River and Quantico are researching potential solutions, including collaborating with PACC. The call center has the infrastructure and capacity to absorb additional appointing volume from these two clinics. Consolidating appointing services at this site is also the most cost effective alternative. In reviewing the merits of consolidation, however, Patuxent River and Quantico have to weigh the action's potential drawbacks particularly the loss of direct control over appointment scheduling and its implications on quality of service.

DTIC

Clinical Medicine; Medical Services; Patients; Scheduling

20050167423 Georgetown Univ., Washington, DC USA

FGF Activation and Signaling in Breast Cancer

Swift, Matthew R.; Jul. 2004; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0397

Report No.(s): AD-A432081; No Copyright; Avail: CASI; A03, Hardcopy

Fibroblast growth factor binding protein (FGF-BPl) is a crucial molecule that acts to chaperone active FGPs to receptors, thus propagating angiogenic signals for the development of new vasculature. We have shown that FGF-BPl is expressed in head and neck, skin, cervical, and lung squamous cell carcinomas. A second family member, FGF-BP2 has been identified in our lab and is present in mammary tissue. In this grant, we hypothesized that FGF-BP2 acts in a similar pro-angiogenic capacity as FGF-BP1. The aims were 1) to produce recombinant FGF-BP2 and test its effect on signal transduction, and 2) to study the expression of FGF-BP2 during mouse mammary gland development and carcinogenesis. To date, we have isolated human FGF-BP2 cDNA and protein and confirmed its ability to modulate FGF2. However, we have yet to discover the murine homologue to FGF-BP2. We have identified a third family member, FGF-BP3 in human and mouse. Accordingly, we have adjusted our focus to the characterization of FGF-BP3 activity and expression while continuing our search for murine FGF-BP2. Both human and murine FGF-BP3 have been shown to bind FGF2, promote increased proliferation, MAPK activation, and anchorage-independent growth in SW-l3 adrenal carcinoma cells, and murine FGF-BP3 is present in high levels at specific time points in developing mouse embryonic tissue.

DTIC

Breast; Cancer; Mammary Glands

20050167428 Baylor Univ., Houston, TX USA

Patient Reasons for Non-Urgent Utilization of the Dwight David Eisenhower Army Medical Center Emergency Department

Sizemore, Charles J.; Jan. 2004; 95 pp.; In English; Original contains color illustrations

Report No.(s): AD-A432086; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this research study was to identify the reasons why non-urgent patients utilize the Emergency Department at Dwight David Eisenhower Army Medical Center, from the patients' perspective. A review of the present body of literature revealed common themes why non-urgent patients typically present at emergency departments, the impacts to hospitals, and possible initiatives that could be undertaken to help alleviate non-urgent utilization of emergency departments. This study sought to explore associations between reasons for non-urgent patients visiting the emergency department through a descriptive cross-sectional design, which utilized the computation of frequencies, cross tabulation, and Chi-Square testing. A random sample of n=206 non-urgent patients who presented to the emergency department in January and February, 2004, were solicited for demographic information, as well as reasons for their visit. The results of this study will enable the hospital to gain insight into their patient population's care seeking behaviors. This information may facilitate the formulation of strategies to continue to increase the quality of care, while better meeting the health care demand.

DTIC

Clinical Medicine; Emergencies; Management Systems; Medical Services; Patients

20050167429 Baylor Univ., Houston, TX USA

Provider Productivity: A Comparative Study of the Relative Value Unit as a Practice Management Tool at Landstuhl Regional Medical Center, Landstuhl Germany

Portee, Anthony L.; Jul. 2004; 41 pp.; In English; Original contains color illustrations

Report No.(s): AD-A432089; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this Graduate Management Project is to gain an understanding of the relationship between provider productivity, coding accuracy, and coder characteristics at Landstuhl Regional Medical Center, Landstuhl Germany. Results of correlation analysis indicate that formal training and duty position play a role in determining a provider's productivity level. Statistical analysis of the data revealed that higher relative value units (RVUs) were associated with trained coders (r(underscored)sub pb = .351, p \h 0.001), and with Noncommissioned Officers (r(underscored)sub pb = -.351, p \h 0.001) serving as timekeepers. The results suggest that the RVU should not be used as the sole indicator of provider productivity in all military treatment facilities: organizational decisions informed by RVU analysis must be tempered by the effects that other contextual variables nave on productivity. The results of this study suggest that providers at LRMC may not receive RVU credit for as much as 70% of their patient visits and that additional research is needed to fully address the issue of provider productivity in the Military Health System. The author believes this study will raise questions concerning the reliability of the RVU as a management tool for measuring provider productivity at LRMC.

DTIC

Germany; Health; Medical Science; Medical Services; Military Operations; Planning; Productivity

20050167435 University of Southern California, Marina del Rey, CA USA

An Immersive Virtual Reality Therapy Application for Iraq War Veterans with PTSD: From Training to Toy to Treatment

Rizzo, A. A.; Pair, J.; McNerney, P. J.; Eastlund, E.; Manson, B.; Gratch, J.; Hill, R.; Swartout, B.; Roy, M.; Dec. 2004; 3 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-99-D-0046

Report No.(s): AD-A432098; No Copyright; Avail: Defense Technical Information Center (DTIC)

Post Traumatic Stress Disorder (PTSD) is reported to be caused by traumatic events that are outside the range of usual human experiences including (but not limited to) military combat, violent personal assault, being kidnapped or taken hostage and terrorist attacks. Initial data suggests that 1 out of 6 Iraq War veterans are exhibiting symptoms of depression, anxiety and PTSD. Virtual Reality (VR) exposure treatment has been used in previous treatments of PTSD patients with reports of positive outcomes. The aim of the current paper is to briefly describe the rationale, design and development of an Iraq War PTSD VR therapy application created from assets that were initially developed for a combat tactical training simulation, which then served as the inspiration for the X-Box game entitled Full Spectrum Warrior.

DTIC

Education; Iraq; Psychotherapy; Therapy; Virtual Reality; Warfare

20050167436 Bureau of Medicine and Surgery (Navy), Washington, DC USA

A Study of the Financial Value of Care of a Notional Orthopedic Clinic

Johnson, Scott A.; Apr. 2004; 57 pp.; In English; Original contains color illustrations

Report No.(s): AD-A432100; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this study was to discuss a Financial Value of Care methodology developed by Naval Medicine and illustrate how clinic managers can utilize the data to improve business decisions. The study utilized a descriptive cross sectional case study methodology employing secondary data analysis and analysis of internal historical workload and expense data. An adaptation of the nursing process was utilized as a theoretical model for the analysis of data. Data for the study was obtained from the Naval Medicine Data Repository for a Notional Orthopedic Clinic from FY 2002. The study concludes that the Financial Value of Care when used in conjunction with variance analysis techniques provides a powerful clinical business management tool.

DTIC

Financial Management; Orthopedics

20050167437 Walter Reed Army Inst. of Research, Silver Spring, MD USA

Target Directed Drug Discovery: A Technology Driven Approach to Combating Malaria

Hudson, T.; Kopydlowski, K.; Bhattacharjee, A.; Dec. 2004; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A432101; No Copyright; Avail: Defense Technical Information Center (DTIC)

A procedure is described for identifying chemical entities with potential for being developed into antimalarial drugs. State-of-the-art technologies involving molecular genetics, computer modeling, structural analysis and high throughput screening have been leveraged to optimize the chances of success and minimize the time required.
DTIC
Drugs; Parasitic Diseases; Targets

20050167457 ExxonMobil Research and Engineering Co., Annandale, NJ USA
Sensory Irritation Study in Mice: JP-5, JP-TS, JP-7, DFM, JP-10
Whitman, Frederick T.; Hinz, John P.; Jul. 2004; 116 pp.; In English
Contract(s)/Grant(s): F41624-00-C-9007
Report No.(s): AD-A432128; EMBSI-112451; AFIOH-RS-BR-SR-2004-0001; No Copyright; Avail: CASI; A06, Hardcopy

AFIOH (formerly the Air Force Institute for Environment, Safety and Occupational Health Risk Analysis AFIERA), in concert with Army and Navy colleagues, designed a study based on ASTM's 'Standard Method E 981-84' to characterize and compare the relative potency of five hydrocarbon fuels to cause respiratory tract sensory irritation. These fuels (JP-5, JP-TS, JP-7, DFM, JP-1O) were administered for 30 minute periods by means of a head-only exposure system to groups of 4 male Swiss-Webster mice. Test atmospheres laden with these fuels were presented as vapor/aerosol mixtures to insure that all of each fuel's constituents were represented in the test atmospheres. Analytical sampling data for concentration revealed differences in the prevalence and distribution of these constituents between the vapor and aerosol phases of the test atmospheres. Each fuel was tested at one or more concentrations in air that resulted in minimal to severe decreases in respiratory rate. All fuels evoked breathing patterns that were characteristic of upper airway sensory irritation at all exposure levels. Within the context of this study, there was no apparent evidence of pulmonary (deep lung) irritation or narcosis at any exposure level. The concentration of JP-5 that reduced the respiratory rate by 50% (RD50) was calculated from the data to be 3338 mg/m3. Exposures with the other fuels were targeted for levels near the RD5O for JP-5 and JP-8 order to compare their relative irritancy. Based on the results of this study, the relative irritancy of the fuels tested in this study may be ranked as follows: DFM \g JP-5 \gJP-7 \g JP-TS \g JP-lO.
DTIC
Hydrocarbons; Irritation; Jp-5 Jet Fuel; Jp-7 Jet Fuel; Respiratory System

20050167460 Naval Health Research Center, San Diego, CA USA
Effectiveness of Two Versions of a STD/HIV Prevention Program
Booth-Kewley, Stephanie; Shaffer, Richard A.; Minagawa, Rahn Y.; Brodine, Stephanie K.; Jan. 2002; 14 pp.; In English
Report No.(s): AD-A432133; NHRC-01-01; No Copyright; Avail: Defense Technical Information Center (DTIC)

Little is known about the comparative effectiveness of HIV prevention interventions that differ in duration but contain similar content. The objective of this study was to evaluate and compare the effectiveness of two versions (6 hr vs. 3 hr) of a behavioral intervention called the STD/HIV Intervention Program (SHIP) in a sample of Marines. Marines were exposed to either a 6 hr or a 3 hr version of SHIP. Comparisons of pretest and posttest knowledge, attitude, and behavioral intention scores revealed similar results for both versions. For both versions of the intervention, scores on STD/HIV knowledge were significantly higher after the intervention. Both the 6 hr and the 3 hr versions of SHIP also led to significant increases on scales measuring social norms and behavioral intentions. The two versions of SHIP appeared to be of comparable effectiveness for producing short-term changes in knowledge, attitudes, and behavioral intentions.
DTIC
Diseases; Health; Prevention; Viruses

20050167462 Henry Ford Health System, Detroit, MI USA
Molecular Differentiation of Risk for Disease Progression: Delineating Stage-Specific Therapeutic Targets for Disease Management in Breast Cancer
Worsham, Maria J.; Raju, Usha; Chase, Gary; Lu, Mei; Jul. 2004; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0406
Report No.(s): AD-A432140; No Copyright; Avail: Defense Technical Information Center (DTIC)

Cancer is a highly heterogeneous disease, both morphologically and genetically. A current shortcoming in cancer prognosis and treatment is a lack of methods that adequately address the complexity and diversity of the disease. Genome wide studies can provide molecular characterization or fingerprints of cancer phenotypes linked to clinical information. The aim of this research is to 1a: identify an informative set of specific genetic alterations that underlie the pathogenesis of disease

progression to serve as targets for management of disease at the earliest stages and 1b: refine stage-specific disease phenotypes by integration of molecular profiles with known risk factors of breast cancer such as reproductive characteristics, medical history, and histologic parameters of breast carcinomas. We will examine 100 cases in each disease stage category of 0, 1, 2, 3, 4 and unknown to evaluate 120 breast cancer associated gene markers distributed throughout the human genome. Molecular fingerprints identified from genome wide studies should delineate patterns of genomic imbalances at the level of stage-specific gene loci, providing a novel index to estimate the extent of genomic abnormality with disease progression. This knowledge should allow the integration of stage-specific therapeutic targets as treatment intervention strategies in the management of breast cancer.
DTIC
Breast; Cancer; Diseases; Genes; Mammary Glands; Risk; Targets; Therapy

20050167463 California Univ., Berkeley, CA USA
Interaction of BRCA1 With the DNA-Dependent Protein Kinase
Burma, Sandeep; Sep. 2004; 34 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0635
Report No.(s): AD-A432142; No Copyright; Avail: Defense Technical Information Center (DTIC)

The DNA-dependent protein kinase (DNA-PK) plays a very important role in the repair of DNA double-strand breaks generated by ionizing radiation (IR). The activation of DNA-PK in response to IR involves multiple autophosphorylations at SftQ residues of the catalytic subunit, DNA-PKcs. We find that the activation of DNA-PKcs is attenuated during the S/G2 phases of the cell cycle, phases during which the tumor suppressor protein Brca1 is expressed. We found that DNA-PKcs interacts with Brcal and have mapped the DNA-PKcs-interaction domain of Brca1. In order to investigate if the interaction of Brcai with DNA-PKcs might attenuate DNA-Pkcs activation, we examined DNA-PKcs autophosphorylation in Brca1-deficient HCC1937 cells ectopically expressing Brca1. Although we did not observe any significant differences in DNA-PKcs autophosphorylation in the presence or absence of Brca1, the lack of observable differences could also be due to the low levels of Brca1 expression in these cells. We are currently attempting to overexpress the DNA-PK-interaction domain of Brca1 in human cells to see if this region of Brcal has any effect on DNA-PK activation. We are also examining if the interaction of DNA-PK with Brca1 has any modulatory effect on Ercal phosphorylation in response to IR.
DTIC
Breast; Cancer; Deoxyribonucleic Acid; Genes; Ionizing Radiation; Mammary Glands; Proteins

20050167464 California Univ., Berkeley, CA USA
Identification of the Molecular Determinants of Breast Epithelial Cell Polarity
Itoh, Masahiko; Oct. 2004; 24 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0742
Report No.(s): AD-A432143; No Copyright; Avail: Defense Technical Information Center (DTIC)

Cell polarity is a fundamental property of tissue architecture and loss of polarity has been linked to progression of malignancy in cancer. Both cell-cell and cell-extracellular matrix interactions are involved in the establishment and maintenance of cell polarity. However, molecular information on how these interactions and polarity are coordinated and how the integrity of these interactions and polarity are modified in cancer is still limited. Although the Ras family proteins control a wide variety of cellular processes, the function of Rapt, which is most closely related to Ras, remains unclear. The original characterization of Rap tin fibroblasts indicated Rapt antagonizes Ras signal by competing effectors. However, later studies revealed that like Ras, Rapt can stimulate MAPK pathway in several cell types. In addition, recent reports showed that Rap1 stimulates integrin-dependent adhesion of T-cells and regulates the distribution of adherens junctions in Drosophila epithelial cells. I hypothesized that Rap1 could be a potential molecule which coordinates, cell-cell, cell-ECM interactions, and cell polarity in breast epithelial cells. The analyses of malignant breast epithelial cells transfected with dominant-active and dominant-negative form of Rap tin a three-dimensional culture model indicate that Rapt is involved in the regulation of malignant phenotype of breast epithelial cells.
DTIC
Breast; Cancer; Determinants; Mammary Glands; Polarity; Proteins

20050167465 Michigan Univ., Ann Arbor, MI USA
Immunologic Response to Cryoablation of Breast Cancer
Sabel, Michael S.; Oct. 2003; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0533
Report No.(s): AD-A432155; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this project is to characterize the anti-tumor immunologic response to cryosurgery a new minimally invasive approach to the ablation of breast cancer. The work consists of both murine and human studies, expanding upon reports that cryosurgery of primary tumors has been reported to be capable of developing specific anti-tumor immunological responses that can prevent the growth of micrometastasis. Because of conflicts with other grant support the grant was relinquished effective August 31, 2003. While the project is ongoing several interesting findings were discovered. Murine studies, utilizing the MT-901 mammary adenocarcinoma cell line in BALB/c mice, demonstrated a Th1 cytokine response to cryoablation as compared to surgical excision. Mice treated with cryoablation had long-term tumor specific memory as demonstrated by tumor re-challenge. Immunologic studies demonstrated an early but brief antibody response, a regional T-cell response and a systemic NK cell response, although no long- lasting systemic T-cell response could be identified. A manuscript is presently in preparation. Human immunologic studies have been initiated, but the results are too early for interpretation at this time.
DTIC
Breast; Cancer; Immunology; Mammary Glands; Surgery

20050167469 Washington Univ., Saint Louis, MO USA
PET Radiotracers for Imaging the Proliferation Status of Breast Tumors
Mach, Robert H.; Dec. 2004; 75 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0446
Report No.(s): AD-A432165; No Copyright; Avail: Defense Technical Information Center (DTIC)

The goal of this research project is to develop radiotracers for imaging the proliferative status of breast tumors using the noninvasive imaging technique, Positron Emission Tomography (PET). The strategy taken involves developing radiotracers having a high affinity and selectivity for the sigma (sub 2) receptor, which has been shown to be a useful receptor-based biomarker of proliferation in breast tumor cells growing both in vitro and in vivo. During the second year of the three-year IDEA project, we identified a new class of ligands displaying an outstanding affinity and selectivity for sigma (sub 2) versus sigma (sub 1) receptors. Preliminary in vivo biodistribution and microPET imaging studies with Br-76, C-11 and I-125-labeled analogs indicate that these agents may be useful for use in the diagnosis and determination of the proliferative status of breast tumors in breast cancer patients.
DTIC
Breast; Cancer; Imaging Techniques; Mammary Glands; Neoplasms; Positrons; Tomography; Tumors

20050167476 Louisiana Tech Univ., Ruston, LA USA
Bioeffects of Electromagnetic Nanopulses
Haynie, Donald T.; Aug. 2004; 7 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0136
Report No.(s): AD-A432195; AFRL-SR-AR-TR-05-0124; No Copyright; Avail: CASI; A02, Hardcopy

Theoretical analysis suggests that the nanopulse experiments we have carried our (typically 20kV/m for 1-4 h of exposure) do not cause sample heating. See Simicevic and Haynie (2005) The growth of E. coli is stimulated by exposure to nanopulses under moderate conditions - low electric field strength (10kV/m), low pulse frequency (\h10 kHz), and 120 min of exposure. E. coli is inexpensive to culture and perhaps the simplest organism known to man. Moreover, it has been studied in considerable depth, making it valuable for experiments aimed at determining the mechanism of observed bioeffects of nanopulse exposure. The finding that the growth of this species of bacteria is enhanced on exposure is potentially of considerable value to biotechnology. See Ayenapurapu et al. The growth of a highly-malignant mouse mammary epithelial cell is stimulated by exposure to nanopulses under moderate conditions. These cells were chosen because they are a valuable model of apoptosis (programmed cell death) and are very familiar to Dr. Paul Sylvester, University of Louisiana at Monroe. The finding that these cells are stimulated on exposure is potentially of considerable value to tissue engineering. It could also be important for setting safety guidelines for exposure. This work is likely to result in at least one publication.
DTIC
Biological Effects; Biotechnology; Electric Fields

20050167478 Institute for Genomic Research, Rockville, MD USA
Genomics of the Human Gastrointestinal Microbiome
Gill, Steven R.; Dec. 2004; 5 pp.; In English
Contract(s)/Grant(s): N00014-02-1-1002
Report No.(s): AD-A432197; No Copyright; Avail: CASI; A01, Hardcopy

We have used sequencing of targeted 16S rDNA PCR libraries and random metagenomic libraries to examine the phylogenetic and genomic diversity within the human gastrointestinal bacterial community. In one study, we used both 16S and metagenomic analysis in a study of fecal samples from three healthy human subjects. In a second study, we used 16S analysis to compare bacterial diversity between samples obtained from multiple intestinal mucosal sites and companion fecal samples of multiple healthy individuals. These studies demonstrate a remarkable diversity between bacterial communities in the different sites within the gastrointestinal tract and also between individuals. Through the metagenomic approach, we have identified genome sequences from fungal and archael organisms and identified several virulence genes as potential markers of pathogens within the population. Finally, we have modified our DNA assembly program, Celera Assembler, to successfully assemble contigs up to ^40 kb from the random metagenomic sequence data.
DTIC
Deoxyribonucleic Acid; Gastrointestinal System

20050167732 Texas Univ., Dallas, TX USA
(Bio-Inspired Theme) The Engineering of Thermally and Mechanically Activated Nanosensors
Blount, Paul; Dec. 2004; 23 pp.; In English
Contract(s)/Grant(s): F49620-O1-1-05O3
Report No.(s): AD-A431793; AFRL-SR-AR-TR-05-0143; No Copyright; Avail: CASI; A03, Hardcopy

Some biological sensors undergo structural changes, such as the opening of a large pore, upon matrix deformation. Other biological molecules have the ability to bind heavy metals, such as nickel, cadmium, copper, etc. We have been inspired by these findings to propose a fusion of these biological attributes into a single nanosensor. The long-range goal of this project is identify conditions in which we can utilize a biological mechano-sensor, MscL, to engineer a nano-scale mechanically-activated solid-state relay device. To do this, it would be preferable to design a metal, or nanoparticle, binding site within the pore of this biological sensor that allows electrical conduction only upon mechanical-stress of the matrix in which it is embedded. This would allow stability under conditions of little moisture. Using funding from the BioInspired Concepts (BIC) program of the AFOSR, we have utilized biochemical and electrophysiology assays to identify regions of the sensor that are exposed in the pore lumen. We have mutated these candidate sites to cysteine and histidine regions, amino acids that are known to bind heavy metals. Electrophysiological studies have now confirmed that some of these substituted residues within the sensor do indeed bind metals; however, many of these interactions deleteriously affect the probability or energetics of sensor activation. Hence, we needed to define those regions exposed in the open pore of the stimulated channel. To accomplish this, we have designed and used microbial screens to determine candidates for residues that are exposed only upon sensor activation.
DTIC
Biochemistry; Nanoparticles; Nanotechnology

20050168215 Phillips Lab., Kirtland AFB, NM, USA
The Effect of Pulsed ElectricalFon Biological Cells
Baker, William L.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 68-72; In English; See also 20050168165; Copyright; Avail: Other Sources

Abstract Experimental studies on the effect of pulsed electric fields on aquatic organisms and on cancer cells have shown that the stress level of micro-and macro-organisms can be controlled by varying the pulse amplitude and pulse duration. It could also be shown that an increase in frequency, or reduction in pulse duration, respectively, causes the location of the cell damage to change from the outer membrane to the nucleus. The experimental results can be explained by considering the equivalent circuit of biological cells.
Author
Electric Fields; Pulse Duration; Cells (Biology); Marine Biology; Organisms

20050169314 Harvard Univ., Cambridge, MA, USA
Thermal Noise, Motional Electromotive Force, and Electric Fields in the Human Body
King, Ronold W. P.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1206-1209; In English; See also 20050169243
Contract(s)/Grant(s): N00014-89-J-1023; NIH-1-R01-ES08051-01; Copyright; Avail: Other Sources

The human body is a parasitic antenna in which currents and electric fields are induced when it is near a 50-60 Hz transmission line or a 10-30 kHz transmitter. Specifically, the magnitudes of E(sup inc, sub z) and B(sup inc, sub y) within

2 m of the earth's surface at horizontal distances y from 220-kV and 440-kV transmission lines are shown.
Author
Thermal Noise; Electromotive Forces; Electric Fields; Human Body

20050169434 Northwestern Univ., Evanston, IL, USA
Nonuniform Exposures of Petri Dish Cultures within a TEM Cell Identified by FDTD Modeling
Popovic, Milica; Hagness, Susan C.; Taflove, Allen; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1218-1221; In English; See also 20050169243; Copyright; Avail: Other Sources

The effects of electromagnetic fields on living cell cultures have been investigated for some time. Transverse electromagnetic (TEM) transmission cells are widely used for exposing cell cultures to uniform TEM fields and quantifying the biological effects. The uniformity of exposure is critical to quantifying the response versus dose of any observed biological effect. Standing waves and other electromagnetic field nonuniformities can lead to a nonuniform exposure. The use of field or temperature probes to monitor exposure within the cell culture is not easy. First, the presence of measurement probes perturbs the field distribution. Second, the heat diffusion process is fast, especially within small cell culture petri dishes. The finite-difference time-domain (FDTD) method provides a highly accurate means for quantifying eh_ctromagnetic field exposure levels within the culture cells, l_lrther, given the FDTD-eoml)uted electric and magnetic field distribution throughout the TEM cell, the specific absorption rate (SAR) can be calculated at each grid point within the cell culture.
Author
Electromagnetic Fields; Cells (Biology); Biological Effects; Finite Difference Time Domain Method; Time Domain Analysis

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AEROSPACE MEDICINE

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

20050166850 Institute of Space Medico-Engineering, Beijing, China
Space Medicine and Medical Engineering, Volume 18, No. 1
Wei, Jin-He, Editor; Jiang, Shi-Zhong, Editor; Wang, Xi-Ji, Editor; Chen, Shan-Guang, Editor; Su, Shuang-Ning, Editor; Wang, Xian-Min, Editor; Liu, Xin-Min, Editor; Su, Hong-Yu, Editor; Bai, Jing, Editor; Sun, Xi-Qing, Editor, et al.; February 2005; ISSN 1002-0837; 88 pp.; In English; In Chinese; See also 20050166851 - 20050166868
Report No.(s): CN-11-2774/R; Copyright; Avail: Other Sources

The 18 papers presented in this issue are classified as original research or brief reports. Some of the aerospace topics covered by the papers include: gravitational effects, including brain effects, gene expression, the cardiovascular system, space waste material processing, space gloves, and development of a vegetable cultivating facility.
CASI
Aerospace Medicine; Gravitational Effects; Bioastronautics; Gravitational Physiology

20050166852 Northwestern Polytechnical Univ., Xian, China
Method for Segmenting Medical Image Based on Anatomical Model
Yang, Xiao-Qiang; Li, Bin; Wei, Sheng-Min; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 62-65; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

The object of this research was to improve the automatization and reliability of medical image segmentation. An anatomical model was built and used to guide the low-level segmentation process. The system architecture was made up of an anatomical model, image processing routines and an inference engine, the interaction of which are governed by a blackboard. The result of application of the segmentation for chest CT image was satisfactory and needs less operator intensive. This method improves automatization and reliability of the medical image segmentation. Because of the good expansibility, it may serve as a template for knowledge-based processing of medical image.
Author (revised)
Image Processing; Imaging Techniques; Human Body; Models

20050166853 Jiaotong Univ., Xian, China

Effects of Three Chinese Traditional Drugs on Afferent Discharge from Single Muscle Spindle in Toads

Gao, Yun-Fabg; Fan, Xiao-Li; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 16-18; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

The objective of this research is to shed some light on treatment of muscle atrophy through testing the effects of several Chinese traditional drugs that can invigorate blood circulation on the afferent discharge of muscle spindle. Single muscle spindle was isolated from sartorius muscle of toad. Afferent discharge from the muscle spindle was recorded using air-gap technique and effects of three Chinese traditional drugs on afferent activity of the muscle spindle were observed. Ligustrazine could markedly tingle the spontaneous electrical activity of the muscle spindle, and it also showed a good dose-response relationship, while Salvia Miltiorrhiza and Safflower had no such excitative effect. It is known that ligustrazine can expand blood vessels and agitate microcirculation, and this effect on the muscle spindle makes it helpful for persons with muscle atrophy.

Author

Atrophy; China; Drugs; Muscles; Animals

20050166854 Wuhan Inst. of Physical Education, Wuhan, China

Relationship between Respiration Exchange Ratio and Muscle Oxygen Content Measured by Near-infrared Spectroscopy

Xu, Guo-Dong; Liu, Ming; Chen, Gang; Gong, Hui; Luo, Qing-Ming; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 28-31; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

The objective of this research is to study the relationship between respiration exchange ratio (RER) and tissue oxygen content in human skeletal muscle. Using a portable tissue oximeter based on near-infrared spectroscopy (NIRS), the relative changes of skeletal muscle oxygen content were measured non-invasively and in vivo when healthy volunteers were performing an incremental intensity running protocol. The results were compared with heart rate (HR), V(sub O2), V(sub CO2), and RER. In the experiment, the change in skeletal muscle oxygenation content of the volunteers was regular and has a significant close relationship to HR, V(sub O2) and RER (P = 0.01). It shows that NIRS is a new photonic technology which provides a measurable biomedical parameter for the evaluation of athlete's physique and training effect. It offers reference for monitoring and assessing training effect in vivo, real-time and non-invasively.

Author

Near Infrared Radiation; Infrared Spectroscopy; Oximetry; In Vivo Methods and Tests; Respiratory Physiology; Skeletal Muscle

20050166858 Fourth Military Medical Univ., Xi'an, China

Effects of High +Gx during Simulated Spaceship Emergency Return on Learning and Memory in Rats

Xu, Zhi-Peng; Sun, Xi-Qing; Liu, Ting-Song; Wu, Bin; Zhang, Shu; Wu, Ping; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 1-5; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

To observe the effects of high + Gx during simulated spaceship emergency return on learning and memory in rats. Thirty two male SD rats were randomly divided into control group, 7 d simulated weightlessness group, + 1S Gx/180 s group and +1S Gx/180 s exposure after 7 d simulated weightlessness group, with 8 rats in each group. The changes of learning and memory in rats were measured after stresses by means of Y-maze test and step-through test. In Y-maze test, as compared with control group, percentage of correct reactions decreased significantly(P\h0.01) and reaction time increased significantly (P\h0.01) in hypergravity after simulated weightlessness group at all time after stress ;as compared with + 15 Gx group or simulated weightlessness group, percentage of correct reactions decreased significantly(P\h0.05) and reaction time increased significantly (P\h0.05) immediately after stress. In step-through test, as compared with control group,total time increased significantly (P\h0.01) in hypergravity after simulated weightlessness group at 1 d after stress; latent time decreased significantly(P\h0.01) and number of errors increased significantly (P\h0.01) at all the time after stress. As compared with + 1.5 Gx group, total time increased significantly (P\h0.O5) immediately, 1d after stress. As compared with simulated weightlessness group, total time and number of errors increased significantly (P\h0.05) immediately after stress. It is suggested that + 15 Gx/180 s and simulated weightlessness may affect the ability of learning and memory of rats. Simulated weightlessness for 7 d can aggravate the effect of +Gx on learning and memory ability in rats.

Author

High Gravity Environments; Learning; Memory; Rats; Gravitational Effects

20050166859 Institute of Space Medico-Engineering, Beijing, China

Reactivity of Pulmonary Arteries and Thoracic Aortae in Rats under Tail-suspension and the Effects of NOS Inhibitor

Wang, De-Sheng; Yuan, Min; Li, Zhi-Li; Yuan, Ming; Liu, Zhao-Xia; Cao, Yi; Tong, Fei-Zhou; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 6-11; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

To further disclose mechanisms in adaptation of pulmonary and systemic arteries to simulated microgravity (SM), so as to elucidate the mechanisms accounting for orthostatic intolerance after SM, and to explore a new kind of countermeasure for orthostatic intolerance. -30 degree tail suspended (TS) rats were used as the model to simulate the physiological effects of microgravity. Vasoreactivity changes of rings sectioned from pulmonary artery (PA) and thoracic aorta (TA) to 68 mmol/L KCI, plus phenylephrine (PE) and acetylcholine (ACh) were observed after 7 d and 14 d tail-suspension. After preconditioning with 10 - 5 mol/L N-nitro-L-arginine methylester (L-NAME) for 20 min, vasoreactivity changes of PA and TA to PE and ACh were respectively repeated. The contractile responsiveness of PA and TA to KCI and PE decreased significantly or very significantly after TS7d and TS14d. The dilatory reactivity of PA and TA to ACh after TS7d had a significant or very significant increase, but reactivity of PA showed no change and TA showed only a tendency to increase after TS14d. After preconditioning with mol/L L-NAME, responsiveness of PA to PE after TS7d and TS14d had no difference among the three groups, but responsiveness of TA to PE after TS7d and TS14d had a significant decrease. The dilatory reactivity of PA after TS7d decreased significantly or very significantly, and the remains showed no significant change. The decrease of contractile responsiveness of PA and TA might be due to the increased dilatory function of the endothelial cells. The fact that mol/L L-NAME reversed the decrease of contractile responsiveness of PA and partly of TA after tail suspension implicates that there might be an inhibitory action on the dilatory function of the endothelial cells. The NOS inhibitors may be helpful in preventing orthostatic intolerance.

Author

Adaptation; Aorta; Arteries; Countermeasures; Microgravity; Physiological Effects; Rats

20050166860 Fourth Military Medical Univ., Xi'an, China

Daily 4-h Standing Can Prevent Soleus Atrophy Induced by 4 Weeks Tail Suspension in Rats

Sun, Biao; Feng, Han-Zhong; Zhang, Li-Fan; Wang, Yun-Ying; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 12-15; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

To observe the effects of intermittent standing in counteracting the soleus atro- phy induced by simulated microgravity. Eighteen male Sprague-Dawley rats were randomly assigned to 3 groups: control (CON), four-week tail-suspension (TS) , and TS plus daily 4 h standing (TS + STD4). After 4 weeks, bilateral adrenal glands and soleus muscle were dissected and weighed. The left soleus was sectioned with cryostat and stained with ATPase staining. The cross sectional area (CSA) of type I and II fibers and the relative proportion of type I fibers were measured using Leica image analysis system. The right soleus was homogenized and stained with Coomassie Brilliant Blue following electrophorosis on 8% SDS-PAGE under 70 V and \h4 c for 28 h. The Scion image software was used to evaluate the result of the densitometry of different types of MHC. In TS, wet weights of the soleus, CSA of type I and II fibers, and proportion of type I fibers decreased obviously, as compared with those rats in CON (P\h0.01 or P\h0.05). The SDS-PAGE showed similar results as by ATPase staining in the proportion of MHC I . Whereas in TS + STD4, there were no significant differences of those parameters compared with those rats in CON. Daily 4-h standing fully prevented the soleus atrophy induced by simulated microgravity for 4 wk in rats.

Author

Atrophy; Microgravity; Muscles; Rats; Gravitational Physiology; Gravitational Effects

20050166861 Naval Medical Research Inst., Shanghai, China

A Study on Etiology and Pathogenic Mechanism of Decompression Sickness

Yuan, Jin-Fu; Ji, Zhong-Yi; Lei, Cheng-Xiang; Wang, Ping; Tao, Wen-Zhao; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 19-24; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

To explain the etiology of decompression sickness (DCS) and to elucidate its pathogenic mechanism. Tunica conjunctiva was examined by microscopy and blood pressure was measured at the exposed femoral arteries in inadequately decompressed animals after hyperbaric exposure. Then pathological examinations were done. Animals with vascular spasm and dysfunction after decompression showed DCS symptoms. Severe DCS was found in the period of increasing of blood pressure swelling. Appeared in endothelial cells, fracted, hemorrhages were also formed in the body of DCS animals. DCS is a disease with vascular spasm and dysfunction caused by decompression. It resulted from anoxia or pathological change caused by vascular spasm, dysfunction or even failure of blood vessels due to the gas tension (etiology) provoked by supersaturated gas in the blood during descending of ambient pressure. Vascular spasm and dysfunction impede the elimination of gas from the blood,

and once the gas amount is sufficient to cause severe ischemia of the circulation system, the state of disease would be severe. Author

Animals; Arteries; Blood Pressure; Decompression Sickness; Etiology; Pressure Reduction

20050166865 Institute of Space Medico-Engineering, Beijing, China

Application of Fractal Dimension in Heart Rate Variability Analysis during Head-down Tilt

Liang, Zhong-Gang; Yan, Hong; Wu, Bin; Wu, Ping; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 58-61; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

The paper applies the fractal dimension to heart rate variability (HRV), and discusses the changes of the fractal dimension of cardiovascular system during head down tilt (HDT). ECG of 10 subjects were recorded during HDT, the experiment was repeated in each subject. Fractal dimension was used to analyze the HRV. Compared to supine before HDT, the standard deviation of all normal to normal RR intervals (SDNN) at 15 - 20 min, 20 - 25 min, 25 - 30 min and restoration increased significantly; the root mean square of successive differences between adjacent normal cycles (rMSSD) at 20 - 25 min increased significantly; the fractal dimension at 0 - 5 min, 5 - 10 min, 10 - 15 min, 20 - 25 min, 25 - 30 min and restoration increased significantly. The result shows that HRV and the nonlinearity of cardiovascular system increase during HDT. It is feasible that the fractal dimension can be used for analyzing HRV.

Author

Fractals; Electrocardiography; Head Down Tilt; Heart Rate; Space Environment Simulation; Variability

20050166866 Tsinghua Univ., Bejing, China

Development of a Portable ECG and Blood Pressure Monitor Based on Personal Digital Assistant (PDA)

Yang, Sun-Yong; Zhang, Yong-Hong; Bai, Jing; Wang, Jia-Sen; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 66-71; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

The objective of this research was to develop a portable multifunctional electrocardiograph (ECG) and blood pressure monitor with its convenience to use. It consisted of the electrocardiograph and blood pressure monitor module, microprocessor module and a personal digital assistant (PDA), to implement the functions of ECG/blood pressure signal automatic monitoring and remote data transferring to the hospital. Under the control of the microprocessor, the monitor module can achieve the ECG signal, the blood pressure signal and transmit the data to the PDA. The program runs in PDA, integrating the capabilities of data waveform browsing and remotes data transferring. The monitor meets the design requirements and has a good future for application.

Author (revised)

Portable Equipment; Medical Equipment; Electrocardiography; Blood Pressure

20050166867 Zhejiang Univ., China

Research Progresses on Deformable Model in Medical Image Processing

Xiao, Min; Yan, Yong; Xia, Shun-Ren; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 75-78; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

In recent years, image processing technique based on deformable models has been widely used in the field of medical image processing and analysis. This survey demonstrates the principle of two kinds of basic deformable models, i.e. parametric deformable model and geometric deformable model. The design of model in application is also discussed. By incorporating prior knowledge and modeling global properties, several new extensions of basic deformable model are then reviewed. At last, some prospects of possible research are given.

Author

Dummies; Image Processing; Imaging Techniques; Human Body

20050167207 Oregon Health and Science Univ., Beaverton, OR USA

Augmented Cognition: Amplification of Attention for Better Decision

Pavel, Misha; Jan. 2005; 16 pp.; In English

Contract(s)/Grant(s): N00014-01-1-0706; NASA-NCC-2-1218

Report No.(s): AD-A431404; No Copyright; Avail: CASI; A03, Hardcopy

The primary purpose of this project was to investigate the underlying principles for the future development of systems capable of estimating the cognitive state of an operator, the demands of the task, and the relevant environmental conditions. The cognitive state is estimated using physiological as well as behavioral measures. Examples of the physiological measures

include EEG, heart rate, plethysmography, and galvanic skin response. The behavioral measures include performance on the task, position, movements (especially eye movements), and vocal emissions. Environmental sensors would include microphones, thermometers, video cameras, and infrared cameras. In addition, the environmental information would include a database that is as complete as possible in terms of the terrain and situation information obtained from other intelligence sources. The authors developed a theoretical framework for a class of models that relate attention allocation to a measure of workload, and they demonstrated their ability to apply this framework to several tasks. Subsequently, they carried out several experiments to investigate the effectiveness of this approach within a visual search paradigm. The results suggest that significant improvements are possible, but only in situations in which the performance is truly limited by the abilities and the state of the human operator.
DTIC
Amplification; Augmentation; Cognition; Decision Making; Measurement; State Estimation; Workloads (Psychophysiology)

20050167228 Jackson (Henry M.) Foundation, Rockville, MD USA
A Randomized Clinical Trial of Cognitive-Behavioral Treatment for PTSD in Women
Engel, Charles C.; Oct. 2004; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0674
Report No.(s): AD-A431576; No Copyright; Avail: CASI; A02, Hardcopy

This study is a randomized clinical trial comparing two types of individual psychotherapy for treating PTSD in 384 female veterans and active duty personnel at 11 sites. The treatments are a trauma-focused approach, Prolonged Exposure therapy, and an approach focused on current needs and problems, Present Centered Therapy. Each site will enroll 32 patients over the 24 months of active recruitment in the study. The hypothesis is that Prolonged Exposure therapy will be more effective than Present Centered Therapy for the treatment of PTSD in female veterans and active duty personnel. The study has entered the randomized phase. There are no conclusions to date.
DTIC
Cognition; Females; Military Personnel; Psychotherapy

20050167324 Army War Coll., Carlisle Barracks, PA USA
Fitness and Its Affects on the Military
Brown, Matthew J.; Mar. 2005; 25 pp.; In English
Report No.(s): AD-A431871; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this research paper is to look at the different aspects of fitness in the U.S. military services to determine if their fitness programs are adequate. Do the U.S. Armed Forces need different levels of physical fitness standard based on the types of duty assignments of their military service members? For example, does a military supply clerk need to meet the same fitness standard as a combat soldier? To answer these questions, the author examines various military fitness programs and the way they look at acceptable fitness levels among their military members. It is perceived that throughout its military history, physical fitness has been a cornerstone for all personnel in the U.S. Armed Forces. In general, the military believes that the physical conditioning of its soldiers has enhanced its success on very stressful and physically demanding battlefields. It is an essential part of everyday life in the U.S. military during both peacetime and wartime. A good physical fitness program assists service members in achieving better performance and overall good health.
DTIC
Injuries; Military Personnel; Physical Fitness

20050167696 Research Triangle Inst., Research Triangle Park, NC USA
2002 Department of Defense Survey of Health Related Behaviors Among Military Personnel
Bray, Robert M.; Hourani, Laurel L.; Rae, Kristine L.; Dever, Jill A.; Brown, Janice M.; Vincus, Amy A.; Pemberton, Michael R.; Marsden, Mary E.; Faulkner, Dorothy L.; Vandermaas-Peeler, Russ; Oct. 2003; 336 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431566; RTI/7841/006-FR; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report presents the primary results of the 2002 Department of Defense (DoD) Survey of Health Related Behaviors Among Military Personnel. This study is the eighth in a series of surveys of active-duty military personnel conducted in 1980, 1982, 1985, 1988, 1992, 1995, 1998, and 2002 under the direction of the Office of the Assistant Secretary of Defense (Health Affairs). All of the surveys investigated the prevalence of alcohol use, illicit drug use, and tobacco use, as well as negative consequences associated with substance use. The 1985 through 1992 surveys also covered an expanded set of health behaviors

and related issues. In 1995 and 1998, health behavior questions were revised and items were added to assess selected Healthy People 2000 objectives. In addition, questions were added to examine the mental health of the Active Force, specific health concerns of military women and military men, oral health, and gambling behaviors. The 2002 survey continued the focus of the 1998 survey and expanded it to include Healthy People 2010 objectives. It also augmented the items on nutrition and mental health and added new items on supplement use, risk taking and impulsive behavior, job satisfaction, and religiosity/spirituality. The eligible population for the 2002 survey consisted of all active-duty military personnel except recruits, Service academy students, persons absent without official leave (AWOL), and persons who had a permanent change of station (PCS) at the time of data collection. The final sample consisted of 12,756 military personnel (3,269 Army, 3,625 Navy, 3,008 Marine Corps, and 2,854 Air Force) who completed self-administered questionnaires anonymously. Participants were selected to represent men and women in all pay grades of the Active Force throughout the world.
DTIC
Defense Program; Health; Military Personnel; Surveys

20050169462 Texas Univ. Health Science Center, Houston, TX, USA
[Dentists on Mars]
Duke, P. J.; [2004]; 8 pp.; In English
Contract(s)/Grant(s): NNG04GG87G; No Copyright; Avail: CASI; A02, Hardcopy

The oral health of astronauts, last studied in the mid- 1970s on Skylab, has not been a priority area of study for NASA due to the short length of shuttle stays. But with longer stays on the International Space Station, and planning for a trip to Mars, investigations into how spaceflight affects oral health are needed. The objective of this symposium is to introduce the dental research community to changes occurring in humans who go into space, and how these changes might impact oral health. Dr. Millie Hughes-Fulford, an astronaut-scientist, will review what happens to humans who go into space, and the difficulties of living, and carrying out experiments in space. She will then discuss her research on cell cultures of osteoblasts in space, and in hypergravity Dr. Gerald Sonnenfeld will review immunological changes that occur in spaceflight, and relate the observed decreases in various types of immunological responses to possible effects on oral immunological factors. Dr. Marian Lewis will discuss the effects of spaceflight on gene expression using results from her spaceflight experiments on various cell types. Dr. Jack van Loon, fiom the Dutch Experiment Support Center, will review what is known about bone loss in humans and rats and metatarsal cultures which go into space, and review ground based models (head down bedrest, and tail suspension) that simulate the unloading of spaceflight. Attendees will gain a knowledge of spaceflight research, and information on getting their own experiments in space. The symposium is supported by the NASA Office of Bioastronautics
Derived from text
Dentistry; Mars (Planet); Bioastronautics; Conferences; Immunology

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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*.

20050165776 National Inst. of Information and Communications Technology, Japan
Live Cell Imaging by Fluorescence Microscopy
Haraguchi, Tokuko; Ding, Da-Qiao; Chikashige, Yuji; Yamamoto, Ayumu; Hiraoka, Yasushi; Review of the National Institute of Information and Communications Technology, Volume 50, Nos. 3/4; September/December 2004, pp. 25-29; In Japanese; See also 20050165771; Copyright; Avail: Other Sources

Communications within the cell are accomplished by the coordinated interactions of molecular components. Observation of such molecular interactions in living cells can be essential for understanding cellular communications. Toward this end, we have developed microscope systems for imaging intracellular molecular components in living cells. Here we introduce unique features of these microscope systems and their applications.
Author
Fluorescence; Microscopy; Molecular Interactions; Cells (Biology)

20050166855 Beijing Univ. of Aeronautics and Astronautics, Beijing, China

An Experimental Study of Effects of Active-heating-system for Extravehicular Spacesuit Gloves on Working Performance

Ding, Li; Han, Long-Zhu; Yang, Chun-Xin; Yang, Feng; Yuan, Xiu-Gan; Space Medicine and Medical Engineering, Volume 18, No. 1; February 2005, pp. 47-51; In Chinese; See also 20050166850; Copyright; Avail: Other Sources

The objective of this research was to observe the effects of active heating system for spacesuit gloves on extravehicular working performance. After analyzing the factors with gloves influence on the working performance, the effects of active heating system for gloves were studied experimentally with aspects to fatigue, hand strength, dexterity and tactile sensing. Heating-system had not influence to grip; 2) Heating-system had 17% influence to fatigue except specific person; 3) Nut assembly and nipping pin showed that heating-system had little influence to dexterity; 4) Apperceiving shape of object and two-point distance showed heating-system had little influence to tactility. The active heating method is rational and has little influence on working performance.

Author (revised)

Extravehicular Mobility Units; Gloves; Heating; Astronaut Performance

20050167430 Army Research Lab., Aberdeen Proving Ground, MD USA

An Evaluation of Selected Communications Assemblies and Hearing Protection Systems: A Field Study Conducted for the Future Force Warrior Integrated Headgear Integrated Process Team

Scharine, Angelique A.; Henry, Paula P.; Binseel, Mary S.; Apr. 2005; 38 pp.; In English; Original contains color illustrations

Report No.(s): AD-A432092; ARL-TR-3475; No Copyright; Avail: Defense Technical Information Center (DTIC)

Radio communications and hearing protection are two critical components of the Future Force Warrior (FFW) ensemble. A field study was conducted to evaluate three different communication system concepts: bone conduction, communications earmuffs, and communications earplugs, all of which are being considered for the FFW ensemble. Eight Soldiers participated in a series of activities to evaluate each of the systems regarding communication effectiveness, comfort, environmental hearing, hearing protection, and ease of use. Objective and subjective data were collected in each of the following tasks: a road march, speech intelligibility in noise, speech intelligibility in noise in a moving vehicle, and speech intelligibility when chemical/biological protective gear is worn. The results of the study suggest reducing selection to two concepts: the bone conduction system and the communications earplug. However, further testing and development are needed in order for either system to being an acceptable form. Furthermore, a determination should be made regarding whether communication systems should be independent from the helmet. Both the Soldier's comfort and the Soldier's need for communications should be considered.

DTIC

Ear Protectors; Helmets; Intelligibility; Protective Clothing; Speech; Telecommunication

20050167853 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Zeist, Netherlands

Nutrition Motivation and Behaviour of Experienced Military Personnel of Different Fighting Units with Respect to Combat Rations, Part 3, Final Results and Recommendations

Westenbrink, S.; opdeWeegh, M. J.; Rubingh, C.; vanAken, P.; terDoest, D.; vanErp-Baart, A. M. J.; February 2005; 133 pp.; In Dutch

Contract(s)/Grant(s): A02/KL/105; TNO proj. 010.22050

Report No.(s): TD-2004-0403; TNO-V6103; Copyright; Avail: Other Sources

Attitude towards and real consumption of military combat rations were measured among military personnel with varying background, to obtain insight into how to optimize the use of military rations. The attitude towards the ration was in general neutral. Respondents were more positive about hot meals than breakfast and lunch products. Use of the ration was not optimal: not all products are consumed and respondents frequently replace products or supplement the ration with other products. Most respondents don't intend to improve these habits. Respondents feel stimulated by colleagues and executives to eat and drink sufficiently, and indicate that they are capable of eating the ration in different extreme circumstances. Respondents think they have sufficient knowledge to choose the right products. They experienced few barriers when using the ration. There were differences in outcomes between certain fighting units, ranks and brigades. The energy intake of the groups, operating in a mobile environment was above the recommended intake, in particular the group allowed to bring their own food. The group operating on foot had the highest energy expenditure. Their energy intake was in accordance with the recommendations; although for some individual intakes might have been too low. This group did not drink enough water. It is advised to add

popular foods like noodle soup, dry sausage and winegums to the ration or the additional food package.
Author
Military Personnel; Nutrition; Eating; Habits; Motivation; Rations

20050167898 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands
Respirator Field Trials
vanderGijp, S.; Steenweg, L. A. W. N.; Nijboer, B.; March 2005; 50 pp.; In English
Contract(s)/Grant(s): V015-5 19D; TNO Proj. 014.15234
Report No.(s): TD-2005-0015; DV2-2005-A15; Copyright; Avail: Other Sources

In this report the results are described of three field trials. The purpose of these field trials was to measure the actual protection level of respirator during realistic NBC-exercises, like e.g. patrol and decontamination. Two field trials were conducted in the UK and one field trial in the Netherlands. In the latter special attention was given to the effect of recoil on the mask. The data show the protection offered by the Dutch FM12 respirator is not always adequate. No correlation between specific actions and reduction in protection factors were found.
Author
Respirators; Field Tests; Masks; Human Factors Engineering; Protection

20050168296 Physics and Electronics Lab. TNO, The Hague, Netherlands
Night Vision Goggles (NVG) for the Tactical Helicopter Group
Benoist, K. W.; Kooi, F. L.; January 2005; 60 pp.; In Dutch
Contract(s)/Grant(s): TNO Proj. 015.33243
Report No.(s): TD-2004-0138; TNO-DV1-2004-A104; Copyright; Avail: Other Sources

At the Dutch Royal Airforce knowledge is desired to the support the (possible) replacement of Night Vision Goggles (NVG) for the pilot and the loadmaster of the Chinook and Cougar. In the project 'Night Vision Goggles voor de Tactische Helikopter Groep' (NVG-THG) the technological developments in the field of image intensifiers and NVGs and the consequences for the user are charted. The project is carried out by TNO-FEL, responsible for the technological part, and TNO-TM, who explored the human factor aspects. The acquired knowledge, recorded in this report, has led to a useful knowledge base helpful to identify relevant selection criteria for NVGs during procurement trajectories. When considering the replacement of the current AN/AVS NVG the benefits of the product has to be carefully weighted against the potential drawback.
Author
Night Vision; Goggles; Image Intensifiers

20050169206 NASA Kennedy Space Center, USA
Crew Configures ISS
Covault, Craig; Aviation Week and Space Technology; April 04, 2005; ISSN 0005-2175; Volume 162, No. 14, pp. 32; In English; Original contains color illustrations; Copyright; Avail: Other Sources

European Automated Transfer Vehicles (ATVs) can begin sending tons of logistics supplies to the International Space Station as early as 2006, now that the U.S./Russian crew has outfitted the exterior of the ISS with the final communications and GPS antennas needed for ATV rendezvous and docking. During their extravehicular activity (EVA) on Mar. 28, Expedition 10 commander astronaut Leroy Chiao and Russian flight engineer cosmonaut Salizhan Sharipov also coordinated the hand-launch by Sharipov of a small Russian technology satellite. The crew wore Russian Orlan space suits during the 4 hr. 30 min. EVA, which they completed an hour earlier than expected. The EVA was the sixth for Chiao and the second for Sharipov. Both Expedition 10 crewmen had been outside together on Jan. 25 at the start of their six- month mission. The Expedition 11 replacement crew is to launch to the ISS Apr. 15, enabling the current crew to return to Earth Apr. 25. A detailed discussion about Chiao and Sharipov's EVA is presented.
Derived from text
International Space Station; Extravehicular Activity; Spacecrews; Automated Transfer Vehicle

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EXOBIOLOGY

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see *52 Aerospace Medicine*; on animals and plants see *51 Life Sciences*. For psychological and behavioral effects of aerospace environments see *53 Behavioral Sciences*.

20050165782 National Inst. of Information and Communications Technology, Japan
Genome-wide Analysis of Gene Functions
Chikashige, Yuji; Ding, Da-Qiao; Yamamoto, Ayumu; Hayashi, Aki; Asakawa, Haruhiko; Masuda, Hirohisa; Haraguchi, Tokuko; Hiraoka, Yasushi; Review of the National Institute of Information and Communications Technology, Volume 50, Nos. 3/4; September/December 2004, pp. 31-35; In Japanese; See also 20050165771; Copyright; Avail: Other Sources

Cellular events are regulated b y a number of genes contained in the genome. Understanding mechanisms of such genetic regulations can lead to breakthrough in communications technology. Toward this end, we have carried out genome-wide analysis of about 4,500 genes and their protein products in the fission yeast genome. Here we introduce a DNA microarray for monitoring expression profiles of the genes, and a library of fluorescent proteins for imaging four dimensional localization of the gene products.
Author
Genome; Genes; Deoxyribonucleic Acid; Fission; Yeast; Proteins

20050167071 NASA, USA
The Living Universe: NASA and the Development of Astrobiology
Dick, Steven J.; Strick, James E.; [2004]; 312 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-8594
Report No.(s): LC-2004004037; Copyright; Avail: CASI; A14, Hardcopy

In the opening weeks of 1998 a news article in the British journal Nature reported that NASA was about to enter biology in a big way. A 'virtual' Astrobiology Institute was gearing up for business, and NASA administrator Dan Goldin told his external advisory council that he would like to see spending on the new institute eventually reach $100 million per year. 'You just wait for the screaming from the physical scientists (when that happens),' Goldin was quoted as saying. Nevertheless, by the time of the second Astrobiology Science Conference in 2002, attended by seven hundred scientists from many disciplines, NASA spending on astrobiology had reached nearly half that amount and was growing at a steady pace. Under NASA leadership numerous institutions around the world applied the latest scientific techniques in the service of astrobiology's ambitious goal: the study of what NASA's 1996 Strategic Plan termed the 'living universe.' This goal embraced nothing less than an understanding of the origin, history, and distribution of life in the universe, including Earth. Astrobiology, conceived as a broad interdisciplinary research program, held the prospect of being the science for the twenty-first century which would unlock the secrets to some of the great questions of humanity. It is no surprise that these age-old questions should continue into the twenty-first century. But that the effort should be spearheaded by NASA was not at all obvious to those - inside and outside the agency - who thought NASA's mission was human spaceflight, rather than science, especially biological science. NASA had, in fact, been involved for four decades in 'exobiology,' a field that embraced many of the same questions but which had stagnated after the 1976 Viking missions to Mars. In this volume we tell the colorful story of the rise of the discipline of exobiology, how and why it morphed into astrobiology at the end of the twentieth century, and why NASA was the engine for both the discipline's founding and for its transformation.
Author (revised)
Exobiology; NASA Programs; Histories; Research Management; Priorities

20050167790 NASA Ames Research Center, Moffett Field, CA, USA
Astrobiology and the Basaltic Plains in Gusev Crater
DesMarais, D. J.; Clark, B. C.; Crumpler, L. S.; Farmer, J. D.; Grotzinger, John P.; Haskin, Larry A.; Knoll, Andrew H.; Landis, Geoffrey A.; Moersch, Jeffrey; Schroeder, Christian, et al.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This report assesses the availability of nutrient elements, energy and liquid water on the plains surrounding Columbia Memorial Station by evaluating observations by the MER rover Spirit in the context of previous Mars missions, Earth-based

studies of martian meteorites and studies of microbial communities on Earth that represent potential analogs of martian biota. Derived from text
Basalt; Exobiology; Mars Craters; Mars Missions

20050169532 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Amino Acids in the Antarctic Martian Meteorite MIL03346
Glavin, D. P.; Aubrey, A.; Dworkin, J. P.; Botta, O.; Bada, J. L.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The report by McKay et al. that the Martian meteorite ALH84001 contains evidence for life on Mars remains controversial. Of central importance is whether ALH84001 and other Antarctic Martian meteorites contain endogenous organic compounds. In any investigation of organic compounds possibly derived from Mars it is important to focus on compounds that play an essential role in biochemistry as we know it and that have properties such as chirality which can be used to distinguish between biotic versus abiotic origins. Amino acids are one of the few compounds that fulfill these requirements. Previous analyses of the Antarctic Martian meteorites ALH84001 and EETA79001 have shown that these meteorites contain low levels of terrestrial amino acid contamination derived from Antarctic ice meltwater. Here we report preliminary amino acid investigations of a third Antarctic Martian meteorite MIL03346 which was discovered in Antarctica during the 2003-04 ANSMET season. Additional information is included in the original extended abstract
Author
Antarctic Regions; Amino Acids; Meteoritic Composition; SNC Meteorites

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*.

20050166364 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Improved Searching for Spatial Features in Spatio-Temporal Data
Stockinger, K.; Wu, K.; Sep. 2004; 20 pp.; In English
Report No.(s): DE2004-833576; No Copyright; Avail: Department of Energy Information Bridge

Scientific data analysis often requires mining large databases or data warehouses to find features in space. One important task is to find regions of interest such as stellar objects in astrophysics or flame fronts in combustion studies. Typically, this task is performed in two steps. The first step (searching) identifies records satisfying certain conditions specified by the user and outputs a set of cells. The second step (region-growing) groups these cells into connected regions. Most common approaches essentially perform a brute-force scan for these arching step. A number of indexing schemes have been proposed to speed up the searching step. Because they usually also slow down the region-growing step, these schemes have not reduced the overall time. In this article, we propose an approach based on compressed bitmap indices. Our approach speeds up not only the searching step, but also the region-growing step. In the literature, the time complexity of the region-growing step is demonstrated to be linear in the number of records in the dataset. In our tests, we show that the response time of our region-growing algorithm is linear in the number of records close to the surface of the regions of interest which is a small subset of all cells.
NTIS
Astrophysics; Data Processing; Algorithms; Spatial Dependencies

20050166365 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Graphical Model Theory for Wireless Sensor Networks
Davis, W. B.; 2004; 22 pp.; In English
Report No.(s): DE2004-833692; No Copyright; Avail: Department of Energy Information Bridge

Information processing in sensor networks, with many small processors, demands a theory of computation that allows the minimization of processing effort, and the distribution of this effort throughout the network. Graphical model theory provides a probabilistic theory of computation that explicitly addresses complexity and decentralization for optimizing network computation. The junction tree algorithm, for decentralized inference on graphical probability models, can be instantiated in a variety of applications useful for wireless sensor networks, including: sensor validation and fusion; data compression and

channel coding; expert systems, with decentralized data structures, and efficient local queries; pattern classification, and machine learning. Graphical models for these applications are sketched, and a model of dynamic sensor validation and fusion is presented in more depth, to illustrate the junction tree algorithm.
NTIS
Data Compression; Algorithms; Data Structures; Expert Systems

20050166367 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, California Univ., Berkeley, CA
Proposal for Extending the UPC Memory Copy Library Functions and Supporting Extensions to GASNet, Version 1.0
Bonachea, D.; Oct. 2004; 24 pp.; In English
Report No.(s): DE2004-833709; No Copyright; Avail: Department of Energy Information Bridge

This document outlines a proposal for extending UPC's point-to-point memcpy library with support for explicitly non-blocking transfers, and non-contiguous (indexed and strided) transfers. Various portions of this proposal could stand alone as independent extensions to the UPC library. The designs presented here are heavily influenced by analogous functionality which exists in other parallel communication systems, such as MPI, ARMCI, Titanium, and network hardware API's such as Quadricselan, Infiniband vapi, IBM LAPI and Cray X-1. Each section contains proposed extensions to the libraries in the UPC Language Specification (section 7) and corresponding extensions to the GASNet communication system API.
NTIS
Cray Computers; Telecommunication

20050166388 California Univ., Berkeley, CA, National Environmental Engineering Research Inst., Nagpur, India
Can Fuzzy Logic Bring Complex Problems into Focus. Modeling Imprecise Factors in Environmental Policy
2004; 22 pp.; In English
Report No.(s): DE2004-834236; No Copyright; Avail: Department of Energy Information Bridge

In modeling complex environmental problems, we often fail to make precise statements about inputs and outcome. In this case the fuzzy logic method native to the human mind provides a useful way to get at these problems. Fuzzy logic represents a significant change in both the approach to and outcome of environmental evaluations. Risk assessment is currently based on the implicit premise that probability theory provides the necessary and sufficient tools for dealing with uncertainty and variability. The key advantage of fuzzy methods is the way they reflect the human mind in its remarkable ability to store and process information which is consistently imprecise, uncertain, and resistant to classification. Our case study illustrates the ability of fuzzy logic to integrate statistical measurements with imprecise health goals. But we submit that fuzzy logic and probability theory are complementary and not competitive. In the world of soft computing, fuzzy logic has been widely used and has often been the 'smart' behind smart machines. But it will require more effort and case studies to establish its niche in risk assessment or other types of impact assessment. Although we often hear complaints about 'bright lines,' could we adapt to a system that relaxes these lines to fuzzy gradations. Would decision makers and the public accept expressions of water or air quality goals in linguistic terms with computed degrees of certainty. Resistance is likely. In many regions, such as the US and European Union, it is likely that both decision makers and members of the public are more comfortable with our current system in which government agencies avoid confronting uncertainties by setting guidelines that are crisp and often fail to communicate uncertainty. But some day perhaps a more comprehensive approach that includes exposure surveys, toxicological data, epidemiological studies coupled with fuzzy modeling will go a long way in resolving some of the conflict, divisiveness, and controversy in the current regulatory paradigm.
NTIS
Environment Management; Fuzzy Systems

20050166391 Royal Inst. of Tech., Stockholm, Sweden
What is a Quadrature Domain
Gustafsson, B.; Shapiro, H. S.; Mar. 2004; 32 pp.; In English
Report No.(s): PB2005-102983; TIRTA-MAT-04-MA-04; No Copyright; Avail: CASI; A03, Hardcopy

We give an overview of the theory of quadrature domains with indications of some if its ramifications.
NTIS
Domains; Quadratures

20050166392 Royal Inst. of Tech., Stockholm, Sweden
Algebraic Aspects of the Dirichlet Problem
Ebenfelt, P.; Khavinson, D.; Shapiro, H. S.; Mar. 2004; 24 pp.; In English
Report No.(s): PB2005-102984; TRITA-MAT-04-MA-02; No Copyright; Avail: CASI; A03, Hardcopy

Our aim in this paper is to make some remarks about certain algebraic aspects of the classical Dirichlet problem for the Laplace operator.
NTIS
Algebra; Laplace Transformation; Dirichlet Problem

20050166393 Swedish Defence Research Establishment, Linkoeping, Sweden
Distributed STDMA Algorithms for Ad Hoc Networks
Groenkvist, J.; Dec. 2003; 68 pp.; In English
Report No.(s): PB2005-102989; FOI-R-1059-SE; No Copyright; Avail: CASI; A04, Hardcopy

Spatial reuse TDMA (STDMA) has been proposed as an access scheme for multi-hop radio networks where real-time service guarantees are important. The idea is to achieve high capacity by letting several radio terminals use the same time slot when the radio units are geographically separated such that small interference is obtained. The transmission rights of the different users are described with a schedule. Due to the mobility of the users, this schedule must be constantly updated. To make this possible such updates must be made in parallel with only local information, i. e. distributed STDMA algorithms must be used. In this report we investigate and list the properties a distributed STDMA algorithm must have to be efficient in a military scenario. We also study the existing STDMA algorithms and see what methods they use to fulfill these properties and show that no existing algorithm can fulfill all these properties, The main contribution of this report is the description of the central parts of an interference- based distributed STDMA algorithm. This is the first distributed algorithm that uses a interference-based model of the network, which is important since this property can make STDMA really efficient and competitive. The algorithm is evaluated to show that this distributed algorithm can achieve as high network capacity as a centralized scheme using the same information.
NTIS
Real Time Operation; Time Division Multiple Access; Schedules

20050166398 Netherlands Energy Research Foundation, Petten
Wind Turbine Control Algorithms. DOWEC-F1W1-EH-03-094/0
van der Hooft, E. L.; Schaak, P.; van Engelen, T. G.; Dec. 2004; 94 pp.; In English
Report No.(s): PB2005-103060; ECN-C-03-111; Copyright; Avail: National Technical Information Service (NTIS)

The objective of DOWEC task 3 of work package I has been defined as 'research and devel- opment of wind turbine (power) control algorithms to maximize energy yield and reduction of turbine fatigue load, and its optimisation for offshore operation'. In accordance with the DOWEC baseline turbine and the related DOWEC turbine all activities were focused on active pitch to vane, variable speed concept. The results of this task contribute to the: set-up of a modular control structure based on thcoretical analysis and industrial needs; increase of turbine performance (power production, load reduction) by additional control features and actions. It can be concluded that the control structure is superior to ordinary PD feedback control of the rotor speed. An independent comparison for the DOWEC turbine using an aerodynamic code, with a state-of-the-art control structure, has resulted in improvements concerning: extreme fore-aft tower bending moment (-40%); fatigue fore-aft tower bottom bending equivalent moment (-50%); variations in blade pitch rate (standard dev. -0.65 dg/s); tilt moment (-10%).
NTIS
Wind Turbines; Algorithms; Control Systems Design

20050166403 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Implementation of Industry Foundation Classes in Simulation Tools for the Building Industry
Bazjanac, V.; Crawley, D. B.; 2004; 12 pp.; In English
Report No.(s): DE2004-833543; No Copyright; Avail: Department of Energy Information Bridge

Industry Foundation Classes (IFC) provide an envi-ronment of interoperability among IFC-compliant software applications in the architecture, engineering, construction, and facilities management (AEC/FM) industry. They allow building simulation software to automatically acquire building geometry and other building data from project models created with IFC-compliant CAD software. They also facilitate direct exchange of input and output data with other simula-tion software. This paper discusses how simulation software can be made compliant with version 1.5 of the IFC. It also describes the immediate plans for expansion of IFC and the process of definition and addition of new classes to the model.
NTIS
Computer Aided Design; Computerized Simulation; Interoperability

20050166404 Lawrence Livermore National Lab., Livermore, CA

Fast Stable Solvers for Sequentially Semi-Separable Linear Systems of Equations

Chandrasekaran, S.; Dewilde, P.; Gu, M.; Pals, T.; van der Veen, A. J.; Jan. 17, 2003; 48 pp.; In English

Report No.(s): DE2004-15003389; UCRL-CR-151499; No Copyright; Avail: Department of Energy Information Bridge

We define the class of sequentially semi-separable matrices in this paper. Essentially this is the class of matrices which have low numerical rank on their off diagonal blocks. Examples include banded matrices, semi-separable matrices, their sums as well as inverses of these sums. Fast and stable algorithms for solving linear systems of equations involving such matrices and computing Moore-Penrose inverses are presented. Supporting numerical results are also presented. In addition, fast algorithms to construct and update this matrix structure for any given matrix are presented. Finally, numerical results that show that the coefficient matrices resulting from global spectral discretizations of certain integral equations indeed have this matrix structure are given.

NTIS

Integral Equations; Linear Systems; Matrices (Mathematics); Numerical Analysis; Algorithms

20050167053 Stanford Univ., Stanford, CA, USA

What Sensing Tells Us: Towards a Formal Theory of Testing for Dynamical Systems

McIlraith, Sheila; Scherl, Richard; [2005]; 8 pp.; In English

Contract(s)/Grant(s): N66001-97-C-8554; NAG2-1337; NSF 98-19116; No Copyright; Avail: CASI; A02, Hardcopy

Just as actions can have indirect effects on the state of the world, so too can sensing actions have indirect effects on an agent's state of knowledge. In this paper, we investigate 'what sensing actions tell us', i.e., what an agent comes to know indirectly from the outcome of a sensing action, given knowledge of its actions and state constraints that hold in the world. To this end, we propose a formalization of the notion of testing within a dialect of the situation calculus that includes knowledge and sensing actions. Realizing this formalization requires addressing the ramification problem for sensing actions. We formalize simple tests as sensing actions. Complex tests are expressed in the logic programming language Golog. We examine what it means to perform a test, and how the outcome of a test affects an agent's state of knowledge. Finally, we propose automated reasoning techniques for test generation and complex-test verification, under certain restrictions. The work presented in this paper is relevant to a number of application domains including diagnostic problem solving, natural language understanding, plan recognition, and active vision.

Author

Detection; Dynamical Systems; Formalism; Artificial Intelligence

20050168104 Rutherford Appleton Lab., Chilton, UK

Numerical Analysis Group Progress Report January 2002 - December 2003

Duff, I. S.; Apr. 30, 2004; 66 pp.; In English

Report No.(s): PB2005-103059; RAL-TR-2004-016; Copyright; Avail: National Technical Information Service (NTIS)

We discuss the research activities of the Numerical Analysis Group in the Computational Science and Engineering Department at the Rutherford Appleton Laboratory of CLRC for the period January 2002 to December 2003. This work was supported by EPSRC grant R46441 until October 2003 and grant S42170 thereafter.

NTIS

Numerical Analysis; Algebra; Matrices (Mathematics)

20050168113 General Accounting Office, Washington, DC

Information Security: Internal Revenue Service Needs to Remedy Serious Weaknesses over Taxpayer and Bank Secrecy Act Data

Apr. 2005; 34 pp.; In English

Report No.(s): PB2005-106244; GAO-05-482; No Copyright; Avail: CASI; A03, Hardcopy

The Internal Revenue Service (IRS) relies extensively on computerized systems to support its financial and mission-related operations. In addition, IRS provides computer processing support to the Financial Crimes Enforcement Network (FinCEN) another Treasury bureau. As part of IRS's fiscal year 2004 financial statements, GAO assessed (1) the status of IRS's actions to correct or mitigate previously reported weaknesses at one of its critical data processing facilities and (2) the effectiveness of IRS's information security controls in protecting the confidentiality, integrity, and availability of key financial and tax processing systems.

NTIS

Computer Techniques; Data Processing

20050168150 Rutherford Appleton Lab., Chilton
Use of Performance Toolkits to Analyse a Real Performance Problem
Ashby, J. V.; Dec. 09, 2004; 18 pp.; In English
Report No.(s): PB2005-103033; RAL-TR-2004-034; Copyright; Avail: National Technical Information Service (NTIS)

We consider the use of two Hardware Performance Monitoring tools in understanding a performance problem with a computational science code. The tools are assessed for the quality and usability of the information they present. While the underlying problem is not fully explained, sufficient understanding is attained to achieve a partial remedy.
NTIS
Performance Tests; Computer Programs

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

20050167729 Michigan Univ., Ann Arbor, MI USA
Asymptotic Connectivity of Low Duty-Cycled Wireless Sensor Networks
Kim, Dongsook; Hsin, Chih-fan; Liu, Mingyan; Dec. 2004; 3 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431657; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Army's Future Combat Systems potentially rely heavily on the efficient use of unattended sensors to detect, identify and track targets in order to enhance situation awareness, agility and survivability. Among different types of sensors, the unattended ground sensors (UGS) are typically deployed and left to self-organize and carry out various sensing, monitoring, surveillance and communication tasks. These sensors are operated on battery power, and energy is not always renewable due to cost, environmental and form size concerns. This imposes a stringent energy constraint on the design of the communication architecture, communication protocols, and the deployment and operation of these sensors. It is thus critical to operate these sensors in a highly energy efficient manner.
DTIC
Telecommunication; Communication Networks

20050167731 Army Research Lab., Aberdeen Proving Ground, MD USA
50 Years of Army Computing From ENIAC to MSRC
Bergin, Thomas J.; Sep. 2000; 179 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431730; ARL-SR-93; No Copyright; Avail: Defense Technical Information Center (DTIC)

A symposium and celebration was held at Aberdeen Proving Ground (APG), Maryland, in November 1996, to recognize and commemorate seminal Army contributions to the birth and development of modern computing. Primarily inspired by the 50th anniversary of the invention of the world's first general purpose electronic computer (the ENIAC), this two-day event also celebrated the dedication at APG of significant new computational resources provided by the Office of Secretary of Defense. On this occasion, scores of computing pioneers gathered at APG to reminisce about the accomplishments that stemmed from the Army's computation needs during World War II in particular, the need for the fi ring and bombing tables that were essential for accurate targeting of ground-and air-delivered ordnance.
DTIC
Computers; Computation

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.

20050167218 Space and Naval Warfare Systems Command, San Diego, CA USA
Integrated Installation Team Standard Process Manual. Revision 1
May 2001; 131 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431533; TM-708-REV-1; No Copyright; Avail: Defense Technical Information Center (DTIC)

This Integrated Installation Team Standard Process Manual provides policy-related process management guidelines for all codes and teams of Space and Naval Warfare Systems Center, San Diego (SSC San Diego) involved in advance planning and executing afloat Command, Control, Communications, Computers, Surveillance, and Reconnaissance (C4ISR) alteration installations. It is to be used as an indoctrination tool, a training aid, and a timeline and event-oriented guide. C4ISR alterations include permanent Ship Alterations (SHIPALTs), Temporary ship Alterations (TEMPALTs), software installations, field changes (FC), etc., and any system upgrades or installations to surface ships and submarines.
DTIC
Installation Manuals; Manuals

20050167219 Space and Naval Warfare Systems Command, San Diego, CA USA
Technical Manual 708. Integrated Installation Team Standard Process Manual
Jun. 2001; 125 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): SPAWAR/CA
Report No.(s): AD-A431542; TM-708XB; No Copyright; Avail: Defense Technical Information Center (DTIC)
This Integrated Installation Team Standard Process Manual provides policy-related process management guidelines for all codes and teams of Space and Naval Warfare Systems Center, San Diego (SSC San Diego) involved in advance planning and executing afloat Command, Control, Communications, Computers, Surveillance, and Reconnaissance (C4ISR) alteration installations. It is to be used as an indoctrination tool, a training aid, and a timeline and event-oriented guide. C4ISR alterations include permanent Ship Alterations (SHIPALTs), Temporary ship Alterations (TEMPALTs), software installations, field changes (FC), etc. and any system upgrades or installations to surface ships and submarines.
DTIC
Installation Manuals; Manuals; Systems Integration

20050167358 Minnesota Univ., Minneapolis, MN USA
Advanced High and Low Fidelity HPC Simulations of FCS Concept Designs for Dynamic Systems
Sandhu, S. S.; Kanapady, R.; Tamma, K. K.; Jan. 2004; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431951; No Copyright; Avail: Defense Technical Information Center (DTIC)
The Objective Force concept of the future US Army is to fight wars with adversaries, which are fast evolving and have adaptive capabilities. To have advantage over these adversaries, new weapon system designs and development should be modular to operate as system-of systems and should have short development cycles. This requires validated high performance computational models within this modular framework and the need to effectively utilize the High Performance Computing (HPC) resources of many Army initiatives. In this paper we present a new and advanced HPC based rigid and flexible modeling and simulation technology capable of adaptive high/low fidelity modeling that is useful in the initial design concept stage to intermediate stages and to the final design stage in a single seamless simulation environment. Two examples are considered that illustrate the capabilities and scalability of the proposed approach.
DTIC
Adaptation; Simulation; Weapon Systems

20050167359 Semiotic Engineering Associates, LLC, Albuquerque, NM USA
Ultra-High Speed Solid-State FTIR Spectroscopy and Applications for Chemical Defense
Buican, Tudor N.; Carrieri, Arthur H.; Dec. 2004; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABJ05-03-P-0979; DAAL03-91-C-0034
Report No.(s): AD-A431953; No Copyright; Avail: Defense Technical Information Center (DTIC)
We introduce a new class of FTIR spectrometers capable of acquiring 6x10(exp 4)-1.4x10(exp 5) interferograms (spectra) per second over the spectral range of 1 micrometers - 12 micrometers, with a resolution of 10 /cm (exp-1) or better. The new FTIR technology is based on the use of birefringence interferometers and employs photoelastic modulators (PEMs) as birefringent elements for ultra-high modulation speed. With characteristic data rates of tens of kHz and wide spectral range these spectrometers are eminently suitable for high-speed spectrally detailed chemical biological (CB) hyperspectral imaging.
DTIC
Chemical Defense; Infrared Spectroscopy; Solid State; Spectroscopy

20050167360 Johns Hopkins Univ., Laurel, MD USA

Component-Based Analysis and Design of Routing Protocols for Mobile AD HOC Networks

Wang, I-Jeng; Benmohamed, Lotfi; Jones, Steven D.; Liu, Chunyue; Saadawi, Tarek; Dec. 2004; 3 pp.; In English

Contract(s)/Grant(s): DAAD19-01-2-0011

Report No.(s): AD-A431954; No Copyright; Avail: Defense Technical Information Center (DTIC)

In this paper, we present a component-based framework for analysis and design of routing protocols for mobile ad hoc networks (MANET). This framework defines a common set of functional components for a MANET routing protocol under which a protocol can be designed and analyzed at the component basis. Each MANET routing protocol is designed and optimized to address the entire routing problem that consists of many dimensions. To tackle the significant challenges arising in mobile ad hoc wireless networks, each protocol is a complicated piece of software with many intertwined components. As a result, the protocol-based approach, which designs and analyzes each protocol as a whole to address each unique routing performance requirement, provides limited insight into key aspects of protocols. In addition, careful examination of existing protocols shows that many protocols share fundamentally the same mechanisms/algorithms for common functions in support of routing (perhaps with different minor optimization or fine-tuning to achieve specific performance improvements). These overlaps further increase the difficulties of protocol-based comparison and analysis. Finally, each attempt to design a new protocol to address new technical challenges might imply development of the entire routing function that in many cases duplicates past efforts and reproduces similar results at the component levels.

DTIC

Communication Networks; Computer Programs; Protocol (Computers)

20050167383 Maryland Univ., College Park, MD USA

Improving the Speed of Dynamic Cluster Formation in Manet Via Simulated Annealing

Manousakis, K.; Baras, J. S.; McAuley, A. J.; Morera, R.; Dec. 2004; 9 pp.; In English

Report No.(s): AD-A431996; No Copyright; Avail: Defense Technical Information Center (DTIC)

Future military systems, such as FCS, require a robust and flexible network that supports thousands of ad hoc nodes. Therefore, networking protocols for MANETs must be made to scale. The use of hierarchy is a powerful general solution to the scaling problem. We have previously proposed methods based on Simulated Annealing (SA) to optimize hierarchy in MANETs. The challenge, however, is to improve the slow convergence time of SA, so it can be used in dynamic environments, without penalizing optimality. In previous work the importance of parameters such as cooling schedule, state transition probabilities and convergence condition are investigated. This paper proposes a new approach to decrease SA convergence time. SA is an optimization technique based on an iterative process that takes an initial solution, or map, to start the process. In this paper we analyze the effect that this initial solution has on the SA convergence time as a function of the network size. We believe that the combined modifications to SA can speed the optimization process to the point that it can quickly generate very efficient clustering solutions in large dynamic networks.

DTIC

Annealing; Simulated Annealing

20050167386 Johns Hopkins Univ., Laurel, MD USA

Initial Studies on Worm Propagation in Manets for Future Army Combat Systems

Cole, Robert G.; Sep. 2004; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A431999; No Copyright; Avail: Defense Technical Information Center (DTIC)

This study presents an analysis of computer worm propagation in a Mobile Ad-hoc Network (MANET). According to the recent DARPA BAA - Defense Against Cyber Attacks on MANETS (DARPA, 2004), One of the most severe cyber threats is expected to be worms with arbitrary payload that can infect and saturate MANET-based networks on the order of seconds. Critical to the design of e ective worm counter measures in MANET environments is an understanding of the propagation mechanisms and their performance. MANET technologies are expected to play a key role in the Future Combat System (FCS). This work aims to advance the security of these critical systems through increasing knowledge of propagation mechanisms, performance and the e ect of future mitigation technologies. We present both analytic and simulation analysis of worm propagation. This study focuses on features of a tactical, battlefield MANET which are unique to this environment. The ultimate goal of these studies is to develop an accurate set of performance requirements on potential mitigation techniques of worm propagation for tactical, battlefield MANETS.

DTIC

Combat; Computer Programs; Worms

20050167409 L-3 Communication Government Services, Inc., Rome, NY USA

Open Radio Communications Architecture Core Framework V1.1.0. Volume 4. Joint Tactical Radio System Test Application (JTAP) Test Report

Hallatt, Dave; Bagdasarova, A.; Feb. 2005; 573 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-01-C-0205; Proj-APAW

Report No.(s): AD-A432053; AFRL-IF-RS-TR-2005-59; No Copyright; Avail: Defense Technical Information Center (DTIC)

This document provides the results of compliance testing the Open Radio Communications Architecture Core Framework (OrcaCF) 0.1.0. The testing utilized the Joint Tactical Radio System (JTRS) Test Application (JTAP) version 2.3.1.0, released July 2003. Test deficiencies were identified and categorized. Some test deficiencies were corrected, and regression testing was performed on the final version 1.1.0 of the OrcaCF code in June. The results of the testing starting in April 2004 and concluding in June 2004 are described. This Test Report is written to follow the same structure as the JTAP test results, wherein results are categorized based on JTAP tests rather than SCA requirements. There are 324 JTAP tests. The OrcaCF passed 91 % of the tests. Please note that these numbers do not indicate the number of requirements passed or failed. The JTAP tool does not provide a convenient method that maps the tests to the requirements. Each specific JTAP test evaluates multiple requirements. The same requirement may be tested multiple times by different JTAP tests. It's possible to pass a requirement in one test, and fail that requirement in another test. The JTAP tool does not provide any automated means to convert the test numbers to the number of SCA requirements passed or failed. The first attachment is the test configuration. The second attachment is the test log generated by the JTAP test run.

DTIC

Radio Communication; Regression Analysis; Software Development Tools

20050167443 Maryland Univ., College Park, MD USA

Cross-Layered Security Analysis of Wireless Ad Hoc Networks

Cardenas, Alvaro A.; Benammar, Nassir; Papageorgiou, George; Baras, John S.; Dec. 2004; 3 pp.; In English

Contract(s)/Grant(s): DAAD19-01-1-0494

Report No.(s): AD-A432108; No Copyright; Avail: Defense Technical Information Center (DTIC)

There is an inherent tradeoff between the performance of a network and its security. In this work we explore possible evaluations of security threats versus the cost of prevention and reaction to such threats. We consider different kind of adversaries with different capabilities. We present the effect of these capabilities on the different layers and the network as a whole. Such a study will help identify the importance of layered security in this infrastructure-less wireless setting.

DTIC

Local Area Networks; Security; Wireless Communication

20050167466 Reaction Engineering International, Salt Lake City, UT USA

Advanced Computer Simulations of Military Incinerators

Denison, M. K.; Montgomery, C. J.; Sarafim, A. F.; Sadler, B.; Bockelie, M. J.; Magee, D.; Gouldin, F.; Bozzelli, J.; Dec. 2004; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-C0050

Report No.(s): AD-A432156; No Copyright; Avail: Defense Technical Information Center (DTIC)

Incineration is one of the technologies being used by the US Army to destroy the highly toxic chemical agents and munitions contained within the Chemical Weapons Stockpile. In this paper we describe a suite of models for conducting detailed simulations of chemical demilitarization incinerator operation. The models contain 3D furnace and canister geometries and all of the relevant physics and chemistry. The destruction of chemical agent is predicted using non-equilibrium chemistry models. Models have been developed for a Liquid Incinerator. Metal Parts Furnace. and a Deactivation Furnace System. Using computational chemistry methods. chemical kinetics have been developed that describe the incineration of organo-phosphorus nerve agent (GB, VX) and sulfur mustard (H, HD, HT). The models have been used to study a variety of scenarios to develop a deeper understanding of furnace operation and agent destruction when processing munitions or equipment containing or contaminated by chemical agent. Model results demonstrate the incinerators to be robust systems that destroy chemical agent in a safe and efficient manner.

DTIC

Computerized Simulation; Incinerators

20050167468 ScenPro, Inc., Richardson, TX USA

Dismounted Infantry Decision Skills Assessment in the Virtual Training Environment

Gately, Michael T.; Watts, Sharon M.; Jaxtheimer, John W.; Pleban, Robert J.; Mar. 2005; 109 pp.; In English

Contract(s)/Grant(s): DASW01-02-C-0013; Proj-M770

Report No.(s): AD-A432164; SP-ARB02-2004-6F; ARI-TR-1155; No Copyright; Avail: CASI; A06, Hardcopy

This report was developed under a Small Business Innovation Research Program, Phase II. The Virtual Soldier Skills Assessment (ViSSA) is a software system that operates in a DIS/HLA-based virtual environment. ViSSA can automatically detect significant events in virtual exercises. It also has a logger/playback module to allow to assist the trainer or Observer/Controller (O/ C) in highlighting these significant events during the after action review (AAR) The system is designed to assess warfighter skills, decision-making, and situational awareness. Event/Condition/Action rules are designed by experts for consistent assessment against Doctrine. ViSSA can reduce training and assessment costs by minimizing the burden on the O/C and assisting in orchestrating an effective AAR by providing the rapid replay of significant events, summary statistics, and critical decision points during the exercise. Training for urban operation missions is limited by time, cost, and safety factors. Virtual environment technologies like ViSSA have the potential to provide the Army with a training capability to meet these demands to optimize human performance by enhancing Soldier decision-making skills.

DTIC

Decision Making; Education; Virtual Reality

20050167733 Army War Coll., Carlisle Barracks, PA USA

Human Resource Automation Architecture Validation for a Transforming Army

Devine, Patrick; Mar. 2005; 35 pp.; In English

Report No.(s): AD-A431881; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper will recommend specific steps to transform the disconnected elements of the USA Army Human Resources System. These steps if taken will result in better support to USA Army members while expediting access to commander's key information requirements and decreasing the workload of service providers. These improvements will depend on the creation of an integrated architecture (Network-centric) with one lead agent in charge of developing maintaining and growing the architecture. Other recommendations will simplify users system input requirements. The final recommendation is to establish a cell that monitors users performance and identifies user's that require assistance/training.

DTIC

Human Resources; Automation; Education

20050168267 Mission Research Corp., Albuquerque, NM, USA

Ivory Pic Sof the Z Insulator Stack

Mostrom, M. A.; Hughes, T. P.; Clark, R. E.; Stygar, W. A.; Spielman, R. B.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 460-465; In English; See also 20050168165; Copyright; Avail: Other Sources

The IvoRy code has been modified to enable pulsed-power component design on desktop computers. A front-end based on a commercial CAD package (MICROSTATION) allows graphical creation and editing of conductors and dielectrics. Diagnostics can also be positioned graphically. Multi-segment transmission lines can be attached to each boundary of the simulation region. A mouse-driven post-processor is used to analyse the simulation output. The code has been used to model the water-plastic-vacuum interface in the Z machine. In particular, the effect of grading-ring emission on the potential distribution was calculated and found to be severe. Avoidance of ring emission was the main criterion used to design the vacuum flare in the vicinity of the insulator stack.

Author

Computer Aided Design; Computer Design; Simulation; Diagnosis

20050168269 Tennessee Univ. Space Inst., Tullahoma, TN, USA

Improvements to the Integrated Tiger Series Monte Carlo Radiation Transport Codes

Smith, L. Montgomery; Hochstedler, Reuben D.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 474-479; In English; See also 20050168165

Contract(s)/Grant(s): F40600-94-D-0001; Copyright; Avail: Other Sources

This paper describes two areas in which the usability of the Integrated TIGER Series (ITS) Monte Carlo radiation transport codes has been improved for use in the design and analysis of tests conducted with the DECADE nuclear weapons effects simulator. The first area is in improving the speed of execution. By benchmarking and profiling the member codes of

the ITS on three representative test cases (l-D, 2-D and 3-D geometry), computationally intensive subroutines were identified. The algorithms in these routines were replaced with numerically identical, but more efficient methods and the subroutines recoded in the original FORTRAN 77 higher-level language to accelerate code execution. Timing results of the modified codes indicate that a speedup factor of 2 was achieved in nearly all cases. The second area is in the development of a graphical user interface (GUI) to facilitate parameter input and input file development. A proof-of-concept GUI has been written for use on PC-based DOS/Windows platforms that allows the user to easily define problems for the ITS. A mouse and/or arrow-key driven interface can be used to move through a series of menus for each set of ITS input options, with colored graphics display of the geometric configuration providing visualization for the user. Currently restricted to the XGEN, TIGER and CYLTRAN member codes, this GUI has already proven useful in facilitating the writing of input files and reducing inadvertent errors. Author

Algorithms; Computer Programs; Monte Carlo Method; Radiation Transport

20050169158 NASA Lewis Research Center, Cleveland, OH, USA

CARES/LIFE Software Commercialization

[1995]; 1 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The NASA Lewis Research Center has entered into a letter agreement with BIOSYM Technologies Inc. (now merged with Molecular Simulations Inc. (MSI)). Under this agreement, NASA will provide a developmental copy of the CARES/LIFE computer program to BIOSYM for evaluation. This computer code predicts the time-dependent reliability of a thermomechanically loaded component. BIOSYM will become familiar with CARES/LIFE, provide results of computations useful in validating the code, evaluate it for potential commercialization, and submit suggestions for improvements or extensions to the code or its documentation. If BIOSYM/Molecular Simulations reaches a favorable evaluation of CARES/LIFE, NASA will enter into negotiations for a cooperative agreement with BIOSYM/Molecular Simulations to further develop the code--adding features such as a user-friendly interface and other improvements. This agreement would give BIOSYM intellectual property rights in the modified codes, which they could protect and then commercialize. NASA would provide BIOSYM with the NASA-developed source codes and would agree to cooperate with BIOSYM in further developing the code. In return, NASA would receive certain use rights in the modified CARES/LIFE program. Presently BIOSYM Technologies Inc. has been involved with integration issues concerning its merger with Molecular Simulations Inc., since both companies used to compete in the computational chemistry market, and to some degree, in the materials market. Consequently, evaluation of the CARES/LIFE software is on hold for a month or two while the merger is finalized. Their interest in CARES continues, however, and they expect to get back to the evaluation by early November 1995.

Author

Commercialization; Computer Programs

20050169293 Illinois Univ., Urbana-Champaign, IL, USA

A Fast Multipole Approach to Computing Scattering from an Inhomogeneous Bianisotropic Cylindrical Object Using Beltrami Fields

Shanker, Balasubramaniam; Iian, Sang-Kyun; Michielssen, Eric; Chew, Weng C.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 902-905; In English; See also 20050169243

Contract(s)/Grant(s): F49620-96-1-0025; Copyright; Avail: Other Sources

In recent years, there has been growing interest in the electromagnetic analysis of complex materials. Analysis of scattering from bianisotropic objects is attractive from both practical and intellectual perspectives. Furthermore, tailoring the properties of bianisotropic materials to specific needs is not altogether inconceivable due to recent advances in materials technology. Therefore, in this paper we present an efficient algorithm for analyzing scattering from an inhomogeneous bianisotropic cylinder.

Derived from text

Electromagnetic Properties; Complex Compounds; Algorithms; Scattering

20050169395 Utah Univ., Salt Lake City, UT, USA

Computations of SAR Distributions for Two Anatomically-Based Models of the Human Head Using CAD Files of Commercial Telephones and the Parallelized FDTD Code

Tinniswood, A. D.; Furse, C. M.; Gandhi, O. P.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 982-985; In English; See also 20050169243; Copyright; Avail: Other Sources

The Finite Difference Time Domain (FDTD) method is well suited for the computation of bio-electromagnetic effects and

has become the method of choice for most researchers in this area. There does however remain some limitations on its use. Firstly the FDTD method requires large amounts of memory and computational power. The size of the model is dependent upon both the physical size of the model and its resolution. Higher frequencies of operation require higher resolutions. This can place the solution of some problems outside the capabilities of the technique. Secondly the representation of the problem (i.e. the head and the telephone) can cause some difficulties. Often the telephone has to be represented by a series of boxes which approximate the shape of the actual device. The paper addresses these two problems. The problem size is accommodated by the use of a parallelized version of the FDTD method, which is run on large parallel processing machines such as the IBM SP-2. Additionally a method of inputting data from the Computer Aided Design (CAD) files of the telephone has been developed. These two techniques are used in combination with two head models which have been developed from MRI images of two human subjects. The usefulness of the techniques developed and comparisons of the specific absorption rates (SARs) in the two models is discussed.
Author
Finite Difference Time Domain Method; Parallel Processing (Computers); Computer Aided Design; Finite Difference Theory

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COMPUTER SYSTEMS

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

20050167067 Stanford Univ., Stanford, CA, USA
Hybrid Systems Diagnosis
McIlraith, Sheila; Biswas, Gautam; Clancy, Dan; Gupta, Vineet; [2005]; 14 pp.; In English
Contract(s)/Grant(s): NAG2-1337; No Copyright; Avail: CASI; A03, Hardcopy

This paper reports on an on-going Project to investigate techniques to diagnose complex dynamical systems that are modeled as hybrid systems. In particular, we examine continuous systems with embedded supervisory controllers that experience abrupt, partial or full failure of component devices. We cast the diagnosis problem as a model selection problem. To reduce the space of potential models under consideration, we exploit techniques from qualitative reasoning to conjecture an initial set of qualitative candidate diagnoses, which induce a smaller set of models. We refine these diagnoses using parameter estimation and model fitting techniques. As a motivating case study, we have examined the problem of diagnosing NASA's Sprint AERCam, a small spherical robotic camera unit with 12 thrusters that enable both linear and rotational motion.
Author
Diagnosis; Dynamical Systems; Mathematical Models; Complex Systems

20050167085 Defence Science and Technology Organisation, Edinburgh, Australia
An Application of Queues to Offensive Support Indirect Fire Weapons Systems
Wheeler, S.; January 2005; 27 pp.; In English
Report No.(s): DSTO-TR-1662; DODA-AR-013-296; No Copyright; Avail: Other Sources

This paper presents a general foundation for an analysis of the grade of service provided by delivery systems in the execution of fire missions. Queueing theory is used to develop several queueing models for the delivery systems in field operations. Furthermore, a number of simulations are constructed from these simple queueing models. These simulations extend the concepts introduced earlier with the inclusion of an x and y coordinate reference for both the delivery systems and the targets prosecuted by the delivery systems. In these simulations, three methods for the allocation of targets to delivery systems are examined. Results from simulations are analysed in terms of empirical approximations to stationary distributions and average occupancies.
Author
Fires; Queueing Theory; Weapon Systems; Mathematical Models

20050167154 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Science Alert Demonstration with a Rover Traverse Science Data Analysis System
Castano, R.; Estlin, T.; Gaines, D.; Castano, A.; Bornstein, B.; Anderson, R. C.; Judd, M.; Stough, T.; Wagstaff, K.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Onboard Autonomous Science Investigation System (OASIS) evaluates geologic data gathered by a planetary rover. This analysis is used to prioritize the data for transmission, so that the data with the highest science value is transmitted to Earth. In addition, the onboard analysis results are used to identify science opportunities. A planning and scheduling component of the system enables the rover to take advantage of the identified science opportunity. OASIS is a NASA-funded research project that is currently being tested on the FIDO rover at JPL for the use on future missions.
Derived from text
Data Processing; Data Transmission; Roving Vehicles

20050167214 University of Southern California, Marina del Rey, CA USA
Dynamic Policy Evaluation for Containing Network Attacks (DEFCN)
Neuman, B. C.; Kim, Dongho; Ryutov, Tatyana; Mar. 2005; 84 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-2-0595; DARPA ORDER-K293; Proj-K293
Report No.(s): AD-A431498; AFRL-IF-RS-TR-2005-67; No Copyright; Avail: Defense Technical Information Center (DTIC)
The DARPA funded DEFCN project at USC's Information Sciences Institute has developed an access control framework that is sensitive to network threat conditions. Project members developed the Generic Authorization and Access control Application Programming Interface (GAA-API), a middle-ware API for generic authorization and accesscontrol and have integrated this framework with intrusion detection and response systems. Access policies evaluated by the GAA-API can be conditioned upon network threat conditions communicated by intrusion detection systems, and they also adapt to changes in information sharing policies prompted by the formation of dynamic coalitions. The GAAAPI allows the generation of audit records at the control points in applications. The level of detail of the audit records generated is dependent upon the network threat condition and on authentication characteristics of a request.
DTIC
Computer Networks; Policies; Security

20050167216 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Enabling Intrusion Detection in IPSEC Protected IPV6 Networks Through Secret-Key Sharing
Sweeney, Patrick J.; Mar. 2005; 95 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431510; AFIT/GCE/ENG/05-06; No Copyright; Avail: Defense Technical Information Center (DTIC)
As the Internet Protocol version 6 (IPv6) implementation becomes more widespread, the IP Security (IPSec) features embedded into the next-generation protocol will become more accessible than ever. Though the network-layer encryption provided by IPSec is a boon to data security, its use renders standard network intrusion detection systems (NIDS) useless. The problem of performing intrusion detection on encrypted traffic has been addressed by differing means with each technique requiring one or more static secret keys to be shared with the NIDS beforehand. The problem with this approach is static keying is much less secure than dynamic key generation through the Internet Key Exchange (IKE) protocol. This research creates and evaluates a secret-key sharing framework which allows both the added security of dynamic IPSec key generation through IKE, and intrusion detection capability for a NIDS on the network. Analysis shows that network traffic related to secret-key sharing with the proposed framework can account for up to 58.6% of total traffic in the worst case scenario, though workloads which are arguably more average decrease that traffic to 10-15%. Additionally, actions associated with IKE and secret-key sharing increase CPU utilization on the NIDS up to 20.7%. Results show, at least in limited implementations, a secret-key sharing framework provides robust coverage and is a viable intrusion detection option.
DTIC
Computer Information Security; Detection; Software Development Tools; Warning Systems

20050167226 SRI International Corp., Menlo Park, CA USA
The Genesis of Cyberscience and its Mathematical Models (CYBERSCIENCE)
Dawson, Steven; Feb. 2005; 82 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-C-0087; DARPA ORDER-J799; Proj-IAST
Report No.(s): AD-A431570; AFRL-IF-RS-TR-2005-49; No Copyright; Avail: Defense Technical Information Center (DTIC)
The Cyberscience project has developed a framework for an integrated approach to secure systems development called security co-design. Acknowledging the need to integrate security into the development process from the beginning, but recognizing that security and functionality are different in character, security co-design separates development into security and functional tracks that strongly influence each other. The security co-design methodology aims to account for all critical aspects of development, including requirements capture, implementation, and the construction of an information assurance

case (IAC). By analogy to safety cases, an IAC seeks to establish that the security requirements of the system are met, and to identify specific points of failure to be addressed if certain requirements are not met. The development of a methodology and tool support for the construction of IACs has been the primary focus of the Cyberscience project. This report documents the security co-design methodology, the principles and goals of IAC development, an exploration of tool support for IAC construction, and an examination of possible alternative approaches.
DTIC
Mathematical Models; Security; Software Development Tools

20050167280 National War Coll., Washington, DC USA
Denial and Deception: A Serious Threat to Information Superiority?
Lasley, Jennifer; Apr. 2000; 15 pp.; In English
Report No.(s): AD-A431704; No Copyright; Avail: Defense Technical Information Center (DTIC)

Today's military vision of the future, embodied in the Chairman's Joint Vision documents, paints an impressive picture of the future battlespace where US forces are superior in every dimension largely because of two critical enabling factors: technological innovation and information superiority. Information superiority, in fact, underpins each of the four new concepts of future warfare: dominant maneuver, precision engagement, focused logistics and full-dimensional protection. Achieving information superiority, however, will be difficult, if not impossible, due to a host of issues, the most pernicious of which is the enemy's ability to conduct successful denial and deception (D&D) operations. Foreign actors increasingly are using D&D as an important part of an asymmetric strategy to counter overwhelming US military superiority, and many of the reasons for their success are the result of US vulnerabilities. These include: ignorance of the foreign D&D threat, security negligence that provides foreign actors with a wealth of information vital to their D&D efforts, intentional release of information to foreign governments that compromises US collection assets, and American hubris that discounts the viability of such a threat. The results of these vulnerabilities can range from costly military campaigns, to future surprise, to outright defeat in a worst-case scenario. The Departments of Defense and State, together with the intelligence community, need to address these shortfalls in order to limit future opportunities for foreign D&D exploitation and to ensure information superiority in a JV2010 or 2020 environment.
DTIC
Intelligence; Warfare

20050167315 Grammatech, Inc., Ithaca, NY USA
Static Analysis for Detecting Vulnerabilities in COTS
Gruian, Radu; Teitelbaum, Tim; Jan. 2005; 9 pp.; In English
Contract(s)/Grant(s): N00014-03-C-0502
Report No.(s): AD-A431817; No Copyright; Avail: CASI; A02, Hardcopy

This is the final report of a project to study object code analysis, rewriting, and regeneration; interacting with Univ. of Wisconsin on enhancements to and applications of CodeSurfer/x86 and Weighted Moped; and supporting DOD clients in their evaluation of assurance and understanding tools developed at GrammaTech. This one-year project was a continuation of a two-year effort that involved two CIP/SW MURIs at the University of Wisconsin and Carnegie-Mellon University (CMU) managed by the Office of Naval Research (ONR), and four separately funded GrammaTech projects with similar goals.
DTIC
Commercial Off-the-Shelf Products; Detection; Static Tests; Vulnerability

20050167408 Dolphin Technology, Inc., Rome, NY USA
Security Enhanced Multi-Domain Network Management for Joint Warrior Interoperability Demonstration (JWID)
Marcinkowski, James; Miller, Roger; Mar. 2005; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-01-D-0167-0017; Proj-2183
Report No.(s): AD-A432052; AFRL-IF-RS-TR-2005-86; No Copyright; Avail: Defense Technical Information Center (DTIC)

Today, computer networks are a vital communications tool, central to the day-to-day operations of the facility. To assist administrative personnel in maintaining and monitoring a computer network, commercial network management tools are used that collect data regarding network functionality and availability to assist in recording and visualizing the current state of the network. These tools most commonly use the Simple Network Management Protocol (SNMP) to communicate with all network-attached devices. Often a site will contain several networks, each running at a different security level. Each network must be managed individually due to security regulations which require separation of the networks. Personnel responsible for

multiple networks currently are not able to view the operational status of a specific network without physically sitting at the network management station (NMS) dedicated to that network. Administrators have expressed a need to form a 'network common operational picture' (NCOP) showing the status of all networks in the same view. The Security-Enhanced Multi-Domain Network Management project (SE-MDNM) was established to develop an SNMP proxy to serve as a management boundary device. Such boundary devices are used to connect multiple networks of varying security levels to a single, secure network containing a centralized network management station.
DTIC
Data Transmission; Interoperability; Military Operations; Protocol (Computers); Security

20050167452 Morgan State Univ., Baltimore, MD USA
Tactical Manet Attack Detection Based on Fuzzy Sets Using Agent Communication
Watkins, Damian; Dec. 2004; 3 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-2-0011
Report No.(s): AD-A432121; No Copyright; Avail: Defense Technical Information Center (DTIC)

This study describes a distributed attack detection approach for a tactical MANET using intelligent agents equipped with inference systems based on fuzzy logic. The results produce a prototype intrusion detection system capable of effectively detecting attacks in a tactical MANET with accuracy approaching 95%. The attack recognition system is implemented using stationary intelligent fuzzy agents (SIFA) resident on each node. Agents run autonomously on each node, collect packets from the data stream, extract relevant information, exchange information through light-weight messages, and trigger alerts using the fuzzy inference process.
DTIC
Communication Networks; Fuzzy Sets; Fuzzy Systems; Inference

20050167455 Maryland Univ., College Park, MD USA
Efficient, Fault-Tolerant and Distributed Key Agreement for Arbitrary Deployment in MANETS
Di Crescenzo, Giovanni; Striki, Maria; Dec. 2004; 3 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-2-01-0011
Report No.(s): AD-A432125; No Copyright; Avail: Defense Technical Information Center (DTIC)

Military command and control require that information be communicated to the appropriate groups and only with the utmost security. The environment envisioned by the Objective Force is mobile ad-hoc and consists of a large number of (heterogeneous) resource-constrained nodes deployed in a hostile field of limited bandwidth, unreliable channels, and frequent node failures, where usually there is not infrastructure for communications, and where it must be dynamically generated. The challenge lies in designing secure group communications that can be applied to such dynamic, constrained FCSs. In this work we develop a secure, fault-tolerant and scalable (for increasing number of users) contributory key agreement scheme (KA) for multicast communications. By generating hierarchy, applying improved and more resilient contributory protocols to smaller subsets of nodes, focusing on the exact topology of nodes deployed in the network, and by exploiting the redundancy issued by the topology itself, we successfully meet our objectives. Our protocol - Clustered Local Contributory (CLC) - is secure (against eavesdropping adversaries) and captures the dynamics of subgroups. It is highly fault-tolerant and very efficient in terms of communication and computation overhead. According to the results of the comparative evaluation of CLC and some of the most common contributory protocols in the literature (e.g., GDH.2) we conducted, it appears that CLC presents superior performance in terms of communication, computation and storage overhead incurred to the network in order to secure group communications in MANETs.
DTIC
Agreements; Communication Networks; Computer Systems Design; Deployment; Fault Tolerance; Security

20050167699 Massachusetts Inst. of Tech., Lexington, MA USA
An Annotated Review of Past Papers on Attack Graphs
Lippmann, R. P.; Ingols, K. W.; Mar. 2005; 32 pp.; In English
Contract(s)/Grant(s): F19628-00-C-0002
Report No.(s): AD-A431826; PR-IA-1; ESC-TR-2005-054; No Copyright; Avail: CASI; A03, Hardcopy

This report reviews past research papers that describe how to construct attack graphs, how to use them to improve security of computer networks, and how to use them to analyze alerts from intrusion detection systems. Two commercial systems are described 1, 2, and a summary table compares important characteristics of past research studies. For each study, information

is provided on the number of attacker goals, how graphs are constructed, sizes of networks analyzed, how well the approach scales to larger networks, and the general approach. Although research has made significant progress in the past few years, no system has analyzed networks with more than 20 hosts, and computation for most approaches scales poorly and would be impractical for networks with more than even a few hundred hosts. Current approaches also are limited because many require extensive and difficult-to-obtain details on attacks, many assume that host-to-host reachability information between all hosts is already available, and many produce an attack graph but do not automatically generate recommendations from that graph. Researchers have suggested promising approaches to alleviate some of these limitations, including grouping hosts to improve scaling, using worst-case default values for unknown attack details, and symbolically analyzing attack graphs to generate recommendations that improve security for critical hosts. Future research should explore these and other approaches to develop attack graph construction and analysis algorithms that can be applied to large enterprise networks.
DTIC
Annotations; Computer Networks; Intrusion; Security

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CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

20050167056 Oregon Health and Science Univ., Beaverton, OR, USA
Model-Biased, Data-Driven Adaptive Failure Prediction
Leen, Todd K.; [2004]; 22 pp.; In English
Contract(s)/Grant(s): NCC2-1264; No Copyright; Avail: CASI; A03, Hardcopy

This final report, which contains a research summary and a viewgraph presentation, addresses clustering and data simulation techniques for failure prediction. The researchers applied their techniques to both helicopter gearbox anomaly detection and segmentation of Earth Observing System (EOS) satellite imagery.
CASI
Data Simulation; Scientific Visualization; Failure Analysis; Helicopters; Satellite Imagery; Transmissions (Machine Elements); Image Processing

20050167236 General Dynamics Decision Systems, Scottsdale, AZ USA
Channel Estimation Performance for Zero-Overhead Channel Access in Mobile Sensor Networks
Kleider, John E.; Maa1ou1i, Ghassan; Gifford, Steve; Chuprun, Scott; Sadler, Brian; Dec. 2004; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-2-0011
Report No.(s): AD-A431596; No Copyright; Avail: Defense Technical Information Center (DTIC)

In this work we study the effects of channel estimation/ equalization on the BER performance of RF carrier frequency hopped OFDM (FH-OFDM) when using synchronization information that is embedded directly into the OFDM baseband symbol stream. In sensor networks using CSMA, the acquisition preambles can require a large overhead percentage of the overall message. Embedding synchronization information into the data information stream eliminates this channel access overhead, thus providing potential for zero-time overhead channel access. Superposition (embedding) of the sync information, however, causes interference onto the data information, which must be removed for satisfactory BER performance. Consequently, embedded synchronization interference cancellation (EIC) is utilized, which requires accurate channel state estimation. Using coherent 4QAM- and 16QAM-OFDM modulation, channel estimation and BER performance is evaluated using the COST207 multipath fading channel model. Less than a 1 dB performance difference is found between a preamble and embedded system for short message bursts (\h 1msec) and a burst data rate of greater than 1.6 Mbit/sec. The channel estimation mean square error (MSE) versus pilot symbol overhead is also determined as a function of urban and rural channel environments.
DTIC
Carrier Frequencies; Radio Frequencies

20050167362 Engineer Research and Development Center, Alexandria, VA USA

Orthometric Processing of Very High Spatial Resolution Frame Imagery Using Distributed Techniques

Fischer, R. L.; Ruby, J. G.; Pierson, M. J.; Eichholz, J. C.; Zimmerman, E. B.; Sun, X.; Florence, D.; Dec. 2004; 3 pp.; In English; Original contains color illustrations

Report No.(s): AD-A431959; No Copyright; Avail: Defense Technical Information Center (DTIC)

Very high spatial resolution frame imagery (pixel areas \h\h1.0 m(exp 2) is becoming readily available from a number of government-owned and commercial sensors. These systems have and will be mounted on a variety of rotary and fixed-wing aircraft, and because of their small size, are ideally suited as organic sensors for Unmanned Aerial Vehicle (UAV) platforms. Because of the relatively small ground coverage of these systems, a large number of individual frames must be quickly and accurately georegistered to cover a typical area of interest. In a test conducted at Yuma, AZ during February 2004, a total of 88 frames of stereo imagery with 0.01 m(exp 2) spatial resolution were used to cover approximately 4 km along a roadway. Using a recently developed distributed processing system, the 88 frames were mosaicked and georegistered to meter level accuracy in less than 52 minutes. Incorporating state-of-the art hardware, the same number of frames could be used to cover more than 20 km on the ground, providing a valuable data source to multiple applications including targeting, route reconnaissance, and improvised explosive device (IED) detection.

DTIC

Detection; High Resolution; Image Processing; Imagery; Spatial Resolution

20050167388 McAfee, Inc., Rockville, MD USA

The Cost of Protection Measures in Tactical Networks

Matt, Brian J.; Dec. 2004; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-2-0011

Report No.(s): AD-A432010; No Copyright; Avail: Defense Technical Information Center (DTIC)

The security of the Object Force and Future Combat Systems communication is dependent on the Army research community's ability to solve difficult problems in ad hoc routing security. Solving these problems will require (in part) the development of innovative cryptographic methods for protecting routing messages and other communications in wireless ad hoc networks, including strong, efficient methods for authentication. Traditional methods such as digital signatures have significant performance costs, even so routing security researchers have used them to protect routing control messages. Recently, researchers, focusing mainly on commercial networks, have adopted a number of well known lighter weight cryptographic techniques, such as one-time digital signatures (OTDS) and authentication trees, to construct new techniques for faster routing packet authentication and integrity protection. When are these new techniques the correct approach for protecting tactical networks, networks in which the performance characteristics of the devices and protocols can be quite different from commercial counterparts?

DTIC

Computer Networks; Costs; Protection

20050167442 Army Research Development and Engineering Command, Warren, MI USA

Threat and Battlefield Damage Assessment Using 3D Imaging and Sensor Fusion

Bankowski, E.; Meitzler, T.; Bednarz, D.; Bienkowski, M.; Bryk, D.; Gillis, J.; Jozwiak, R.; Lane, K.; Sohn, E. J.; Vala, J.; Dec. 2004; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A432107; No Copyright; Avail: Defense Technical Information Center (DTIC)

The proposed technology is a three dimensional (3D) and sensor fusion display for threat and battlefield damage assessment (BDA). The 3D auto-stereoscopic display is implemented for Homeland defense applications in combination with an X-ray scanner that will bring attention to packages with potential threats. Sensor fusion will benefit BDA by providing fused visible and infrared (IR) images of combat vehicles that have been damaged or destroyed on the battlefield.

DTIC

Damage Assessment; Imaging Techniques; Multisensor Fusion

20050169226 American Inst. of Aeronautics and Astronautics, Reston, VA, USA

Creating Robots for Space Repairs

Iannotta, Ben; Aerospace America; May 2005; ISSN 0740-722X; Volume 43, No. 5, pp. 36-40; In English; Original contains color illustrations; Copyright; Avail: Other Sources

A team of engineers led by Northrup Grumman Space Technology will spend the next year conducting lab tests to show

that two robots built by JPL in 1999 and 2002 for testing space assembly techniques are worthy of being adapted into a new inspection robot that would scan the exteriors of inhabited spacecraft. Northrup Grumman officials assembled the team of industry, NASA, and academic robotic experts as one element of a corporate strategy for breaking into the human space exploration industry via NASA's new Vision for Space Exploration effort, says Sonya Sepahban, vice president of technology development for Northrup Grumman Space Technology.
Author
Robots; In-Flight Monitoring; Space Maintenance; Biomimetics

20050169240 Kentucky Univ., Lexington, KY, USA
Figure Control of Lightweight Optical Structures
Main, John A.; Song, Haiping; [2005]; 28 pp.; In English
Contract(s)/Grant(s): NCC1-385; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this paper is to demonstrate the use of fuzzy logic controllers in modifying the figure of a piezoceramic bimorph mirror. Non-contact electron actuation technology is used to actively control a bimorph mirror comprised two PZT-5H wafers by varying the electron flux and electron voltages. Due to electron blooming generated by the electron flux, it is difficult to develop an accurate control model for the bimorph mirror through theoretical analysis alone. The non-contact shape control system with electron flux blooming can be approximately described with a heuristic model based on experimental data. Two fuzzy logic feedback controllers are developed to control the shape of the bimorph mirror according to heuristic fuzzy inference rules generated from previous experimental results. Validation of the proposed fuzzy logic controllers is also discussed.
Author
Piezoelectric Ceramics; Fuzzy Systems; Mathematical Models; Control Systems Design; Shape Control; Mirrors

20050169525 Nottingham Univ., UK
Evaluating Automated Feature Extraction Using Expert Opinion
Gibbens, M. J.; Cook, A. C.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In planetary science, image analysis is mostly a manual process, with much investigative work being carried out by the inspection of either hardcopy photographs or digital imagery. However, due to the sheer enormity of the image databases currently being acquired by modern planetary missions (such as the Mars Global Surveyor mission [1]), analysis of the data in its entirety is no longer a practical consideration. In response we are developing automated preliminary image inspection techniques to help manage, manipulate and interpret the presently overwhelming data volume. We have developed and validated methods to autonomously extract scientifically interesting features from planetary image data sets. In particular we discuss a general technique for validating feature extraction methods using a conjunction of multiple expert opinions, gathered from within a range of sub- fields of planetary sciences. To illustrate our techniques we present an application of automated feature extraction to a colour image and present a comparison with expert opinions.
Author
Image Analysis; Pattern Recognition; Planetary Mapping

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20050166928 Arizona Univ., Tucson, AZ, USA
Numerical Modeling of Extensional Necking Instabilities: Application to Ganymede's Grooved Terrain
Bland, M. T.; Showman, A. P.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ganymede s pervasive 5-10 km-wavelength grooves have been suggested to result from a necking instability during an epoch of lithospheric extension, but to date few quantitative studies of groove formation have been performed. We present two-dimensional numerical models of necking instabilities under conditions that are appropriate to Ganymede at the time of groove formation. Preliminary simulations indicate that extensional necking instabilities can occur under a range of conditions, many of which may be relevant to Ganymede. The form of the surface topography produced by these instabilities varies as

a function of the strain rate, amount of extension, initial topographic perturbation, and rheological parameters.
Author
Mathematical Models; Two Dimensional Models; Ganymede; Rheology; Stability; Topography

20050166936 Colorado Univ., Boulder, CO, USA
Convection in Ice I with Composite Newtonian/Non-Newtonian Rheology: Application to the Icy Galilean Satellites
Barr, Amy C.; Pappalardo, Robert T.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923
Contract(s)/Grant(s): NGT5-50337; NCC2-1340; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ice I exhibits a complex rheology at temperature and pressure conditions appropriate for the interiors of the outer ice I shells of Europa, Ganymede, and Callisto. We use numerical methods to determine the conditions required to trigger convection in an ice I shell with a stress-, temperature-, and grain-size-dependent rheology measured in laboratory experiments by Goldsby and Kohlstedt [2001] (henceforth GK2001). Triggering convection from an initially conductive ice shell with a non-Newtonian rheology for ice I requires that a finite-amplitude temperature perturbation be issued to the ice shell [2]. Here, we characterize the amplitude and wavelength of temperature perturbation required to initiate convection in the outer ice I shells of Europa, Ganymede, and Callisto using the GK2001 rheology for a range of ice grain sizes.
Derived from text
Convection; Ice; Icy Satellites; Galilean Satellites; Temperature Dependence; Rheology; Actuators

20050167086 Defence Science and Technology Organisation, Edinburgh, Australia
Approximation of Integrals via Monte Carlo Methods, with an Application to Calculating Radar Detection Probabilities
Weinberg, Graham V.; Kyprianou, Ross; March 2005; 37 pp.; In English
Report No.(s): DSTO-TR-1692; DODA-AR-0 13-341; Copyright; Avail: Other Sources

The approximation of definite integrals using Monte Carlo simulations is the focus of the work presented here. The general methodology of estimation by sampling is introduced, and is applied to the approximation of two special functions of mathematics: the Gamma and Beta functions. A significant application, in the context of radar detection theory, is based upon the work of (Shnidman 1998). The latter considers problems associated with the optimal choice of binary integration parameters. We apply the techniques of Monte Carlo simulation to estimate binary integration detection probabilities.
Author
Monte Carlo Method; Integrals; Radar Detection

20050167244 Army Research Lab., Adelphi, MD USA
Kernel-Based Anomaly Detection in Hyperspectral Imagery
Kwon, Heesung; Nasrabadi, Nasser M.; Dec. 2004; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431620; No Copyright; Avail: Defense Technical Information Center (DTIC)

In this paper we present a nonlinear version of the wellknown anomaly detection method referred to as the RXalgorithm. Extending this algorithm to a feature space associated with the original input space via a certain nonlinear mapping function can provide a nonlinear version of the RX-algorithm. This nonlinear RX-algorithm, referred to as the kernel RX-algorithm, is basically intractable mainly due to the high dimensionality of the feature space produced by the non-linear mapping function. However, in this paper it is shown that the kernel RX-algorithm can easily be implemented by kernelizing it in terms of kernels which implicitly compute dot products in the feature space. Improved performance of the kernel RX-algorithm over the conventional RX-algorithm is shown by testing several hyperspectral imagery for military target and mine detection.
DTIC
Anomalies; Imagery; Kernel Functions

20050167247 Maryland Univ., College Park, MD USA
Self-Evaluation for Video Tracking Systems
Wu, Hao; Zheng, Qinfen; Dec. 2004; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-02-0008
Report No.(s): AD-A431637; No Copyright; Avail: Defense Technical Information Center (DTIC)

In this paper, we present an algorithm for automatic performance evaluation of a video tracking system that does not

require ground-truth data. Such an algorithm can play an important role in automatically determining when the underlying system loses track and needs re-initialization. The algorithm is based on measuring appearance similarity and tracking uncertainty. Several experimental results on vehicle and human tracking are presented. Effectiveness of the evaluation scheme is assessed by comparisons with ground truth. The proposed self evaluation algorithm has been used in an acoustic/video based moving vehicle detection and tracking system.
DTIC
Algorithms; Ground Truth; Video Signals

20050167335 Air Force Research Lab., Kirkland AFB, NM USA
Identification of FIR Wiener Systems With Unknown, Non-Invertible, Polynomial Non-Linearities
Lacy, Seth L.; Bernstein, Dennis S.; Jan. 2003; 9 pp.; In English
Report No.(s): AD-A431898; No Copyright; Avail: Defense Technical Information Center (DTIC)
Wiener systems consist of a linear dynamic system whose output is measured through a static non-linearity. In this paper we study the identification of single-input single-output Wiener systems with finite impulse response dynamics, and polynomial output non-linearities. Using multi-index notation, we solve a least squares problem to estimate products of the coefficients of the non-linearity and the impulse response of the linear system. We then consider four methods for extracting the coefficients of the non-linearity and impulse response: direct algebraic solution, singular value decomposition, multi-dimensional singular value decomposition and prediction error optimization.
DTIC
Far Infrared Radiation; Inversions; Nonlinearity; Polynomials

20050167387 Naval Surface Warfare Center, Dahlgren, VA USA
Application of the Lambert Problem to Inverse-Square Gravity
Sofair, Isaac; Dec. 2003; 99 pp.; In English
Report No.(s): AD-A432000; NSWCDD/TR-03/81; No Copyright; Avail: CASI; A05, Hardcopy
The Lambert Problem can be solved by employing an iterative procedure that utilizes the Newton-Raphson method. Three candidates for the iteration variable are considered. Equations for an elliptical trajectory in terms of each of the iteration variables are derived. Equations for hyperbolic and parabolic trajectories are then deduced, and it is demonstrated how the type of trajectory can be determined from the given parameters.
DTIC
Ellipses; Gravitation; Hyperbolas; Orbital Mechanics; Parabolas; Reentry Vehicles; Trajectories

20050167406 Cornell Univ., Ithaca, NY USA
Adaptive Probabilistic Protocols for Advanced Networks/Assuring the Integrity of Highly Decentralized Communications Systems
Mar. 2005; 56 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-99-1-0532; DARPA ORDER H533; Proj-H533
Report No.(s): AD-A432049; AFRL-IF-RS-TR-2005-87; No Copyright; Avail: Defense Technical Information Center (DTIC)
The project consisted of two merged DARPA-funded efforts exploring related but different topics. The first was a project to develop a new kind of probabilistically scalable, stable, communications protocols and to exploit these protocols in building a new kind of scalable software infrastructure for large, dynamic, mission-critical networked applications. Examples include networks exploited to support massive data centers (such as are used by the NSA and CIA, by a great variety of military applications, and by a new generation of lightweight sensor networks). The second was a project to elaborate on a new 'compositional' method for protocol design and implementation, in which small microprotocols are combined to obtain a protocol customized to the needs of a specific setting, under control of an automated theorem proving system that can guarantee correctness of the resulting specialized protocol, subject to the validity of assumptions that guide the process. The second was a project to elaborate on a new 'compositional' method for protocol design and implementation, in which small microprotocols are combined to obtain a protocol customized to the needs of a specific setting, under control of an automated theorem proving system that can guarantee correctness of the resulting specialized protocol, subject to the validity of assumptions that guide the process.
DTIC
Adaptation; Networks; Protocol (Computers); Telecommunication

20050167698 Maryland Univ., College Park, MD USA

Dimensionality Estimation in Hyperspectral Imagery Using Minimum Description Length

Broadwater, Joshua B.; Meth, Reuven; Chellappa, Rama; Dec. 2004; 3 pp.; In English; Original contains color illustrations Report No.(s): AD-A431643; No Copyright; Avail: Defense Technical Information Center (DTIC)

Numerous algorithms have been developed for hyperspectral automatic target recognition (ATR) applications. Many of these algorithms require estimation of a background subspace. The estimation of the background subspace has been addressed using multiple methods. but most of these methods assume a-priori knowledge of the background dimensionality. In order to automate the estimation of the background subspace. we present an algorithm based on minimum description length (MDL) that can identify the background dimension. Results show that the MDL criterion estimates the proper dimension of the background for ATR applications.

DTIC

Algorithms; Detection; Imagery; Target Acquisition; Target Recognition

20050169248 Dassault Electronique, Paris, France

Anisotropic Perfectly Matched Layer-Absorbing Medium in Finite Element Time Domain Method for Maxwell's Equations

Mathis, Vincent; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 680-683; In English; See also 20050169243; Copyright; Avail: Other Sources

We have presented here how to adapt the PML's techniques to finite elements in time domain. The major point is the approximation of the material coefficients in order to suppress the omega-dependance in the conductivity Sigma. After that, the implementation in a calculus code is quite straight-forward.

Derived from text

Maxwell Equation; Time Domain Analysis; Anisotropy; Finite Element Method; Perfectly Matched Layers

20050169253 Lockheed Martin Missiles and Space, Sunnyvale, CA, USA

The Lunar Prospector Helix Antenna

Loane, Joseph T.; Tanner, David R.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 860-861; In English; See also 20050169243; Copyright; Avail: Other Sources

Fourier analysis can be used to model an infinitely long helix antenna embedded in a layered cylindrical geometry. The source is expanded in cylindrical harmonics over the spectrum (v, 13), in which each component has behavior exp(jv(phi)-j(Beta)z) in cylindrical coordinates. Due to periodicity in phi, v is an integer. A current on a helical tape is expressed as a sum over all n of (v(sub n), Beta(sub n))current sheets, and so produces a sum of (v(sub n), Beta(sub n)) field harmonics.

Author

Fourier Analysis; Lunar Prospector; Cylindrical Coordinates; Integers; Antenna Arrays

20050169257 Arizona Univ., Tucson, AZ, USA

Stabilization of Time Domain Solutions of EFIE Based on Partial Element Equivalent Circuit Models

Pinello, William; Ruehli, Albert; Cangellaris, Andreas; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 996-969; In English; See also 20050169243; Copyright; Avail: Other Sources

Progress is being made towards the stable integration of time-domain electromagnetic field integral equations. Many different techniques have been proposed recently for overcoming the well known 'late time' instability problem associated with the numerical integration of these equations. Recently, it was observed that the instabilities could be either due to the discretization of the integral equation or the numerical integration scheme. In this paper, we present a stable time domain solution technique which is based on recent advances in the understanding of the sources of the late instability problem. The proposed technique takes advantage of the distributed equivalent circuit representation of the electromagnetic problem effected through the use of Partial Element Equivalent Circuit (PEEC) models for the numerical approximation of the integral equation.

Author

Stability; Time Domain Analysis; Equivalent Circuits; Integral Equations; Electromagnetic Fields

20050169258 Tel-Aviv Univ., Ramat-Aviv, Tel-Aviv, Israel

Absorbing Boundary Conditions in the Context of the Hybrid Ray-FDTD Moving Window Solution

Pemper, Y.; Fidel, B.; Heyman, E.; Kastner, R.; Ziolkowski, R. W.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1006-1009; In English; See also 20050169243; Copyright; Avail: Other Sources

The hybrid ray-FDTD moving window scheme has been presented recently for the propagation of electromagnetic pulses in homogeneous and inhomogeneous media [1]. This method has been cast in the Lagrange formulation, where the field equations have been transformed into a moving frame. Compared with the stationary formulation, the moving frame equations exhibit different characteristics in terms of both numerical dispersion and absorbing boundary conditions. It has been shown [1] that the wavepacket-tracking Lagrangian formulation reduces the effects of numerical dispersion compared with the stationary frame. In this paper, the moving frame formulation is extended to 3D and applied to track a propagating wavepacket (pulsed beam). We derive both the numerical dispersion relations and the stability conditions using a unified approach. Boundary conditions for the moving frame scheme are derived by diagonalizing the field equations, identifying the backward propagating and stationary eigenfunctions as the basic two independent unknowns and imposing numerical absorption or specification upon them.
Derived from text
Finite Difference Time Domain Method; Electromagnetic Pulses; Lagrangian Function; Boundary Conditions; Wave Packets; Wave Dispersion

20050169274 City Univ. of Hong Kong, Kowloon, Hong Kong
A PVM Based Parallel Sparse Matrix Equation Solver to Speed up Computation of MEI Method
Chen, R. M. M.; Niu, G. F.; Liu, Y. W.; Mei, K. K.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 660-663; In English; See also 20050169243; Copyright; Avail: Other Sources

The conventional method of moment is capable of solving wave scattering problems of circumferential dimension of 100 wavelength. Using MEI (Measured Equation of Invariance) method [1] the problem of a cylinder of 10,000 wavelength is within the storage capacity of a personal computer (PC) nowadays. The MEI method requires the generation of a large sparse matrix for the boundary equations. The MEI matrix coefficients are computed from numerical integrations of the metrons. Interpolation and extrapolation technique [2] can be employed to save integration time. This means the solution of the sparse matrix equation of the MEI method to be the bottleneck of computation. Since the MEI equation matrix is a sparse matrix with nonzero diagonal elements and very small number of nondiagonal elements at the upper right and lower left corners for 2 dimensional problems, a matrix decomposition algorithm derived by the first author [3] can be employed for the purpose of decomposition and parallel computing.
Derived from text
Computation; Wave Scattering; Coefficients; Boundaries; Matrices (Mathematics)

20050169279 Southeast Univ., Nanjing, China
Appropriate Change Technique (ACT) for Phased Array Antennas
Jiang, Wei; Yang, Qi-He; Guo, Yan-Chang; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 726-729; In English; See also 20050169243; Copyright; Avail: Other Sources

Appropriate Change Technique (ACT) is applied to phased array antenna in this paper, Its concept is evolved from Appropriate Random Technique (ART) for amplitude quantization. Now we use ACT m other subjects. Studies show that ACT can provide significant performance improvement in many applications.
Author
Antenna Arrays; Statistical Distributions

20050169302 Universidad de Cantabria, Santander, Spain
An Algorithm Based on the Matrix Pencil Method for 2D Angles of Arrival and Polarization Estimation
FernandezdelRio, Jose Enrique; FelipeCatedra-Perez, Manual; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1020-1023; In English; See also 20050169243; Copyright; Avail: Other Sources

In this communication an L-shaped array is used to estimate azimuth-elevation angles and also polarization of multiple narrow-band plane waves. The angles of arrival are estimated by means of the Matrix Pencil Method and afterwards a least squares problem is stated to solve for the polarization.
Author
Algorithms; Matrix Methods; Estimating; Polarization; Plane Waves; Elevation Angle

20050169310 Georgia Inst. of Tech., Atlanta, GA, USA
RCS Prediction Comparison Between Physical Optics and Moment Method Techniques
Sidhu, J. S.; Kuster, E. J.; Friederich, P. G.; Hopkins, E. J.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1148-1151; In English; See also 20050169243; Copyright; Avail: Other Sources

The analysis of complex scattering objects can be accomplished using various numerical methods. Two complementary techniques that have found great success in many classes of electromagnetic applications are the moment method(MM) and the physical optics techniques. This paper will present results of RCS predictions using Riverside Research Institute modified moment method code 'IBC3D' and Georgia Tech Research Institute developed physical optics code 'GTS'. Some of the predicted results will also be compared to the measured results.
Derived from text
Numerical Analysis; Scattering; Method of Moments; Physical Optics

20050169317 Massachusetts Univ., Amherst, MA, USA
Analysis of Nonperiodic Perturbations to Infinite Periodic Printed Arrays
Pozar, David M.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1252-1255; In English; See also 20050169243; Copyright; Avail: Other Sources

While the theory and application of full-wave solutions for infinite periodic phased arrays and frequency selective surfaces is well-known and extensive, the fact that such analyses rely on Floquet's theorem for periodic structures prevents the direct treatment of non-periodic variations to such problems. Such non-periodicities can be categorized as either nonperiodic array excitations and/or loadings, or nonperiodic variations in the geometry of the array. Some examples of nonperiodic infinite array problems include the following: An infinite array with one (or a few) elements short-circuited. An infinite array with one (or a few) elements missing. An infinite array with a non-periodic excitation at one (or a few) elements. An infinite array with one (or a few) extra elements. and Coupling between and infinite array antenna and a separate nearby element.
Derived from text
Perturbation; Infinity; Antenna Arrays; Periodic Variations

20050169321 McMaster Univ., Hamilton, Ontario, Canada
High Precision Differentiation of FEM Approximate Solutions
Omeragic, Dzevat; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1306-1309; In English; See also 20050169243; Copyright; Avail: Other Sources

This paper presents the high precision differentiation method based on Green's second identity. The technique is compared to several recent methods based on local smoothing and superconvergent patch recovery (SPR). The methodology is extended to 3D problems described by scalar Poisson equation, using the sphere as a base domain for extraction of derivatives. Analytic verification and error sensitivity analysis is performed. The alternative approach employing fundamental solutions to the Dirichlet problem in place of Green's functions is also outlined. The technique is suited to postprocessing of finite element solutions, or may be applied to other numerical approximate solutions.
Author
Finite Element Method; Approximation; Numerical Analysis; Precision; Operators (Mathematics)

20050169322 McGill Univ., Montreal, Quebec, Canada
Hierarchal Triangular Edge Elements Using Orthogonal Polynomials
Carrie, C.; Webb, J. P.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1310-1313; In English; See also 20050169243; Copyright; Avail: Other Sources

Edge elements are vector finite elements that have degrees of freedom associated with their edges. Unlike nodal elements, they impose continuity only on the tangential component of the vector field, allowing the normal component to be discontinuous from one element to the next. They have been widely used for representing the electric or magnetic field in the computational analysis of electromagnetic wave problems, having distinct advantages over their nodal counterparts [1].
Derived from text
Polynomials; Magnetic Fields; Electric Fields; Finite Element Method; Analysis (Mathematics)

20050169323 Victoria Univ., British Columbia, Canada
Some Thoughts on the Relationship between Finite Elements, Finite Differences and TLM
Hoefer, Wolfgang J. R.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1314-1317; In English; See also 20050169243; Copyright; Avail: Other Sources

Peter Silvester has pioneered the application of Finite Element methods in electromagnetics. While this has been a strong focus of his work, he always placed considerable emphasis on the greater picture in order to avoid the inherent limitations of

specialization and to preserve a clear view of the larger context of field modeling. It is in this spirit that this contribution to the memorial session for Peter Silvester has been written. It demonstrates in simple terms that Finite Element, Finite Difference and Transmission Line Matrix (TLM) models, approaches so very different at first glance, can lead to identical discrete algorithms for field computation under certain conditions.
Author
Finite Difference Theory; Finite Element Method; Transmission Lines; Electromagnetism

20050169344 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Error Estimation and h-Adaptivity for Optimal Finite Element Analysis
Cwik, Tom; Lou, John; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 664-667; In English; See also 20050169243; Copyright; Avail: Other Sources

The objective of adaptive meshing and automatic error control in finite element analysis is to eliminate the need for the application engineer from re-meshing and re-running design simulations to verify numerical accuracy. The user should only need to enter the component geometry and a coarse finite element mesh. The software will then autonomously and adaptively refine this mesh where needed, reducing the error in the fields to a user prescribed value. The ideal end result of the simulation is a measurable quantity (e.g. scattered field, input impedance), calculated to a prescribed error, in less time and less machine memory than if the user applied typical uniform mesh refinement by hand. It would also allow for the simulation of larger objects since an optimal mesh is created.
Derived from text
Error Analysis; Automatic Control; Computational Grids; Grid Refinement (Mathematics); Grid Generation (Mathematics)

20050169367 Tel-Aviv Univ., Ramat-Aviv, Tel-Aviv, Israel
A Wavelet Approach to Effective Modal Analysis of Complex Lamination
Steinberg, Ben Zion; McCoy, John J.; Mirotznik, Mark; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1096-1099; In English; See also 20050169243; Copyright; Avail: Other Sources

Sturm-Liouville equations and eigenfunctions/eigenvalues problems are of the most fundamental tools in mathematical physics with applications pertaining to statics (electromagnetics or mechanics), theory of wave propagation, sound and vibration, quantum mechanics, and more. The eigenvalues of a statistical or dynamical problem and the associated eigenfunctions (or modes) convey indispensable information about the physics of the problem and constitute a solid basis for a plethora of analytical and computational techniques for brevity termed here modal analysis such as modes expansion, characteristic Green function procedure (resolvent), and alternative wavefield representations, to name a few. The efficacy of modal analysis, however, critically depends on ones ability to predict the specific mode shapes and the associated eigenvalues. Let L(q, omega) be a linear operator of the Sturm-Liouville type, with q(x) representing the system heterogeneity and omega a parameter. A boundary value problem is expressed formally by the equation given in this paper.
Derived from text
Laminates; Quantum Mechanics; Sturm-Liouville Theory; Wavelet Analysis; Mode (Statistics); Operators (Mathematics)

20050169372 Illinois Univ., Urbana, IL, USA
Application of the FMM Technique to Elastic Wave Surface Integral Equations,
Chen, Y. H.; Chew, W. C.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 780-783; In English; See also 20050169243; Copyright; Avail: Other Sources

The elastic wave (beam) scattering from a solid-solid interface is of great interest to a wide range of disciplines such as geophysical exploration, nondestructive evaluation, mechanical design, etc. Since elastic waves are characterized by both displacement fields and stress fields which propagate and cover large spatial domains in terms of the wavelength, a large number of unknowns are often involved in the numerical modeling. For large problems, iterative methods such as conjugate gradient (CG) methods are preferred over direct methods. The major computational cost of an iterative method lies in the matrix-vector multiplications. In a standard dense matrix boundary element method (BEM) [1-2], the number of floating-point operations (FPO) of a matrix-vector multiplication is O(N2), where N is the number of unknowns involved. The memory requirement is also of O(N2). Iterative methods are superior to direct methods when the number of iterations required for convergence is small, and when the number of right-hand sides is small. However, when N is big (unfortunately this is often the case), the dense matrix methods become prohibitively slow and impractical.
Derived from text
Elastic Waves; Floating Point Arithmetic; Conjugate Gradient Method; Boundary Element Method; Integral Equations

20050169375 Illinois Univ., Chicago, IL, USA

Double-Vector Integral Equation Method for Antenna Interaction with Photonic Band-Gap Materials

Yang, Hung-Yu David; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 792-795; In English; See also 20050169243; Copyright; Avail: Other Sources

This paper describes a double vector-integral-equation (DOVIE) method for the modeling of antennas on photonic band-gap (PBG) materials. The proposed computational method deals with radiating-elements interacting with periodic structures. The method of solution involves two stages of vector integral equations. The first integral equation formulation is to find the Green's function for a PBG structure. A spectral-domain moment-method is applied to the second vector integral-equation to determine the fields or currents on the antennas and the associated parameters of interest. A microstrip dipole on a PBG substrate is used to highlight the proposed numerical method.

Author

Integral Equations; Energy Gaps (Solid State); Green's Functions

20050169385 National Inst. of Standards and Technology, Gaithersburg, MD, USA

Integral Equations for Scattering by a Particle in a Layer

Marx, Egon; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 878-881; In English; See also 20050169243; Copyright; Avail: Other Sources

In applications such as the alignment of layers in an integrated circuit or the application of a coating to a surface we may need to determine the light scattered by a dielectric or conducting particle of size comparable to the wavelength in a dielectric layer. We apply the method of the single integral equation to solve this problem and find that the minimum number of required unknown surface fields depends on the geometrical configuration of the system. This method, originally applied to gratings, involves the definition of auxiliary fields that coincide with physical fields in one region, obey the same equations everywhere, obey the radiation condition, and satisfy certain boundary conditions involving jumps that are the unknown surface functions in the integral equations. We have applied this method to a number of two-dimensional and three-dimensional configurations, and here we apply it to particles in layers. We find that for certain configurations the number of unknowns exceeds the number of boundaries. We also estimate the memory requirements for such a three-dimensional problem.

Author

Integral Equations; Scattering; Layers; Coating

20050169399 Hong Kong Polytechnic, Hong Kong

An Enhanced 2D-FDTD Solver for Analyzing of Guided Wave Structures

Tong, Ming-Sze; Chen, Yin-Chao; Mittra, Raj; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1002-1005; In English; See also 20050169243; Copyright; Avail: Other Sources

Recently, an equivalent two-dimensional Finite Difference Time Domain (2D-FDTD) method has been introduced by Xiao and Vahldieck [1], which is applied in conjunction with a modified Courant stability condition [2], for efficiently analyzing guided-wave structures over a broad band of frequencies. In this paper, we present an enhancement of the above algorithm that incorporates various advanced techniques, including the unsplit anisotropic perfectly matched layer (PML) [3] type of absorbing boundary condition (ABC), digital signal processing windowing (DSPW) technique, and the discrete Fourier transform (DFT) for field plot extraction. The use of the enhanced version of FDTD can lead to significant time and memory savings without a sacrifice of the accuracy of the results. The application of the enhanced, equivalent 2D-FDTD analysis is illustrated by analyzing the propagation characteristics and field distributions in an open microstrip line.

Derived from text

Finite Difference Time Domain Method; Broadband; Signal Processing; Discrete Functions; Fourier Transformation

20050169404 Manitoba Univ., Winnipeg, Manitoba, Canada

Stabilizing a Single Integral Equation for Transverse Electric Wave Scattering by Dielectric Cylinders

Swatek, D. R.; Ciric, I. R.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 906-909; In English; See also 20050169243; Copyright; Avail: Other Sources

The problem of wave scattering by homogeneous dielectric obstacles can be formulated by using a single integral equation (SIE) in terms of only one unknown surface density. Such a formulation assumes half the number of unknown entities required by the more common coupled surface integral equations and thus yields increased computational efficiency as demonstrated in. However, SIEs formulated exclusively in terms of either electric or magnetic surface current suffer from non-uniqueness at eigen frequencies of the associated interior problem. A method of stabilizing the SIE, by employing a

combination of surface electric and magnetic current defined in terms of a single unknown density, has been suggested in. The first numerical implementation of the combined source SIE formulation was presented in for the problem of transverse magnetic (TM) waves scattered by a homogeneous dielectric circular cylinder. In this paper, a combined source formulation of the SIE is derived for the problem of transverse electric (TE) waves scattered by a system of homogeneous multiply-connected dielectric cylinders. The effectiveness of the method is demonstrated by numerical example. Particular attention is paid to the selection of' the assumed ratio of electric current to magnetic current.
Author
Integral Equations; Wave Scattering; Electric Current; Dielectrics; Circular Cylinders; Stabilization

20050169406 Nanyang Technological Univ., Singapore
An Adaptive Wavelet Transform for Solutions of Electromagnetic Integral Equations
Xiang, Zhonggui; Lu, Yilong; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1104-1107; In English; See also 20050169243; Copyright; Avail: Other Sources

A multiresolution study is proposed for effective solutions of electromagnetic integral equations. The circular wavelet matrix is developed by a fast iterative algorithm from the conventional multiresolution analysis of L(sup 2)(R). Sparse matrix equations can be obtained by using the proposed wavelet transform method. The so-called 'edge effect' and exhaustive wavelet integrations in the wavelet expansion method are avoided. An adaptive discretization scheme is proposed and found more effective than the conventional equal-space discretization scheme. For large-size EM problems whose integral boundaries are characterized by a variety of radii of curvatures ranging from several wavelengths to a small level-scale compared with the wavelength the proposed method shows a obvious advantage over other traditional methods. Numerical results are given to show the validity and effectiveness of the method.
Author
Wavelet Analysis; Integral Equations; Electromagnetism

20050169411 Rutherford Appleton Lab., Chilton, UK
RCS Computation with Paraxial Methods
Levy, M. F.; Borsboom, P-P; Zaporozhets, A. A.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1152-1155; In English; See also 20050169243; Copyright; Avail: Other Sources

Parabolic equation (PE) techniques are based on a paraxial approximation of the wave equation. The resulting parabolic partial differential equation (for scalar problems) or coupled parabolic equations (for vector problems) are solved by marching techniques, with substantial computational advantages. These paraxial methods have recently been applied to scattering problems [1,2,3].
Derived from text
Parabolic Differential Equations; Computation; Wave Equations; Approximation; Partial Differential Equations

20050169426 Michigan Univ., Ann Arbor, MI, USA
Hybrid Finite Element Methods for Conformal Antenna Simulations
Volakis, Jonn L.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1318-1321; In English; See also 20050169243; Copyright; Avail: Other Sources

Since the first publication of the paper[l] by Silvester in 1969, the finite element method has enjoyed a strong interest for electromagnetic analysis. In fact, we can safely state that over the past 10 years, the greatest progress in computational electromagnetics has been on the development and application of partial differential equation(PDE) methods such as the finite difference-time domain and finite element (FEM) methods[2, 3], including hybridizations of these with integral equation and high frequency techniques[4]. The major reasons for the increasing reliance on PDE methods stem from their inherent geometrical adaptability, low O(N) memory demand and their capability to model heterogeneous (isotropic or anisotropic) geometries. These attributes are essential in developing general-purpose codes for electromagnetic analysis/design, including antenna design and characterization.
Derived from text
Finite Element Method; Computational Electromagnetics; Integral Equations; Adaptation; Finite Difference Time Domain Method

20050169428 Georgia Inst. of Tech., Atlanta, GA, USA

A Guided Tour of Interpolatory Vector Basis Functions

Graglia, Robert D.; Wilton, Donald R.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1322-1325; In English; See also 20050169243

Contract(s)/Grant(s): AN9938; NRC-07/96.01664; NSF ECS-92-57927; Copyright; Avail: Other Sources

Fully interpolatory higher-order vector basis functions of the Nedelec variety were recently defined in a unified manner for the most common element shapes [1]. These functions include the curl-conforming type typically used to solve the vector Helmholtz (curl-curl) equation and the divergence-conforming functions usually employed to deal with the electric-field integral equation. Both classes of vector basis function are conveniently expressed in terms of Silvester-Lagrange polynomials similar in form to those used to define scalar interpolation functions in multiple dimensions. The construction process offers a procedure for generating vector basis functions that is as systematic as the almost universal description of scalar interpolation functions, the widespread adoption of which is due in large part to the contributions and publications of P. P. Silvester. The brief discussion included below suggests how the Silvester-Lagrange polynomials are used to construct higher-order elements for triangles. The presentation will review the construction of these functions, and use pictures to illustrate the functions, their interpolation points within common element shapes, and the indexing scheme identifying a specific basis function.

Derived from text

Interpolation; Integral Equations; Electric Fields; Polynomials; Scalars

20050169430 Centre National de la Recherche Scientifique, Saint Martin d'Heres, France

2D and 3D Finite Element Modeling of Electrical Machines

Sabonnadiere, J-C.; Foggia, A.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1326-1329; In English; See also 20050169243; Copyright; Avail: Other Sources

Finite Element Solution of Maxwell's Equations are presently well established and many Laboratories and Industries use these techniques to design Electrical Machines. When these techniques are coupled with electrical circuits, the machine may be investigated as well as in an experimental bench. Such experiments as transient analysis, frequency response, that lead to an accurate and complete model, may then be simulated. At the end of the machine, the electromagnetic phenomena that develop around the windings are essentially 3D and no significant approximation may be made in order to compute the eddy currents that develop at the end of the laminations. This specific problem is very important since extra Joule losses are generated that increase with time and reduce the life time of the machine. A specific 3D formulation is then necessary to compute these currents. In this paper, the authors will present some examples of analysis of Electrical Machines in 2D and 3D approximations.

Author

Maxwell Equation; Finite Element Method; Transient Response; Frequency Response; Eddy Currents; Winding

20050169437 Pennsylvania State Univ., University Park, PA, USA

A Review of Some Recent Advances in Perfectly-Matched Absorbers for Mesh Truncation in FEM

Mittra, Raj; Kuzuoglu, Mustafa; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1302-1305; In English; See also 20050169243; Copyright; Avail: Other Sources

In the finite element modeling of electromagnetic radiation and/or scattering problems, the computational domain is usually truncated by an artificial boundary over which suitable absorbing boundary conditions (ABCs) are imposed. An alternative approach to mesh truncation, which was recently introduced by Berenger for FDTD implementation [1], employs an anisotropic layer of material called perfectly matched layer (PML) at the outer boundary, that is designed to absorb plane waves of arbitrary frequency and incident angles. Although the PML has been introduced in FDTD applications, it can also be used in FEM modeling. An important result obtained by Sacks et al. [2], is the realization of the PML as an anisotropic layer with suitably-defined permittivity and permeability tensors. Some recent advances in perfectly-matched absorbers have been the introduction of conformal PMLs [3,4] and causal PMLs [5] for FEM mesh truncation in frequency domain applications. The principal objective of conformal PMLs is the minimization of the white space (buffer region) in radiation and/or scattering problems. This goal can be achieved by designing a PML that surrounds the scatterer in a way such that it is nearly equidistant from the object. It is shown that the PML can be brought to a very close proximity of the scatterer, and that the scattered field can be effectively absorbed by the layer with a proper choice of its constitutive parameters. Although the PMLs are artificial anisotropic media introduced primarily for the purpose of mesh truncation in finite methods, it is necessary to investigate the dispersion relations satisfied by the constitutive parameters of this medium to ensure that they satisfy the causality conditions. Recently, causal PMLs have been introduced in [5], where the complex permittivity and permeability matrices have been shown to satisfy the Kramers-Kronig relationships [6]. The causal PML has been used in the

FDTD applications [7] and improved performance has been reported for low frequencies, in comparison to those derived by using the conventional non-causal PMLs. Recently, an extension of the causal/conformal PML has been proposed for Finite Element Time Domain (FETD) applications [8].
Derived from text
Finite Element Method; Perfectly Matched Layers; Electromagnetic Radiation; Scattering; Finite Difference Time Domain Method; Anisotropic Media; Boundary Conditions

20050169515 Shemakha Astrophysical Observatory, Azerbaijan, USSR
Searching for Faint Absorption Bands in Vestoid Reflectance Spectra by Means of Optimal Smoothing Algorithm
Golubeva, L.; Shestopalov, D.; McFadden, L.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Reflectance spectra of the vestoids are quite suitable for testing the smoothing algorithm. The vestoid spectra obtained within the framework of SMASS1 have a good resolution, approximately 0.1 nm per channel. Interpretation based on the properties of the absorption bands near 900 and 1900 nm leads to relatively simple mineral composition of asteroid surfaces. On the whole the vestoid surface material is orthopyroxenes and, probably, small portion of olivines (so that opx/ol much greater than 1). Howardites, eucrites and diogenites (HED) are good analogues of the vestoid surfaces. And, last but not least, that pyroxene spectra are well investigated in the visible range.
Derived from text
Absorption Spectra; Algorithms; Data Smoothing; Asteroids; Spectral Reflectance; Reflectance

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STATISTICS AND PROBABILITY

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

20050166405 Pacific Northwest National Lab., Richland, WA, USA
S-PLUS Library For Nonlinear Bayesian Regression Analysis
Heasler, P. G.; Anerson, K. K.; Hylden, J. L.; Sep. 2002; 62 pp.; In English
Report No.(s): DE2004-15003539; PPNL-14051; No Copyright; Avail: Department of Energy Information Bridge

This document describes a library of Splus functions used for nonlinear Bayesian regression in general and IR estimation in particular. This library has been developed to solve a general class of problems described by the nonlinear regression model: Y = F (beta,data)+ E where Y represents a vector of measurements, and F(beta,data) represents a Splus function that has been constructed to describe the measurements. The function F(beta,data) depends upon beta, a vector of parameters to be estimated, while data$ is an Splus object containing any other information needed by the model. The errors, E, are assumed to be independent, normal, unbiased and to have known standard deviations of stdev(E) = sd.E. The components in beta are split into two groups; estimation parameters and nuisance parameters. The Bayesian prior on the estimation parameters will generally be non-informative, while the prior on the nuisance parameters will be constructed to reflect the information we have about them. We hope an extended beta distribution is general enough to adequately represent the information we have on them. While we expect these functions to be improved and revised, this library is mature enough to be used without major modification.
NTIS
Bayes Theorem; Nonlinearity; Regression Analysis

20050167052 Stanford Univ., Stanford, CA, USA
Monitoring a Complex Physical System using a Hybrid Dynamic Bayes Net
Lerner, Uri; Moses, Brooks; Scott, Maricia; McIlraith, Sheila; Keller, Daphne; [2005]; 10 pp.; In English
Contract(s)/Grant(s): N00014-00-1-0637; N00014-99-1-0464; NAG2-1337; No Copyright; Avail: CASI; A02, Hardcopy

The Reverse Water Gas Shift system (RWGS) is a complex physical system designed to produce oxygen from the carbon dioxide atmosphere on Mars. If sent to Mars, it would operate without human supervision, thus requiring a reliable automated system for monitoring and control. The RWGS presents many challenges typical of real-world systems, including: noisy and biased sensors, nonlinear behavior, effects that are manifested over different time granularities, and unobservability of many important quantities. In this paper we model the RWGS using a hybrid (discrete/continuous) Dynamic Bayesian Network (DBN), where the state at each time slice contains 33 discrete and 184 continuous variables. We show how the system state

can be tracked using probabilistic inference over the model. We discuss how to deal with the various challenges presented by the RWGS, providing a suite of techniques that are likely to be useful in a wide range of applications. In particular, we describe a general framework for dealing with nonlinear behavior using numerical integration techniques, extending the successful Unscented Filter. We also show how to use a fixed-point computation to deal with effects that develop at different time scales, specifically rapid changes occuring during slowly changing processes. We test our model using real data collected from the RWGS, demonstrating the feasibility of hybrid DBNs for monitoring complex real-world physical systems.
Author
Bayes Theorem; Numerical Integration; Mathematical Models; Complex Systems; Discretization (Mathematics); Dynamical Systems

20050167054 Stanford Univ., Stanford, CA, USA
Diagnosing Hybrid Systems: a Bayesian Model Selection Approach
McIlraith, Sheila A.; January 2005; 7 pp.; In English
Contract(s)/Grant(s): NAG2-1337; No Copyright; Avail: CASI; A02, Hardcopy

In this paper we examine the problem of monitoring and diagnosing noisy complex dynamical systems that are modeled as hybrid systems-models of continuous behavior, interleaved by discrete transitions. In particular, we examine continuous systems with embedded supervisory controllers that experience abrupt, partial or full failure of component devices. Building on our previous work in this area (MBCG99;MBCG00), our specific focus in this paper ins on the mathematical formulation of the hybrid monitoring and diagnosis task as a Bayesian model tracking algorithm. The nonlinear dynamics of many hybrid systems present challenges to probabilistic tracking. Further, probabilistic tracking of a system for the purposes of diagnosis is problematic because the models of the system corresponding to failure modes are numerous and generally very unlikely. To focus tracking on these unlikely models and to reduce the number of potential models under consideration, we exploit logic-based techniques for qualitative model-based diagnosis to conjecture a limited initial set of consistent candidate models. In this paper we discuss alternative tracking techniques that are relevant to different classes of hybrid systems, focusing specifically on a method for tracking multiple models of nonlinear behavior simultaneously using factored sampling and conditional density propagation. To illustrate and motivate the approach described in this paper we examine the problem of monitoring and diganosing NASA's Sprint AERCam, a small spherical robotic camera unit with 12 thrusters that enable both linear and rotational motion.
Author
Bayes Theorem; Mathematical Models; Dynamical Systems; Algorithms

20050167213 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Selection and Application of Distorted Risk Measures
Offlutt, Edwin J.; Mar. 2005; 159 pp.; In English
Report No.(s): AD-A431496; AFIT/GOR/ENS/05-14; No Copyright; Avail: Defense Technical Information Center (DTIC)

This thesis develops and illustrates a methodology for the selection of probability distributions and distortion functions associated with risk scenarios resulting from military capability shortfalls. Distorted (or transformed) risk measures are analyzed and applied to account for loss scenarios that may occur with low frequency but result in catastrophic outcomes. After reviewing the rudimentary concepts of distortion, four well-known continuous distributions, suitable for modeling risk scenarios, are chosen using defined criteria. Based on subject matter expert inputs, a simple method for assigning exactly one of the four distributions to any risk scenario is proposed. Four parametric distortion functions from the finance and insurance literature are then selected and applied to each of the chosen distributions. The distortion effects are examined analytically, graphically, and empirically, and broad-based recommendations are recorded as to the instances when one distortion function might be preferred over others. An end-to-end notional problem - in which a subset of available mitigation measures are selected to counteract a multi-faceted risk environment - illustrates the means by which the proposed methodology may be used to affect future systems acquisition through the Capabilities Review and Risk Assessment (CRRA) process of the USA Air Force.
DTIC
Distortion; Probability Distribution Functions; Risk

20050167235 Cornell Univ., Ithaca, NY USA
Change Detection and Estimation in Large Scale Sensor Networks: Linear Complexity Algorithms
He, Ting; Ben-David, Shai; Tong, Lang; Dec. 2004; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431591; No Copyright; Avail: Defense Technical Information Center (DTIC)

We propose algorithms for nonparametric sample-based spacial change detection and estimation in large scale sensor networks. We collect random samples containing the location of sensors and their local decisions, and assume that the local decisions can be stimulated or normal , reflecting the local strength of some stimulating agent. Then change in the location of the agent manifests itself by a change in the distribution of stimulated sensors. In this paper, we are aiming at developing a test that, given two collections of samples, can decide whether the distribution generating the samples has changed or not, and give an estimated changed area if a change is indeed detected. The focus of this paper is to reduce the complexity of the detection and estimation algorithm. We propose two fast algorithms with almost linear complexity and analyze their completeness, flexibility and robustness.
DTIC
Algorithms; Change Detection; Detection; Nonparametric Statistics

20050167417 Air Force Research Lab., Edwards AFB, CA USA
Experimental and Numerical Determination of Micropropulsion Device Efficiencies at Low Reynolds Numbers
Ketsdever, Andrew D.; Clabough, Michael T.; Gimelshein, Sergey F.; Alexeenko, Alina; Oct. 2004; 47 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-2308
Report No.(s): AD-A432073; No Copyright; Avail: Defense Technical Information Center (DTIC)
The need for low thrust propulsion systems for maneuvers on micro- and nano-spacecraft is growing. Low thrust characteristics generally lead to low Reynolds number flows from propulsive devices that utilize nozzle expansions. Low Reynolds number flows of helium and nitrogen through a small conical nozzle and a thin-walled orifice have been investigated both numerically, using the Direct Simulation Monte Carlo technique, and experimentally, using a nano-Newton thrust stand. For throat Reynolds number less than 100, the nozzle to orifice thrust ratio is less than unity; however, the corresponding ratio of specific impulse remains greater than one for the Reynolds number range from 0.02 to 200. Once the Direct Simulation Monte Carlo model results were verified using experimental thrust and mass flow data, the model was used to investigate the effects of geometrical variations on the conical nozzle's performance. At low Reynolds numbers, improvements to the specific impulse on the order of 4 to 8% were achieved through a combination of decreasing the nozzle length and increasing the nozzle expansion angle relative to the nominal experimental geometry.
DTIC
Efficiency; Low Reynolds Number; Low Thrust Propulsion; Microthrust; Monte Carlo Method; Spacecraft Propulsion

20050167424 Naval Health Research Center, San Diego, CA USA
The Association Between Participation in High School Physical Education and Physical Fitness in Young Men
Riley, Donna J.; Macera, Caroline A.; Nichols, Jeanne F.; Ji, Ming; Wingard, Deborah; Aug. 2004; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A432082; NHRC-04-28; No Copyright; Avail: Defense Technical Information Center (DTIC)
The purpose of this study was to examine the association between participation in high school physical education and performance on a fitness test among recent high school graduates. A questionnaire was administered to 1, 633 male Marine Corps recruits (ages 17-21 years, M= 18.7, SD = 0.96) in San Diego, California, between September and November 2002. Items included a variety of behaviors including years of participation in high school physical education classes. A logistic regression model assessed items associated with failing a physical fitness test prior to recruit training. Participation in 2 or fewer years of high school physical education was associated with not passing the fitness test (odds ratio = 1.5, 95% confidence interval =1.2-1.9) after controlling for breakfast habits, weight gain supplementation, tobacco smoking, age, race/ethnicity, and body mass index. Participation in high school physical education appears to be independently associated with physical fitness in young men. Further study is needed to answer questions regarding optimal frequency and duration of physical activity programs for high school-aged students.
DTIC
Education; Human Beings; Males; Military Personnel; Physical Fitness; Schools

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20050165723 Defence Science and Technology Organisation, Edinburgh, Australia
A Review of Operations Research Applications in Workforce Planning and Potential Modelling of Military Training
Wang, Jun; February 2005; 37 pp.; In English
Report No.(s): DSTO-TR-1688; DODA-AR-013-337; Copyright; Avail: Other Sources

This report presents the review of workforce planning applications of operations research and explores potential modelling of military training. We classify the operations research techniques applied in workforce planning into four major branches: Markov chain models, computer simulation models, optimization models and supply chain management through System Dynamics. For each of these, we outline the underlying mathematical formalism and concepts, overview models published and discuss potential limitations. The prospect of modelling training forces via System Dynamics is demonstrated by a causal-loop analysis of the military officer system and a simulation model based on a stock-flow diagram for a one-rank officer training system.
Author
Operations Research; Personnel Management; Management Planning

20050165768 Stanford Univ., Stanford, CA, USA
Environmental Monitoring for Situation Assessment using Mobile and Fixed Sensors
Fikes, Richard; June 2004; 41 pp.; In English
Contract(s)/Grant(s): NAG2-1337; No Copyright; Avail: CASI; A03, Hardcopy

This project was co-led by Dr. Sheila McIlraith and Prof. Richard Fikes. Substantial research results and published papers describing those results were produced in multiple technology areas, including the following: 1) Monitoring a Complex Physical System using a Hybrid Dynamic Bayes Net; 2) A Formal Theory of Testing for Dynamical Systems; 3) Diagnosing Hybrid Systems Using a Bayesian Model Selection Approach.
Author
Environmental Monitoring; Bayes Theorem; Formalism; Dynamical Systems; Systems Simulation

20050167221 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
U.S. Transportation Command's (USTRANSCOM) Support to the Federal Emergency Management Agency (FEMA)
Mathews, Kendra S.; Jun. 2003; 83 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431549; AFIT/GMO/ENS/03E-7; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Federal Emergency Management Agency has been tasked by the Robert T. Stafford Disaster Relief and Emergency Assistance Act to act as lead agency in handling natural disasters and recovery operations in the USA, Puerto Rico, and Guam. Although they do not handle all aspects of emergency response, they manage the actions and control the checkbook for all relief operations declared by the President of the USA. During such events, the military has historically been called upon for assistance. Whether the military is providing airlift of relief supplies or moving military equipment to support relief operations, USA Transportation Command (USTRANSCOM) is usually involved. This research project analyzes the process and relationship between FEMA and USTRANSCOM during these operations. It details the procedures implemented during past operations and evaluates the differences between actual and written procedures. It also compares the costs associated with using USTRANSCOM versus the use of commercial lift. This paper will also analyze when and where it is most appropriate for USTRANSCOM to participate.
DTIC
Disasters; Emergencies; Transportation

20050167426 Defence Science and Technology Organisation, Salisbury, Australia
A Review of Operations Research Applications in Workforce Planning and Potential Modeling of Military Training
Wang, Jun; Feb. 2005; 37 pp.; In English; Original contains color illustrations
Report No.(s): AD-A432084; DSTO-TR-1688; DODA-AR-013-337; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report presents the review of workforce planning applications of operations research and explores potential modelling of military training. We classify the operations research techniques applied in workforce planning into four major

branches: Markov chain models, computer simulation models, optimisation models and supply chain management through System Dynamics. For each of these, we outline the underlying mathematical formalism and concepts, overview models published and discus potential limitations. The prospect of modelling training forces via System Dynamics is demonstrated by a causal-loop analysis of the military officer system and a simulation model based on a stock-flow diagram for a one-rank officer training system.
DTIC
Education; Operations Research

20050167439 Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ USA
3D Hydrocode Analysis of Novel Asymmetrical Warhead Designs
Fong, Richard; Kraft, Jeffrey; Thompson, LaMar; Ng, William; Dec. 2004; 4 pp.; In English; Original contains color illustrations
Report No.(s): AD-A432103; No Copyright; Avail: Defense Technical Information Center (DTIC)

In fly over shoot-down munitions, the warhead is mounted perpendicular to the symmetry axis and flight path of the cylindrical carrier. The cylindrical carrier places a geometric constraint on conventional axisymmetric warheads. This constraint limits the warheads diameter, weight, and consequently lethality. In most fly-over shoot down munitions, conventional axisymmetric warheads could not be used, since they would be too small to defeat the required target. The nonaxisymmetric (NAS) warhead concept overcomes these constraints by utilizing the volume along the carrier's axis to put more explosive and liner mass into the warhead, and hence to put more kinetic energy on target. Figure 1 shows the geometric constraints that a cylindrical carrier places on conventional axisymmetric warhead and also how a NAS warhead fully utilizes the volume available within the carrier are both shown.
DTIC
Asymmetry; Ordnance; Projective Geometry; Symmetry; Warheads

20050167454 Army High Performance Computing Research Center, Minneapolis, MN USA
High Performance Scalable Capacity Constrained Routing Algorithms for Evacuation Planning
Shekhar, Shashi; Lu, Qingsong; Dec. 2004; 3 pp.; In English; Original contains color illustrations
Report No.(s): AD-A432124; No Copyright; Avail: Defense Technical Information Center (DTIC)

Capacity constrained route planning tools are vital for increasing the survivability of troops in battlefields and for homeland defense preparation. Efficient tools are needed to produce plans which identify routes and schedules to evacuate affected population. We propose a novel route-scheduling tool for evacuation route planning.
DTIC
Algorithms; Heuristic Methods; Planning; Scheduling

20050167900 Physics and Electronics Lab. TNO, The Hague, Netherlands
Applications of the Torpedo Defence System TestBed
Grootendorst, H. J.; Fitski, H. J.; Keus, D.; February 2005; 84 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 015.33366
Report No.(s): TNO-DV1-2004-A262; TD-2004-0429; Copyright; Avail: Other Sources

The objective of this project is to initiate the building up of knowledge of methods for use of the TDS simulation environment that is developed by TNO Defence, Security and Safety. Existing methods will be applied for an effective and efficient use of the TDSTB. Knowledge of methods to use the TDSTB is built up by means of: A checklist to carry out a study with the TDSTB. An inventory of existing methods (e.g., search techniques, simulation, statistics) and an inventory of criteria and effectiveness measures that best describe the performance of a torpedo defence system. Sufficient knowledge of the use of the TDSTB is available to be able to apply the TDSTB in different types of OR studies e.g., 'Determination of requirements' and 'Determination of operational effectiveness'
Author
Systems Simulation; Defense; Torpedoes; Systems Analysis; System Effectiveness

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THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20050167077 Geophysical Observatory, Helsinki, Finland

Annals of the Finnish Academy of Sciences: Mathematics, Volume 30, No. 1

Olli, Martio, Editor; Drasin, David, Editor; Gehring, Frederick, Editor; Iwaniec, Tadeusz, Editor; Matti, Jutila, Editor; Keen, Linda, Editor; Kulkarni, Ravi S., Editor; Laine, Ilpo, Editor; Lehto, Olli, Editor; Lindenstrauss, J., Editor, et al.; 2005; ISSN 1239-629X; 216 pp.; In English; Copyright; Avail: Other Sources

The papers in this issue include: 1) Cylinder and horoball packing in hyperbolic space; 2) On Q-homeomorphisms; 3) Global properties of the Painleve transcendents: New results and open questions; 4) Hajtasz-Sobolev type spaces and p-energy on the Sierpinski gasket; 5) Sharp estimates for hyperbolic metrics and covering theorems of Landau type; 6) A simply connected, homogeneous domain that is not a quasidisk; 7) A sharp condition for the Loewner equation to generate slits; 8) Boundary correspondence under quasiconformal harmonic diffeomorphisms of a half-plane; 9) On an asymptotically sharp variant of Heinz's inequality; 10) Automorphism groups of Schottky type; 11) Meromorphic functions and also their first two derivatives have the same zeros.

CASI

Periodicals; Mathematics; Finland

20050167461 Michigan Univ., Ann Arbor, MI USA

Model Reduction Techniques for Large-Amplitude Vibrations of Complex Nonlinear Structures

Pierre, Christophe; Shaw, Steven W.; Mar. 2005; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-1-0613

Report No.(s): AD-A432137; ARO-41414.2-EG; No Copyright; Avail: Defense Technical Information Center (DTIC)

The objective of this research is the development of systematic methods for generating reduced-order models that accurately describe the vibrations of large-scale nonlinear structural systems. These methods are based on nonlinear modes of vibration defined and constructed in terms of invariant manifolds. The motivation for the research stems from the fact that the dynamics of nonlinear structures are typically decomposed in terms of the linearized system's modes, often yielding poor modal convergence and too large reduced-order models. Research focused on (1) the development of a more efficient computer code for the generation of reduced order models for a realistic rotorcraft blade model, (2) the investigation of the convergence of reduced-order models based on a finite element rotorcraft blade model, (3) the extension of the model reduction technique to piecewise linear systems and hybrid linear nonlinear structural systems, (4) the development of a new computer code for the construction of multi-mode based reduced-order models, (5) the development of a new computer code for the construction of the reduced-order model for nonlinear systems under periodic external excitation, (6) the development of a methodology that uses component mode synthesis in conjunction with nonlinear normal modes.

DTIC

Amplitudes; Nonlinear Systems; Nonlinearity; Vibration

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PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics*, or *92 Solar Physics*.

20050166366 California Univ., Berkeley, CA, USA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Quadratic Divergences in Effective Supergravity from the Heterotic Superstring

Gaillard, M. K.; Sep. 2004; 18 pp.; In English

Report No.(s): DE2004-833708; LBNL-56404; No Copyright; Avail: Department of Energy Information Bridge

Results from studies of effective Lagrangians for gaugino condensation are summarized and re-examined with an eye to previously neglected one-loop quadratically divergent corrections.

NTIS

Lagrangian Function; Supergravity

20050166369 Oak Ridge Y-12 Plant, TN, USA
Improved Background Corrections for Uranium Holdup Measurements
Oberer, R. B.; Gunn, C. A.; Chian, L. G.; Jun. 21, 2004; 16 pp.; In English
Report No.(s): DE2004-833931; No Copyright; Avail: Department of Energy Information Bridge

In the original Generalized Geometry Holdup (GGH) model, all holdup deposits were modeled as points, lines, and areas. Two improvements were recently made to the GGH model and are currently in use at the Y-12 National Security Complex. These two improvements are the finite-source correction CF(sub g) and the self-attenuation correction. The finite-source correction corrects the average detector response for the width of point and line geometries which in effect, converts points and lines into areas. The result of a holdup measurement of an area deposit is a density-thickness which is converted to mass by multiplying it by the area of the deposit. From the measured density-thickness, the true density-thickness can be calculated by correcting for the material self-attenuation. Therefore the self-attenuation correction is applied to finite point and line deposits as well as areas. This report demonstrates that the finite-source and self-attenuation corrections also provide a means to better separate the gamma rays emitted by the material from the gamma rays emitted by background sources for an improved background correction. Currently, the measured background radiation is attenuated for equipment walls in the case of area deposits but not for line and point sources. The measured background radiation is not corrected for attenuation by the uranium material. For all of these cases, the background is overestimated which causes a negative bias in the measurement. The finite-source correction and the self-attenuation correction will allow the correction of the measured background radiation for both the equipment attenuation and material attenuation for area sources as well as point and line sources.
NTIS
Uranium; Background Radiation

20050166371 California Univ., Berkeley, CA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
String Duality and Novel Theories without Gravity
Kachru, S.; 1998; 18 pp.; In English
Report No.(s): DE2004-834214; LBNL-41189; No Copyright; Avail: Department of Energy Information Bridge

We describe some of the novel 6d quantum field theories which have been discovered in studies of string duality. The role these theories (and their 4d descendants) may play in alleviating the vacuum degeneracy problem in string theory is reviewed. The DLCQ of these field theories is presented as one concrete way of formulating them, independent of string theory.
NTIS
String Theory; Gravitation; Field Theory (Physics)

20050166372 Princeton Univ., NJ, USA
Scaling Deviations for Neutrino Reactions in Aysmptotically Free Field Theories
Zee, A.; Wilczek, F.; Treiman, S. B.; 2004; 48 pp.; In English
Report No.(s): DE2004-4256152; No Copyright; Avail: Department of Energy Information Bridge

Several aspects of deep inelastic neutrino scattering are discussed in the framework of asymptotically free field theories. We first consider the frowth behavior of the total cross sections at large energies. Because of the deviations from strict scaling which are characteristic of such theories the growth need not be linear. However, upper and lower bounds are established which rather closely bracket a linear growth. We next consider in more detail the expected pattern of scaling deviation for the structure functions and, correspondingly, for the differential cross sections. The analysis here is based on certain speculative assumptions. The focus is on qualitative effects of scaling breakdown as they may show up in the X and y distriubtions. The last section of the paper deals with deviations from the Callan-Gross relation.
NTIS
Neutrinos; Asymptotes; Field Theory (Physics)

20050166386 Joint Inst. for Nuclear Research, Dubna, Russia, Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Higher Twists in Spin Structure Functions from a 'Constituent Quark' Point of View
Sidorov, A. V.; Weiss, C.; 2004; 12 pp.; In English
Report No.(s): DE2004-833532; No Copyright; Avail: Department of Energy Information Bridge

No abstract available
Quarks; Mathematical Models; Quantum Chromodynamics

20050166411 Lawrence Livermore National Lab., Livermore, CA
Evaluation of White Light Sources For an Absolute Fiber Optic Sensor Readout System
McConaghy, C. F.; Oct. 10, 2003; 14 pp.; In English
Report No.(s): DE2004-15009728; UCRL-TR-200273; No Copyright; Avail: Department of Energy Information Bridge

This report summarizes work done in pursuit of an absolute readout system for Fabry-Perot optics sensors such as those built both by FISO and LLNL. The use of white light results in a short coherence length reducing the ambiguity of the Fabry-Perot gap measurement which is required to readout the sensor. The light source coherence length is the critical parameter in determining the ability to build a relative or an absolute system. Optical sources such as lasers and LEDs are rather narrow in optical spectral bandwidth and have long coherence length. Thus, when used in interferometric sensor measurements, one fringe looks much like another and it is difficult to make an absolute measurement. In contrast, white light sources are much broader in spectral bandwidth and have very short coherence lengths making interferometry possible only over the coherence length, which can be 1 or 2 microns.
NTIS
Fiber Optics; Light Sources; Sensors; Lasers

20050166415 Lawrence Livermore National Lab., Livermore, CA
Analytic Expressions for the Angular Resolution of Compton Gamma-ray Detectors
Wright, D. M.; Feb. 05, 2004; 18 pp.; In English
Report No.(s): DE2004-15009768; UCRL-TR-202187; No Copyright; Avail: Department of Energy Information Bridge

This paper describes the derivation of analytic expressions for the angular resolution of reconstructing gamma rays detected via Compton interactions. We consider two types of gamma-ray detectors: Compton-ring and electron-tracking devices. In Compton-ring devices, the direction of the scattered electron is not resolved, only the total energy (electron and scattered photon) and the scattered photon direction are measured. The measured quantities define a cone about the axis of the scattered photon direction. The initial photon direction lies along this cone. Thus for single events there is a ring-like ambiguity in the photon direction. By combining multiple events, the intersection of the reconstructed rings will resolve the initial direction of the photon source. In this paper, we derive the resolution of the cone angle for individual rings.
NTIS
Compton Effect; Gamma Ray Spectrometers

20050166417 Lawrence Livermore National Lab., Livermore, CA
Focusing Hard X-rays at Current and Future Light Sources for Microscopy and High-Power Applications
Bionta, R. M.; Feb. 17, 2004; 14 pp.; In English
Report No.(s): DE2004-15009817; UCRL-TR-202967; No Copyright; Avail: Department of Energy Information Bridge

The field of x-ray optics struggles to develop optical systems with the versatility and sophistication of their visible light counterparts. The advent of fourth-generation light sources will make the struggle even more difficult. Fourth-generation light sources include laser/plasma sources, x-ray Free Electron Lasers (FEL), inverse Compton scattering sources, and the National Ignition Facility. LCLS, (Linac Coherent Light Source), and its European cousin, will be the first of the x-ray FELs.
NTIS
Light Sources; Microscopy; Free Electron Lasers

20050166418 Fermi National Accelerator Lab., Batavia, IL, USA
Extensions of the Longitudinal Envelope Equation
Neuffer, D.; 2004; 12 pp.; In English
Report No.(s): DE2004-16068; No Copyright; Avail: Department of Energy Information Bridge

Recently, longitudinal space charge effects have become of increased importance in a variety of dynamical situations. The CEBAF FEL injector beam dynamics shows large space-charge effects, even at 10 MeV ((gamma) (approx) 20). Space-charge dominated longitudinal motion has also been studied in the IUCF ion storage ring. Previously a longitudinal envelope equation with a self-consistent phase-space distribution has been developed, and has been of considerable use in analyzing the motion of these cases. Longitudinal motion in detailed agreement with this envelope equation has been observed at the U. of Maryland Laboratory for Plasma Research, and at the GSI electron cooling storage ring ESR, as well as at the IUCF. However, the initial presentation in ref. 4 used non-relativistic linear-accelerator bunching motion as a simplifying approximation in order to avoid inadvertent errors and minimize misprints, and must be adapted to include relativistic and/or synchrotron effects. In the present note we extend the envelope equation formulae to include relativistic, synchrotron, and acceleration effects, and define the

various factors in the equations in explicit detail. The object is to obtain a set of debugged formulae for these extended cases, with all of the various factors defined explicitly, so that the formulae can be used as a reference without repetitive rederivations. The usual ambiguities over emittance definitions and units and (beta), (gamma), g factors should be resolved. The reader (or readers) is invited to discover any remaining errors, ambiguities or misprints for removal in the next edition. NTIS

Space Charge; Storage Rings (Particle Accelerators)

20050167349 Minnesota Univ., Minneapolis, MN USA

UWB Timing Synchronization Using Dirty Templates

Yang, Liuqing; Giannakis, Georgios B.; Dec. 2004; 4 pp.; In English; Original contains color illustrations

Report No.(s): AD-A431931; No Copyright; Avail: Defense Technical Information Center (DTIC)

Precise localization and reliable exchange of information among distributed sensors, soldiers and unmanned aerial/ground vehicles (UAVs/UGVs) are important for tactical communications. To this end, Ultra-Wideband (UWB) technology emerges as a promising candidate, providing high performance wireless links with low complexity and low probability of detection (LPD). Rapid timing synchronization constitutes a major challenge in realizing these promises. Synchronization faces accentuated difficulties in the UWB regime because its waveforms are impulse-like and have low amplitude, and the propagation channel is unknown at the receiver. These explain why synchronization has attracted so much interest in UWB research 3, 1, 4, 6, 5. But each of existing approaches requires a number of restrictive assumptions. Without invoking any of the assumptions required by existing algorithms, we develop timing algorithms that remain operational in general UWB settings with fast time hopping (TH), unknown multipath propagation and even when multiple users are present. Our synchronizers rely on symbol-rate samples and thus entail low complexity. Most existing synchronizers are based on the unique maximum of the received pulse s autocorrelation function, which requires a clean template of the received pulse to be available. The latter is not feasible when the multipath channel is unknown. Our novel criterion relies on the unique maximum that emerges by cross correlating dirty templates extracted from the received waveform. These dirty templates render channel information unnecessary since it is embedded in the received waveform.

DTIC

Communication Networks; Synchronism; Templates; Time Measurement; Wireless Communication

20050167401 Oklahoma State Univ., Stillwater, OK USA

Numerical Studies of Low Grazing Angle Microwave Scattering from Breaking Water Waves

West, James C.; Jan. 2005; 20 pp.; In English

Contract(s)/Grant(s): N00014-03-1-0134

Report No.(s): AD-A432042; No Copyright; Avail: CASI; A03, Hardcopy

The microwave backscattering from breaking water waves at small illumination Grazing angles (LGA) has been investigated using computational electromagnetics (CEM) techniques. Good agreement is achieved between the numerically calculated and experimentally measured backscattering from a wave tank plunging breaker. The large measured HH/VV polarization ratio is due to the shape of the wave crest and the multi-path scattering from the wave crest and front face. The HH/W ratio is maintained when the wave crest has modified nonuniformities in azimuth, although it is affected by larger variations. The two-scale model fails to predict the LGA scattering from a 3-D gently spilling breaker even after the steepest wave features have been removed.

DTIC

Electromagnetic Scattering; Grazing; Microwave Scattering; Water Waves

20050168106 Rutherford Appleton Lab., Chilton

Operational Characteristics of a GEM-MSGC System for X-ray Detection

Mir, J. A.; Jul. 15, 2004; 22 pp.; In English

Report No.(s): PB2005-103057; RAL-TR-2004-019; Copyright; Avail: National Technical Information Service (NTIS)

This report outlines a recent study undertaken at CCLRC Rutherford Appleton Laboratory to evaluate the performance of a Gas Electron Multiplier (GEM) coupled with a Microstrip Gas counter (MSGC). The parameters investigated during this study were effective gain, effective gain stability and energy resolution at 8.05 keV using Cu-K X-rays. These parameters were studied as a function of drift field, induction field, potential differences across the GEM holes and that across the MSGC anodes and cathodes. This report demonstrates that a single stage GEM can sustain effective gains up to 6000 whilst retaining adequate X-ray energy resolution. By utilizing the MSGC as well as the GEM amplification these gains easily exceed 100,000

and allow the MSGC operation at much lower voltages. This report also demonstrates that the introduction of the GEM preamplification to the MSGC enables the operation of the latter at much higher effective gains (30,000) before any degradation in the X-ray energy resolution.
NTIS
Gas Mixtures; Amplification

20050168128 Brookhaven National Lab., Upton, NY
Beam-Loss Driven Design Optimization for the Spallation Neutron Source (SNS) Ring
Wei, J.; Beebe-Wang, J.; Blaskiewicz, M.; Cameron, P.; Danby, G.; 1999; 10 pp.; In English
Report No.(s): DE2004-770887; BNL-66015; No Copyright; Avail: Department of Energy Information Bridge
This paper summarizes three-state design optimization for the Spallation Neutron Source (SNS) ring: linear machine design (lattice, aperture, injection, magnet field errors and misalignment), beam core manipulation (painting, space charge, instabilities, RF requirements), and beam halo consideration (collimation, envelope variation, e-p issues etc.).
NTIS
Neutron Sources; Accelerators; Storage Rings (Particle Accelerators); Design Optimization; Spallation; Beams (Radiation)

20050168131 Brookhaven National Lab., Upton, NY
RHIC/AGS Online Model Environment: Design and Overview
Satogata, T.; Brown, K.; Pilat, F.; Tafti, A. A.; Tepikian, S.; 1999; 10 pp.; In English
Report No.(s): DE2004-770886; BNL-66013; No Copyright; Avail: Department of Energy Information Bridge
This paper describes the architecture of the RHIC/AGS modeling environment, including the application interface through CDEV and general tools for graphical interaction with the model using Tcl/Tk. Separate papers at this conference address the specifics of implementation and modeling experience for AGS and RHIC.
NTIS
Accelerators; On-Line Systems; Mathematical Models

20050168132 Brookhaven National Lab., Upton, NY
Ramp Management in RHIC
Kewisch, J.; van Zeijts, J.; Peggs, S.; Satogata, T.; 1999; 10 pp.; In English
Report No.(s): DE2004-770885; BNL-66012; No Copyright; Avail: Department of Energy Information Bridge
In RHIC, magnets and RF cavities are controlled by Wave Form Generators (WFGs), simple real time computers which generate the set points. The WFGs are programmed to change set points from one state to another in a synchrotronized way. Such transition is called a 'Ramp' and consists of a sequence of 'stepping stones' which contain the set point of every WFG controlled device at a point in time. An appropriate interpolation defines the set points between these stepping stones. This report describes the implementation of the ramp system. The user interface, tools to create and modify ramps, interaction with modeling tools and measurements and correction programs are discussed.
NTIS
Radio Frequencies; Accelerators

20050168135 Brookhaven National Lab., Upton, NY
Implementatoin of Ramp Control in RHIC
Kewisch, J.; 1999; 10 pp.; In English
Report No.(s): DE2004-770884; BNL-66010; No Copyright; Avail: Department of Energy Information Bridge
After the injection of beam into RHIC the beam energy is ramped from 10.8 GeV/u to 108 GeV/u and the beta function of the interaction points is reduced from 10 meters to 1 meter. The set points for magnet power supplies and RF cavities is changed during such ramps in concert. A system of Wave Form Generators (WFGs), interconnected by a Real Time Data Link (RTDL) and Event Link is used to control these devices. RHIC ramps use a two level system of WFGs: one transmits the beam energy and a 'pseudo time' variable as functions of time via RTDL; the other calculates the device set points as functions of these RTDL variables. Energy scaling, saturation correction and the wiring of interaction region quadruples is performed on the second level. This report describes the configuration and implementation of the software, firmware and hardware of the RHIC ramp system.
NTIS
Power Supplies; Beam Injection

20050168136 Brookhaven National Lab., Upton, NY
Nonlinear Diagnostics Using AC Dipoles
Peggs, S.; 1999; 10 pp.; In English
Report No.(s): DE2004-770880; BNL-66005; No Copyright; Avail: Department of Energy Information Bridge
There are three goals in the accurate nonlinear diagnosis of a storage ring. First, the beam must be moved to amplitudes many times the natural beam size. Second, strong and long lasting signals must be generated. Third, the measurement technique should be non-destructive. Conventionally, a single turn kick moves the beam to large amplitudes, and turn-by-turn data are recorded from multiple beam position monitoring (BPMs). Unfortunately, tune spread across the beam causes the center of charge beam signal to 'decohere' on a time scale often less than 100 turns. Filamentation also permanently destroys the beam emittance (in a hadron ring). Thus, the 'strong single turn kick' technique successfully achieves only one out of the three goals. AC dipole techniques can achieve all three. Adiabatically excited AC dipoles slowly move the beam out to large amplitudes. The coherent signals then recorded last arbitrarily long. The beam maintains its original emittance if the AC dipoles are also turned off adiabatically, ready for further use. The AGS already uses an RF dipole to accelerate polarized proton beams through depolarizing resonances with minimal polarization loss. Similar AC dipoles will be installed in the horizontal and vertical planes of both rings in RHIC. The RHIC AC dipoles will also be used as spin flippers, and to measure linear optical functions.
NTIS
Alternating Current; Nonlinearity; Storage Rings (Particle Accelerators)

20050168137 Brookhaven National Lab., Upton, NY, Massachusetts Inst. of Tech., Cambridge, MA, USA
Plasma Window: A Windowless High Pressure-Vacuum Interface for Various Accelerator Applications
Hershcovitch, A. I.; Johnson, E. D.; Lanza, R. C.; 1999; 10 pp.; In English
Report No.(s): DE2004-770876; BNL-65997; No Copyright; Avail: Department of Energy Information Bridge
The Plasma Window is a stabilized plasma arc used as an interface between accelerator vacuum and pressurized targets. There is no solid material introduced into the beam and thus it is also capable of transmitting particle beams and electromagnetic radiation with low loss and of sustaining high beam currents without damage. Measurements on a prototype system with a 3 mm diameter opening have shown that pressure differences of more than 2.5 atmospheres can be sustained with an input pressure of (approx) 10(sup -6) Torr. The system is capable of scaling to higher-pressure differences and larger apertures. Various plasma window applications for synchrotron light sources, high power lasers, internal targets, high current accelerators such as the HAWK, ATW, APT, DARHT, spallation sources, as well as for a number of commercial applications, is discussed.
NTIS
High Pressure; Particle Beams; Plasmas (Physics); Vacuum; Particle Accelerators

20050168138 Brookhaven National Lab., Upton, NY
Study of Longitudinal Injection/Stacking in the SNS Acummulator Ring
Beebe-Wang, J.; 1999; 10 pp.; In English
Report No.(s): DE2004-770877; BNL-65998; No Copyright; Avail: Department of Energy Information Bridge
Various longitudinal distributions, resulting from the specific injection and stacking methods, are considered to minimize longitudinal and transverse instabilities and particle losses in SNS accumulator ring. The longitudinal phase space paintings by linac energy ramping, increased linac energy spread and the use of a random phase RF debunching cavity are reported. Bunch lengthening and beam in gap rate as functions of injection energy spread, RF voltage and injection energy error is summarized. Finally, the energy error tolerance is concluded.
NTIS
Accelerators; Radio Frequencies; Accumulators

20050168139 Brookhaven National Lab., Upton, NY
Injection of Gold Ions in the AGS Booster with Linear Coupling
Gardner, C.; Ahrens, L.; Roser, T.; Zeno, K.; 1999; 10 pp.; In English
Report No.(s): DE2004-770766; BNL-65938; No Copyright; Avail: Department of Energy Information Bridge
Linear Coupling, introduced by skew quadrupoles, has been used for several years to enhance the multi-turn injection

efficiency of gold and other heavy ions in the AGS Booster. In this paper they describe their latest measurements of the injection process and compare with models.
NTIS
Gold; Heavy Ions; Ion Injection

20050168140 Brookhaven National Lab., Upton, NY
Performance of the AGS Transition Jump System
Ahrens, L. A.; Brennan, J. M.; Glenn, J. W.; Roser, T.; van Asselt, W. K.; 1999; 10 pp.; In English
Report No.(s): DE2004-770767; BNL-65968; No Copyright; Avail: Department of Energy Information Bridge

The transition jump system has been indispensable to the high intensity proton operation of the AGS complex. Nevertheless, transition crossing remains one of the major hurdles as the accelerator complex intensity is pushed upward. To enhance the performance of the system 'quadrupole pumping' in the Booster is used to minimize the necessary longitudinal dilution of the beam on the AGS injection porch. During the transition jump sextupole correctors at strategic locations are pulsed to minimize the effects of the chromatic non-linearity of the jump system. The available instrumentation for diagnosing the performance of the system is described, along with performance at the recent record beam intensities.
NTIS
Beam Injection; Accelerators

20050168141 Brookhaven National Lab., Upton, NY
Turn-by-Turn Analysis of Proton and Gold Beams at Injection in the AGS Booster
Gardner, C.; Ahrens, L.; Williams, N.; 1999; 10 pp.; In English
Report No.(s): DE2004-770765; BNL-65937; No Copyright; Avail: Department of Energy Information Bridge

In this paper the authors describe the latest version of a program they have used for several years to acquire and analyze turn-by-turn data from pick-up electrodes in the AGS Booster during injection. The program determines several parameters of the injected beam including the tunes and the position and angle of the incoming beam. Examples are given for both proton and gold injection.
NTIS
Proton Beams; Gold

20050168145 Brookhaven National Lab., Upton, NY
RHIC/AGS Online Model Environments: Experiences and Design for AGS Modeling
Brown, K.; Niederer, J.; Satogata, T.; Tafti, A. A.; Tsoupas, N.; 1999; 10 pp.; In English
Report No.(s): DE2004-770770; BNL-65975; No Copyright; Avail: Department of Energy Information Bridge

The RHIC/AGS online modeling environment, a general client-server modeling package that supports cdev and straightforward integration of diverse computational modeling engines (CMEs), is being adapted to model the AGS and Booster at BNL. This implementation uses a version of MAD modified at BNL that allows traditional lattice structure analysis, single pass beam line analysis, multi-particle tracking, interactive graphics, and the use of field maps. The on-line model system is still under development, a real working prototype exists and is being tested. This paper describes the system and experience with its design and use for AGS and AGS Booster online modeling.
NTIS
Computer Graphics; Models

20050168146 Brookhaven National Lab., Upton, NY
Feedback Design Method Review and Comparison
Onillon, E.; 1999; 10 pp.; In English
Report No.(s): DE2004-770764; BNL-65936; No Copyright; Avail: Department of Energy Information Bridge

Different methods for feedback designs are compared. These include classical Proportional Integral Derivative (P.I.D.), state variable based methods like pole placement Linear Quadratic Regulator (L.Q.R.), H-infinity and (micro)-analysis. These methods are then applied for the design and analysis of the RHIC phase and radial loop, yielding a performance, stability and robustness comparison.
NTIS
Design Analysis; Feedback; Linear Quadratic Regulator

20050168147 Brookhaven National Lab., Upton, NY

Adiabatic Excitation of Longitudinal Bunch Shape Oscillations

Bai, M.; Brown, K.; Fischer, W.; Roser, T.; Smith, K.; 1999; 10 pp.; In English

Report No.(s): DE2004-770772; BNL-65977; No Copyright; Avail: Department of Energy Information Bridge

By modulating the rf voltage at near twice the synchrotrons frequency we are able to modulate the longitudinal bunch shape. We show experimentally that this can be done while preserving the longitudinal emittance when the rf voltage modulation is turned on adiabatically. Experimental measurements will be presented along with theoretical predictions.

NTIS

Excitation; Oscillations; Modulation

20050168149 Brookhaven National Lab., Upton, NY

Alternative Lattice for the Spallation Neutron Source Accumulator Ring

Gardner, C. J.; Lee, Y. Y.; Tsoupas, N.; Wei, J.; 1999; 10 pp.; In English

Report No.(s): DE2004-770888; BNL-66016; No Copyright; Avail: Department of Energy Information Bridge

As a key component of the Spallation Neutron Source (SNS) Project, the Accumulator Ring will collect the proton beam from the SNS LINAC at an intensity of 2 x 10(sup 14) per pulse at 60 Hz for a total power of 2 MW, exceeding present performance value of existing facilities. Requirements of minimum beam loss for hand-on maintenance and flexibility for future upgrade are essential for the lattice design. In this paper, they study an alternative lattice emphasizing various injection schemes and flexibility for future upgrade. Working points, sextupole families for chromaticity control, and alternate extraction schemes are also considered.

NTIS

Linear Accelerators; Neutron Sources; Proton Beams; Spallation

20050168155 Brookhaven National Lab., Upton, NY

RHIC Beam Synchronous Trigger Module

Hartmann, H.; Kerner, T.; 1999; 10 pp.; In English

Report No.(s): DE2004-770893; BNL-66026; No Copyright; Avail: Department of Energy Information Bridge

The RHIC Beam Synchronous Event System consists of centralized event encoders (one for each collider ring), which operate from the RF clock and the revolution clock provided by the RHIC RF system, and distributed embedded decoders. The Beam Synchronous Trigger Module (V124) is a general pulse 6U x 4HP, VMEbus controlled module that is compatible with the RHIC Beam Synchronous Event System and is designed to provide clocks and triggers for collider data acquisition systems and experiments. The V124 Module contains a separate memory (Bunch Fill Mask RAM) for each channel that is software configurable with the pattern of filled buckets (Bunch Fill Pattern) to permit bunch synchronous triggering/clocking. This module provides eight identical channels that can be configured independently or in pairs, and a buffered RF Clock output.

NTIS

Data Acquisition; Radio Frequencies; Actuators

20050168156 Brookhaven National Lab., Upton, NY, Academy of Sciences (USSR), Novosibirsk, USSR

Results of Beam Tests on a High Current EBIS Test Stand

Beebe, E.; Alessi, J.; Bellavia, S.; Hershcovitch, A.; Kponou, A.; 1999; 10 pp.; In English

Report No.(s): DE2004-770892; BNL-66021; No Copyright; Avail: Department of Energy Information Bridge

At Brookhaven National Laboratory there is an R and D program to design an Electron Beam Ion Source (EBIS) for use in a compact ion injector to be developed for the relativistic heavy ion collider (RHIC). The BNL effort is directed at developing an EBIS with intensities of 3 x 10(sup 9) particles/pulse of ions such as Au(sup 35+) and U(sup 45+), and requires an electron beam on the order of 10A. The construction of a test stand (EBTS) with the full electron beam power and 1/3 the length of the EBIS for RHIC is nearing completion. Initial commissioning of the EBTS was made with pulsed electron beams of duration \h 1 ms and current up to 13 A. Details of the EBTS construction, results of the pulse tests, and preparations for DC electron beam tests are presented.

NTIS

High Current; Electron Beams; Ion Sources

20050168157 Brookhaven National Lab., Upton, NY, European Organization for Nuclear Research, Geneva, Switzerland, Fermi National Accelerator Lab., Batavia, IL, USA

US-LHC Magnet Database and Conventions

Wei, J.; McChesney, D.; Jain, A.; Peggs, S.; Pilat, F.; 1999; 10 pp.; In English

Report No.(s): DE2004-770891; BNL-66019; No Copyright; Avail: Department of Energy Information Bridge

The US-LHC Magnet Database is designed for production-magnet quality assurance, field and alignment error impact analysis, cryostat assembly assistance, and ring installation assistance. The database consists of tables designed to store magnet field and alignment measurements data and quench data. This information will also be essential for future machine operations including local IR corrections.

NTIS

Quality Control; Error Analysis; Data Bases

20050168160 Brookhaven National Lab., Upton, NY, European Organization for Nuclear Research, Geneva, Switzerland, Fermi National Accelerator Lab., Batavia, IL, USA

Interaction Region Local Correction for the Large Hadron Collider

Wei, J.; Fischer, W.; Ptitsin, V.; Ostojic, R.; Strait, J.; 1999; 10 pp.; In English

Report No.(s): DE2004-770890; BNL-66018; No Copyright; Avail: Department of Energy Information Bridge

The performance of the Large Hadron Collider (LHC) at collision energy is limited by the field quality of the interaction region (IR) quadrupoles and dipoles. In this paper they study the impact of the expected field errors of these magnets on the dynamic aperture (DA). Since the betatron phase advance is well defined for magnets that are located in regions of large beta functions, local corrections can be very effective and robust. They compare possible compensation schemes and propose a corrector layout to meet the required DA performance.

NTIS

Accelerators; Collisions; Hadrons

20050168161 Brookhaven National Lab., Upton, NY

Real-World Sorting of RHIC Superconducting Magnets

Wei, J.; Gupta, R.; Harrison, M.; Jain, A.; Peggs, S.; 1999; 10 pp.; In English

Report No.(s): DE2004-770889; BNL-66017; No Copyright; Avail: Department of Energy Information Bridge

During the seven-year construction of the Relativistic Heavy Ion Collider (RHIC), more than 1700 superconducting dipoles, quadrupoles, sextupoles, and multi-layer correctors have been constructed and installed. These magnets have been sorted at several production stages to optimize their performance and reliability. For arc magnets, priorities have bene put first on quench performance and operational risk minimization, second on field transfer function and other first-order quantities, and finally on nonlinear field errors which were painstakingly optimized at design. For Interaction-Region (IR) magnets, sorting is applied to select the best possible combination of magnets for the low-(beta) interaction points (IP). This paper summarizes the history of this real-world sorting process.

NTIS

Superconducting Magnets; Design Analysis; Quadrupoles; Transfer Functions

20050168181 Academy of Sciences (Russia), Troitsk, Russia

X-band 3 GW relativistic BWO based on high current repetitively-pulsed accelerator

Gunin, A. V.; Klimov, A. I.; Korovin, S. D.; Kurkan, I. K.; Pegel, I. V.; Polevin, S. D.; Roitman, A. M.; Rostov, V. V.; Stepchenko, A. S.; Totmeninov, E. M.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 141-146; In English; See also 20050168165

Contract(s)/Grant(s): Proj. 01-25; Copyright; Avail: Other Sources

Results of study of relativistic X-Band BWO with 3 GW peak microwave power are presented. The BWO was realized on the base of high-current electron accelerator SINUS-7. Dependence of microwave pulse duration on microwave power was obtained. Pulse shortening occurring at high powers is probably bound on explosive electron emission from the slow wave structure. Increase of electrodynamic structure cross-section seems to be a way to increase of microwave pulse duration. Experimental results for moderately oversized X-band BWO with resonance reflector are described. This tube can be operated at low external magnetic field.

Author

Backward Waves; Oscillators; Pulse Duration; Electron Accelerators

20050169460 Pennsylvania State Univ., State College, PA, USA
The Electrodynamics of Torus Knots
Werner, Douglas H.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1468-1471; In English; See also 20050169243; Copyright; Avail: Other Sources

The first application of knot theory to electromagnetics was recently reported by O. Manuar and D. L. Jaggard. The initial investigations suggest that the handedness of knots and the degree of knottedness may be deduced from the backscatter signature of electromagnetic waves. The work reported by Manuar and Jaggard is based on results obtained for the threefold rotationally symmetric trefoil knot and its associated unknot. The trefoil knot is the name given to the simplest nontrivial knot. A trefoil knot can be constructed by tieing a piece of string in a knot and gluing the two ends of the string together. Trefoils were chosen because they possess a low knottedness and it only takes one crossing switch (cut and reattach) to transform the trefoil into its corresponding unknot. One of the major drawbacks for application of knot theory to electromagnetics has been the lack of available parameterizations which can be used to mathematically describe knotted curves. This is because knots have traditionally been studies within a topological context where parameterizations for the curves are not generally required. However, in order to successfully characterize the electromagnetic radiation and scattering properties of knots using Maxwell's equations, it is advantageous to develop parameterizations which can be used to geometrically describe the curves of these knots. This paper introduces such parameterizations for a family of knots known as (p,q)-torus knots. These knots reside on the surface of a standard torus, thereby making it possible to readily obtain useful parameterizations to describe them. The well-known trefoil is one important example of a (p,q)-torus knot.
Author
Electrodynamics; Toruses; Parameterization

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ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution*. For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion and Power*.

20050167243 Maryland Univ., College Park, MD USA
Vehicle Tracking using Acoustic and Video Sensors
Sankaranayanan, Aswin C.; Zheng, Qinfen; Chellappa, Rama; Cevher, Volkan; McClellan, James H.; Qian, Gang; Oct. 2004; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-02-0011
Report No.(s): AD-A431619; No Copyright; Avail: Defense Technical Information Center (DTIC)

In target tracking, fusing multi-modal sensor data under a power-performance trade-o is becoming increasingly important. Proper fusion of multiple modalities can help in achieving better tracking performance while decreasing the total power consumption. In this paper, we present a framework for tracking a target given joint acoustic and video observations from a co-located acoustic array and a video camera. We demonstrate on eld data that tracking of the direction-of-arrival of a target improves signi - cantly when the video information is incorporated at time instants when the acoustic signal-to-noise ratio is low.
DTIC
Acoustics; Signal Detectors

20050167389 Army Tank-Automotive and Armaments Command, Picatinny Arsenal, NJ USA
A Doppler Compensation Scheme for RF Communications Useable on Dynamically Retargeted Projectiles
Booth, Donald E.; Dec. 2004; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A432014; No Copyright; Avail: Defense Technical Information Center (DTIC)

The use of dynamic retargeting to modify the impact point of an in-flight projectile is highly desirable for the Future Combat System (FCS). However, communications between the projectile and the ground is complicated by Doppler shift of the Radio Frequency (RF) carrier that is produced by the projectile's speed. Shifts from Ultra-High Frequency (UHF) frequencies can be as high as 7-8 kHz, which would overwhelm typical Frequency Shift Keying (FSK) changes of 1 kHz. This paper proposes a Doppler compensation scheme to allow reliable RF communication between the ground and the projectile, when the projectile includes a Global Positioning System (GPS) receiver.
DTIC
Communication Equipment; Doppler Effect; Projectiles; Radio Communication; Radio Frequencies

20050167415 Tennessee Univ., Knoxville, TN USA

New Sensor Paradigm for Future Combat Systems

Frankel, J. I.; Protopopescu, V.; Dec. 2004; 3 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DE-AC05-00OR22725

Report No.(s): AD-A432070; No Copyright; Avail: Defense Technical Information Center (DTIC)

Highly sensitive and robust sensors are a fundamental component of modern science and engineering; with particular relevance to military applications. Stringent requirements posed by the Future Combat Systems (FCS) on real-time diagnostics from remotely sensed raw data, are only increasing the demand for fast, responsive, and accurate sensors. Basic to all measurement devices are inherent data errors associated with uncertainties and background noise. Turn-key, single-function sensors are designed to provide accuracy and repeatability for a specific, directly measured quantity. However, if these measurements are used to infer other physical quantities, special care must be taken. Indeed, in most applications, data differentiation is applied within the predictive process, sometimes even unbeknown to the user. Unfortunately, upon differentiation, the noise that affects all measured physical quantities is dramatically amplified. Refining the measurement (i.e. increasing the sample density) exacerbates the problem even further, because the increase in accuracy due to finer sampling is wiped out by the cumulative adverse effect of the numerical differentiation. In this paper, we propose the development and implementation of a new, rate-based sensors paradigm that would enhance and secure the US military strength.

DTIC

Combat; Remote Sensors

20050169200 Sonix, Inc., Springfield, VA, USA, NASA Lewis Research Center, Cleveland, OH, USA

Ultrasonic Imaging Technology Helps American Manufacturer of Nondestructive Evaluation Equipment Become More Competitive in the Global Market

[1995]; 2 pp.; In English

Contract(s)/Grant(s): NCC3-385; No Copyright; Avail: CASI; A01, Hardcopy

Sonix, Inc., of Springfield, Virginia, has implemented ultrasonic imaging methods developed at the NASA Lewis Research Center. These methods have heretofore been unavailable on commercial ultrasonic imaging systems and provide significantly more sensitive material characterization than conventional high-resolution ultrasonic c-scanning. The technology transfer is being implemented under a cooperative agreement between NASA and Sonix, and several invention disclosures have been submitted by Dr. Roth to protect Lewis interests. Sonix has developed ultrasonic imaging systems used worldwide for microelectronics, materials research, and commercial nondestructive evaluation (NDE). In 1993, Sonix won the U.S. Department of Commerce 'Excellence in Exporting' award. Lewis chose to work with Sonix for two main reasons: (1) Sonix is an innovative leader in ultrasonic imaging systems, and (2) Sonix was willing to apply the improvements we developed with our in-house Sonix equipment. This symbiotic joint effort has produced mutual benefits. Sonix recognized the market potential of our new and highly sensitive methods for ultrasonic assessment of material quality. We, in turn, see the cooperative effort as an effective means for transferring our technology while helping to improve the product of a domestic firm.

Derived from text

Imaging Techniques; Nondestructive Tests; Technology Transfer; Ultrasonics; Manufacturing

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*.

20050167215 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Deep Level Defects in Electron-Irradiated Aluminum Gallium Nitride Grown by Molecular Beam Epitaxy

Hogsed, Michael R.; Mar. 2005; 204 pp.; In English

Report No.(s): AD-A431507; AFIT/DS/ENP/05-01; No Copyright; Avail: Defense Technical Information Center (DTIC)

Aluminum gallium nitride (AlGaN)-based devices are attractive candidates for integration into future Air Force communication and sensor platforms, including those that must operate in harsh radiation environments. In this study, the electrical and optical properties of 1.0 MeV electron irradiated n-AlxGa1-xN are characterized for aluminum mole fraction x = 0.0 to 0.3 using deep level transient spectroscopy (DLTS), temperature-dependent Hall, and cathodoluminescence (CL) measurements. Following irradiation of the AlGaN, it is found that four different electron traps are created, having energy levels within 0.4 eV below the conduction band edge. Three of these traps correspond to radiation-induced traps previously

reported in GaN, and they are found to deepen significantly in the energy band gap with increase in aluminum mole fraction. The room temperature carrier concentration decreases following irradiation, and the carrier removal rate is found to depend foremost on the initial carrier concentration, regardless of the aluminum mole fraction. Also, following 1.0 MeV electron irradiation at a fluence of 1x1017 cm-2, the peak CL intensities of the samples are reduced, on average, by 50%. In spite of these findings, it is concluded that n-AlxGa1-xN is intrinsically more tolerant to radiation than conventional semiconductor materials such as GaAs and Si.
DTIC
Aluminum Nitrides; Defects; Electron Irradiation; Gallium Nitrides; Irradiation; Molecular Beam Epitaxy

20050167268 Yale Univ., New Haven, CT USA
Aligned Single-Walled Carbon Nanotube Synthesis for Device Design
Pfefferle, L. D.; Haller, G. L.; Reed, Mark; Feb. 2004; 54 pp.; In English
Report No.(s): AD-A431685; MDA972-02-0010; No Copyright; Avail: CASI; A04, Hardcopy

This project was highly successful demonstrating control of carbon nanotube diameter through control of the synthesis process. Mean tube diameter can be preselected from 0.5 to 0.9nm. A sample predominantly semiconducting with two main tubes (7,5 and 8,3), and a sample of smaller (0.5-0.6nm) and mainly metallic tubes were produced. The process also laid the ground for production of the first pure boron nanotubes. In our SWNT synthesis experiments using CO disproportionation at 6 atm and lower pressures, the Co-MCM-41 and Ni-MCM-41 catalysts produced more than 90% selectivity to SWNT with increasing yields as the pressure is increased. The key advantage of our technique is the incorporation of metals into the pore wall of the template, which allows ultra-small metal clusters to be formed and stabilized. These clusters then initiate the growth of highly uniform diameter SWNT. Examples of uniform small diameter SWNT formed with two of our catalysts are shown in Figure 1 below.
DTIC
Carbon Nanotubes; Nanostructure Growth

20050167316 Rochester Inst. of Tech., NY USA
Hybridization of Hyperspectral Imaging Target Detection Algorithm Chains
Grimm, David C.; Messinger, David W.; Kerekes, John P.; Schott, John R.; Apr. 2005; 11 pp.; In English
Report No.(s): AD-A431819; CI04-1027; No Copyright; Avail: CASI; A03, Hardcopy

Detection of a known target in an image has several different approaches. The complexity and number of steps involved in the target detection process makes a comparison of the different possible algorithm chains desirable. Of the different steps involved, some have a more significant impact than others on the final result - the ability to find a target in an image. These more important steps often include atmospheric compensation, noise and dimensionality reduction, background characterization, and detection (matched filtering for this research). A brief overview of the algorithms to be compared for each step will be presented. This research seeks to identify the most effective set of algorithms for a particular image or target type. Several different algorithms for each step will be presented, to include ELM, FLAASll, MNF, PPI, MAXD, the structured background matched filters OSP, and ASD. The chains generated by these algorithms will be compared using the Forest Radiance I HYDICE data set. Finally, receiver operating characteristic (ROC) curves will be calculated for each algorithm chain and, as an end result, a comparison of the various algorithm chains will be presented.
DTIC
Algorithms; Chains; Detection; Imagery; Imaging Techniques; Target Acquisition

20050167438 Army Research Lab., Aberdeen Proving Ground, MD USA
Molecular Simulations of Dynamic Processes of Solid Explosives
Rice, Betsy M.; Sorescu, Dan C.; Kabadi, Vinayak; Agrawal, Paras M.; Thompson, Donald L.; Dec. 2004; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A432102; No Copyright; Avail: Defense Technical Information Center (DTIC)

A variety of molecular dynamics simulations of energetic materials is presented, demonstrating the ability to predict structural and thermodynamic properties of these materials. The studies are also used to explore at an atomic level dynamic processes that might influence conversion of the material to products. These studies are presented to illustrate how information generated through molecular dynamics simulations can be used in the design, development and testing of energetic materials.
DTIC
Explosives; Molecular Dynamics; Simulation

73
NUCLEAR PHYSICS

Includes nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*. For atomic and molecular physics see *72 Atomic and Molecular Physics*. For elementary particle physics see *77 Physics of Elementary Particles and Fields*. For nuclear astrophysics see *90 Astrophysics*.

20050168171 Los Alamos National Lab., NM, USA

Performance of the Multi-pulse X-ray Imaging System for the Pulsed Power Hydrodynamic Experiments at LANL

Obst, A. W.; Fulton, D.; King, N. S. P.; Morgan, D.; Oro, D.; Platts, D.; Sorenson, D. S.; Stelts, M.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 448-453; In English; See also 20050168165; Copyright; Avail: Other Sources

Pulsed power driven cylindrical shock physics experiments are being performed at the PEGASUS facility at Los Alamos National Laboratory. A time dependent, axial x-ray imaging capability forms a subset of the measurements to quantify material behavior during shock propagation. 20 ns pulsed W target X-ray sources with about 10 mR at lm form the back lighter. Inorganic scintillators generate time dependent, visible images, which are relayed to a shuttered, microchannel plate intensifier imaging system coupled to electronic video readouts. The dynamic range, sensitivity, scene contrast, and system spatial resolution are optimized to specific experiments via optimization of fluor response to both X-ray energy and light output time response. In addition, a series of calibration data are taken to permit characterizing density information through pos-tevent image processing. This dataset includes flat field and step wedge images. The fiat field is particularly important due to the relatively large spatial variation in the X-ray dose resulting from the close proximity (60cm) of the source to the imager. Author

X Ray Imagery; Pulse Generators; Hydrodynamics; Laboratory Equipment; Experimentation; Dynamic Range

20050168185 Kumamoto Univ., Japan

Modification of Railgun Plasma Characteristics by Spout Holes on the Bore

Katsuki, S.; Sueda, T.; Akiyama, H.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 256-260; In English; See also 20050168165; Copyright; Avail: Other Sources

In plasma armature railgun, spout holes made on the bore to exhaust some part of plasma is one of possible way to suppress the plasma armature broadening due to wall ablation. This paper describes how the railgun plasma is modified by the spout holes. Mach-Zehnder interferometry using a He-Ne laser enables to obtain the electron density distribution over the plasma armature by a single shot. Electron density distribution in two cases of railguns without and with spout holes were compared. The distribution in case of the railgun without spout holes was mostly obtained and the value was 1.3x10(exp 19)/cc at the most. In case of railgun with spout holes, on the other hand, the distribution was partly missed since the laser beam was deflected due to high density gradient in the plasma. However, the obtained fractional distribution was good enough to see a difference from the other. The high density region was much narrower than that in case without spout holes, namely, the spout holes made the plasma compact.

Author

Plasmas (Physics); Ablation; Armatures; Density Distribution

20050168208 Russian Federal Nuclear Center, Russia

Formation of High-power Electron Beam Pulse

Kormilitsin, A. I.; Diyankov, V. S.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 796-800; In English; See also 20050168165; Copyright; Avail: Other Sources

Development efforts conducted on IGUR-3 accelerator resulted in finding the mode for formation of powerful electron beam with current density on accelerating tube's anode greater than or = 200 kA/sq cm. Operational voltage of the accelerating tube is approx. 6 MV, current approx. 55 kA. Accelerating tube is running in the mode of plasma-filled diode. Focusing of electron beam is attained by means of plasma produced at cathode and anode due to the pre-pulse energy. When running in the bremsstrahlung pulse generation, on the area of anode of approx. l.5 sq cm the yield of bremsstrahlung obtained was approx. 10(exp 3) R/s with pulse duration of approx. 25 ns.

Author

Electron Beams; Pulse Duration; Current Density

20050168244 All-Russian Scientific Research Inst. of Experimental Physics, Nizhni Novgorod, Russia

Experimental study of variable mass liner for soft x-ray generation

Bujko, A. M.; Chernyshev, V. K.; Garanin, S. F.; Gorbachev, Y. N.; Demidov, V. A.; Ivanova, G. G.; Kostyukov, V. N.; Kuznetsov, S. D.; Kuzyaev, A. I.; Mezhevov, A. B., et al.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 177-191; In English; See also 20050168165; Copyright; Avail: Other Sources

High power pulsed energy sources are required to produce large amount of X-rays. The leading role in creation of ultra-high power stationary machines belongs to the US/DOE national laboratories. The machines like 'Pegasus', 'Saturn', 'PBFA-Z' and others have been used for X-ray experiments. PBFA-Z can reach 11.4 MJ of the stored energy. Currently Atlas, storing 36 MJ is being constructed and 'Jupiter' storing 120 MJ is being designed. VNIIEF has made much progress in creation of ultra-high power explosive magnetic generators (EMG). While the hardware can be used only once, such systems allow experiments up to 200 MJ of the stored energy and up to 10(exp 13)W of the power in the load. It is easier to perform studies of high complexity with a wide set of diagnostics on stationary machines. However, as the stored energy increases, the number of elements expended in each experiment becomes so large, that these advantages become less significant. Estimations show that the cost per shot on the stationary machine with the stored energy of approx. 100 MJ is higher than the experiment with EMG. Relatively soft X-rays (quantum energy is about 0.3 keV) may be produced by acceleration of a plasma liner up to a velocity of v approx. 300 km/s followed by stagnation in a pinch. This means that if the plasma acceleration distance is several cm, the time of plasma motion must be about 0.1 of a microsecond. This results in a difficulty, associated with the problem of plasma stability and the liner having very small thickness and very small tolerance on initial thickness and density. Besides, quick energy input into the load requires complicated fast opening switches, which need to be experimentally tested. For experiments with EMG it is reasonable to develop simpler systems to reach mass velocities about 300 km/sec. The paper theoretically considers one of these systems, where a liner mass during its magnetic acceleration significantly decreases and the velocity increases, i.e., a variable mass liner (VML). The same paper suggests two experimental designs to test a new concept: full-scale experiment, including X-rays generation and a model experiment, including testing of the initial stage of VML formation (v less than 100 km/sec).

Author

X Rays; Pulse Generators; Electric Generators; Switches; Plasma Acceleration; Magnetic Fields

20050168266 Lawrence Livermore National Lab., Livermore, CA, USA

LLNL Flash X-ray Radiography Machine (FXR) Double-pulse Upgrade Diagnostics

Ong, Mike; Avalle, Carlos; Richardson, Roger; Zentler, Jan; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 430-435; In English; See also 20050168165; Copyright; Avail: Other Sources

When the FXR machine was first tuned on the 1980's, a minimal amount of diagnostics was available and consisted mostly of power monitors. During the recent accelerator upgrade, additional beam diagnostics were added. The sensor upgrades included beam bugs (resistive wall beam motion sensors) and high-frequency B-dot. Even with this suite of measurement tools, tuning was difficult. For the current Double-Pulse Upgrade, beam transport is a more complex problem--the beam characteristics must be measured better. Streak and framing cameras, which measure beam size and motions, are being added. Characterization of the beam along the entire accelerator is expected and other techniques will be evaluated also. Each sensor has limitations and only provides a piece of the puzzle. Besides providing more beam data, the set of diagnostics used should be broad enough so results can be cross validated. Results will also be compared to theoretical calculations and computer models, and successes and difficulties will be reported.

Author

Radiography; X Rays; Monitors; Mathematical Models

20050168277 Microwave Sciences, Inc., Lafayette, CA, USA

Pulse shortening in high power microwave sources

Benford, James; Benford, Gregory; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 127-134; In English; See also 20050168165; Copyright; Avail: Other Sources

Observations show that the ubiquitous pulse shortening in high power microwave devices arises from formation of plasma, electron streaming, high-E-field breakdown and beam disruption. We review recent experiments in terms of these causes. Linear beam devices exhibit all these mechanisms; in particular beam disruption by ExB drifts in the strong microwave fields and diffusion in turbulent electric fields in background plasma appears common. In many sources the dominant effect is destruction of the resonance between beam and slow wave structure by cathode plasma motion, possibly from water contamination of the surface. Wall plasma effects shorten pulses in most sources. We call for the introduction of improved surface conditioning, cathodes which do not produce plasmas and increased effort on measurements of the high-field and

plasma properties of HPM sources. Because of the broad nature of the phenomena in pulse shortening, we appeal for increased participation in this research by the plasma, intense particle beam and traditional microwave tube communities.
Author
Pulse Generators; Microwaves; Microwave Equipment; Plasmas (Physics)

20050169417 Clemson Univ., SC, USA
Fields and Currents Due to a Modulated Laser Beam Exciting an Array of Narrow Slots
Kustepeli, A.; Martin, A. Q.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1240-1243; In English; See also 20050169243; Copyright; Avail: Other Sources

It is known that a properly modulated laser beam illuminating a conducting surface causes electrons to be emitted in such a way that the resulting electromagnetic radiation is equivalent to that from a distribution of electric dipoles oriented normal to the surface and located on or near the surface. The distribution of these dipoles over the illuminated spot is dictated by the laser-light intensity distribution and their spatial oscillation is controlled by the laser modulation. If an appropriate modulation is used then oscillation will occur at a selected frequency co. The distribution of dipoles, at an angular frequency co, on the conducting surface over a region which is illuminated by a laser beam can be treated as an electromagnetic source in an analysis where one attempts to predict the fields and currents induced on and in the medium around the conducting surface. Derived from text
Laser Beams; Modulation; Oscillations; Electric Dipoles

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OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

20050165721 Pittsburgh Univ., PA, USA
In-Fiber Light Powers Active Fiber Optical Components
Chen, Kevin P.; Photonics Spectra; April 2005; ISSN 0731-1230; Volume 39, No. 4, pp. 78-86, 90; In English; Copyright; Avail: Other Sources

Fiber optic devices such as fiber gratings are key components for optical sensing and communications applications. They offer several important advantages over other optical and electronic techniques, including low manufacturing costs, immunity to electromagnetic fields, long lifetimes, high sensitivity and the ability to work in harsh environments. The small size and low transmission losses of optical fibers enable the deployment of sensor networks for multipoint and long-distance remote sensing. Fiber sensors embedded in structures can provide real-time information on structural deformations. Despite the advantages of purely optical fiber components, their passivity has limited their performance and application. They cannot be reconfigured to adapt to new network topologies. Passive sensor elements do not support active adjustment of sensing parameters such as sensitivity, set point, triggering time, dynamic range and responsivity. To enhance the functionality of fiber optic components, intensive research has been carried out in the past few years, directed toward the development of tunable fiber optic components such as fiber Bragg gratings. Tuning has been accomplished by several mechanisms, including electrical heating, the piezoelectric effect, mechanical stretching and bending, and acoustic modulation. Despite this progress, a common drawback for active fiber components remains: An energy source, an energy delivery mechanism and on-fiber actuators are required to tune the device.
Author (revised)
Fiber Optics; Bragg Gratings; Electric Power Supplies; Infrared Lasers

20050165764 Laurin Publishing Co., Inc., Pittsfield, MA, USA
Adaptive Optics Reveals Details on Galaxy Collisions
Gaughan, Richard, Editor; Photonics Spectra; April 2005; ISSN 0731-1230; Volume 39, No. 4; 3 pp.; In English; Copyright; Avail: Other Sources

The dynamic interaction of galaxies is believed to play a fundamental role in stellar evolution. The compression created in interstellar gas as two galaxies collide can cause shock waves that trigger the formation of stars composed of a different set of constituent atoms. A laboratory experiment to test this hypothesis obviously is out of the question, so astronomers must use the universe as their laboratory. Colliding galaxies are not that easy to come by, however, and some of great interest are

so far away that they are very difficult to image. A new adaptive optics capability at the W.M. Keck Observatory on Mauna Kea in Hawaii is addressing the imaging problem.
Author
Adaptive Optics; Astronomical Observatories; Interacting Galaxies; Infrared Astronomy

20050166389 Du Pont de Nemours (E. I.) and Co., Aiken, SC, USA
Isotopic Hydrogen Analysis via Conventional and Surface-enhanced Fiber Optic Raman Spectroscopy
Lascola, R.; Zeigler, K. E.; McWhorter, C. S.; Tovo, L. T.; Villa-Aleman, E.; 2004; 18 pp.; In English
Report No.(s): DE2004-834245; WSRC-MS-2004-00677; No Copyright; Avail: Department of Energy Information Bridge

This report describes laboratory development and process plant applications of Raman spectroscopy for detection of hydrogen isotopes in the Tritium Facilities at the Savannah River Site (SRS), a U.S. Department of Energy complex. Raman spectroscopy provides a lower-cost, in situ alternative to mass spectrometry techniques currently employed at SRS. Using conventional Raman and fiber optics, we have measured, in the production facility glove boxes, process mixtures of protium and deuterium at various compositions and total pressures ranging from 1000-4000 torr, with detection limits ranging from 1-2% for as low as 3-second integration times. We are currently investigating fabrication techniques for SERS surfaces in order to measure trace (0.01-0.1%) amounts of one isotope in the presence of the other. These efforts have concentrated on surfaces containing palladium, which promotes hydrogen dissociation and forms metal hydride bonds, essentially providing a chemical enhancement mechanism.
NTIS
Hydrogen Isotopes; Fiber Optics; Raman Spectroscopy

20050166892 NASA Ames Research Center, Moffett Field, CA, USA
The 2004 Opposition of Ceres Observed with Adaptive Optics on the VLT
Erard, S.; Frorni, O.; Ollivier, M.; Dotto, E.; Roush, T.; Poulet, F.; Mueller, T.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The close opposition of Ceres in January 2004 has been observed with the NACO adaptive optics system on the VLT. Both imaging and spectroscopy were performed in the 1.1-4.1 m range. Extensive longitudinal coverage was acquired during a three days run, with spatial resolution up to 50 km in imaging mode. The scientific objectives are 1) to provide the first IR map of Ceres; 2) to map possible compositional variations at the surface. Only imaging results are presented here.
Derived from text
Adaptive Optics; Imaging Techniques; Thermal Mapping; Spatial Resolution; Ellipsoids

20050166998 Oklahoma State Univ., Stillwater, OK, USA
Developing OSL Geological Dating Techniques for Use on Future Missions to Mars
Blair, M. W.; Kalchgruber, R.; Deo, S.; McKeever, S. W. S.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923
Contract(s)/Grant(s): 344-36-55-19; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The surface of Mars has been subject to aeolian, fluvial, and periglacial activity in the (relatively) recent past. Unfortunately, chronological dating of recent events on Mars is difficult as the errors associated with crater counting are comparable to younger ages (approx. 1 Ma). Consequently, techniques to quantify the ages of geological processes on Mars have become an important area of research. Optically stimulated luminescence (OSL) dating is one candidate technique for in-situ dating of the deposition of Martian surface sediments. This method can aid in developing a geological and climatic history of the last million years on Mars. The current paper addresses some of the challenges and progress associated with developing OSL as a viable in-situ dating technique for Mars. Some of the challenges include the mineral composition, the effectiveness of solar resetting under Martian conditions, the temperature regime, and determining the natural dose rate on Mars. All of these topics are currently under investigation, and some preliminary results are presented.
Author
Luminescence; Solar Activity; Mars Surface; Mars Environment

20050167001 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Spectral Diversity at Gusev Crater from Coordinated Mini-TES and Pancam Observations

Blaney, D. L.; Bell, James F., III; Cabrol, Nathalie; Christensen, Phil; Farrand, William H.; Ming, Doug; Moersch, Jeff; Ruff, Steve, et al.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

During the last year the Spirit rover has explored Gusev crater with the Athena payload. Two remote sensing instruments collected spectral information at visible (Pancam) and at thermal infrared Mini-TES) wavelengths. Observations for these instruments were coordinated and targeted to determine the mineralogical diversity and identify specific lithologies / end members for detailed investigations with the rest of the payload. Initial results were reported last spring. A wide range of materials have been measured including outcrops, rocks, and soils. Both natural and brushed/ratted rocks and natural and disturbed soils have also been measured permitting investigations of coating and soil structure. As of Jan 9, 2005, over 400 coordinated observations have been made.

Author

Remote Sensing; Cameras; Rocks; Mineralogy; Lithology; Craters; Interferometry

20050167002 Arizona State Univ., Tempe, AZ, USA

Olympus Mons: Inferred Changes in Late Stage Effusive Activity Based on Lava Flow Mapping of Mars Express High Resolution Stereo Camera Data

Bleacher, J. E.; Greeley, D. A.; Bentley, M.; Neukam, G.; Hauber, E., et al.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Our objective is to characterize effusive martian volcanism based on the abundance and temporal relationships of lava flow types. The technique is based on an approach to characterize and contrast the eruptive processes of Kilauea, Mauna Loa, and Mount Etna. We are mapping the flows of Olympus Mons to estimate the percentage of surface flows that were emplaced via lava tubes or channels using ESA s Mars Express High Resolution Stereo Camera (HRSC) data. Results indicate that late stage effusive activity was typified by channel-forming eruptions, while older tube-forming eruptions played a more important role on the north flank than the south flank. Neither flank appears to display point sources fed directly from the magma source.

Author

Fluid Flow; Lava; Magma; Mars Volcanoes; Volcanoes; Cameras

20050167152 Baylor Univ., Waco, TX, USA

Construction of a PZT Sensor Network for Low and Hypervelocity Impact Detection

Carmona, J. A.; Cook, M.; Cooper, M.; Schmoke, J.; Reay, J.; Matthews, L.; Hyde, T.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Orbital debris is a constraint on the long-term health of any spacecraft and must be considered during mission planning. Varying mechanisms have been proposed to quantify the problem. Assessment of orbital debris employing ground-based methods such as radar can help determine where debris clouds are located as well as their density or orbital trajectory. Such data is invaluable to computer simulations and can allow predictions of the debris environment over specific time periods. Accurate in-situ data is essential as well with various types of sensors designed to detect orbital debris impacts employed on space missions since the 1950's. One of the most common of these is the PZT (piezoelectric lead zirconate titanate) which is often used in-situ to measure the momentum of a particle at the time of impact. This paper will discuss a multiple PZT sensor system capable of determining both impactor momentum and location currently in development within CASPER.

Author

Computerized Simulation; Hypervelocity Impact; Lead Zirconate Titanates; Space Debris; Trajectories

20050167298 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Classification of Battlespace Detonations from Temporally Resolved Multi-Band Imagery and Mid-Infrared Spectra

Dills, Anthony N.; Mar. 2005; 280 pp.; In English; Original contains color illustrations

Report No.(s): AD-A431757; AFIT/DS/ENP/05-03; No Copyright; Avail: Defense Technical Information Center (DTIC)

The classification of battlespace detonations, specifically the determination of munitions type and size using temporal and spectral features, has been studied using near-infrared (NIR) and multi-color visible wavelength imagers. Key features from

the time dependence of fireball size are identified for discriminating various types and sizes of detonation flashes. The five classes include three weights of trinitrotoluene (TNT) and two weights of an enhanced mixture, all of which are uncased and detonated with 10% C4. Using Fisher linear discriminant techniques, features are projected onto a line such that the projected points are maximally clustered for the different classes of detonations. Bayesian decision boundaries are then established on class-conditional probability densities. Feature saliency and stability are determined by selecting features that best discriminate while requiring low variations in class-conditional probability densities and high performance in independent testing. The most important and stable feature is the time to the maximum fireball area in the near-infrared wavelength band. Overall, the features related to the time to peak (tmp) of the fireball provide the best classification for each of three a priori conditions. This feature correctly discriminates between TNT and ENE about 90% of the time, whether weight is known or not. The associated class-conditional probability densities separate the two classes with a Fisher ratio of 2.9 and an area under the receiver operating characteristic, AROC, of 0.992. Also, tmp achieves approximately 60% success rate at discerning both weight and type.
DTIC
Classifications; Detonation; Imagery; Infrared Radiation

20050167425 Defence Science and Technology Organisation, Salisbury, Australia
A Review of Registration Capabilities in the Analyst's Detection Support System
Jones, Ronald; Booth, David M.; Perry, Peter G.; Redding, Nicholas J.; Mar. 2005; 37 pp.; In English
Report No.(s): AD-A432083; DSTO-TR-1632; DODA-AR-013-218; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report presents a review and classification of image registration methods that are either currently available in the Analyst's Detection Support System (ADSS) or scheduled for implementation in ADSS in the near future. The aim of this report is to gain an overall understanding of our capabilities in the field of image registration, by identifying key techniques that we are using, highlighting instances where techniques could be reused to augment other methods, and identifying areas of methodology that need further development. In so doing, we aim to gain an understanding of where future work might best be directed in order to meet our current task goals in image registration.
DTIC
Detection; Image Processing; Pattern Registration

20050167854 NASA Langley Research Center, Hampton, VA, USA
Optically Stimulated Electron Emission Contamination Monitor and Method
Welch, Christopher S., Inventor; Perey, Daniel F., Inventor; February 15, 2005; 8 pp.; In English
Patent Info.: Filed 11 Sep. 2003; US-Patent-6,856,403; US-Patent-Appl-SN-662161; NASA-Case-LAR-16091-1; No Copyright; Avail: CASI; A02, Hardcopy

An apparatus and method for performing quality inspections on a test surface based on optically stimulated emission of electrons. In one embodiment, the apparatus comprises a device for producing optical radiation having a plurality of different spectrum lines, selecting at least one of the spectrum lines, and directing the selected spectrum line to the test surface, and circuitry for detecting a current of photoelectrons emitted from the test surface, generating a signal indicative of photoelectron current, and for indicating a condition of quality based on the generated signal indicative of the photoelectron current. In one embodiment, the method comprises producing optical radiation having a plurality of different spectrum lines, selecting at least one of the spectrum lines and directing the selected spectrum line to the test surface, detecting a current of photoelectrons emitted from the test surface and generating a signal indicative of photoelectron current, and indicating a condition of quality based on the generated signal indicative of the photoelectron current.
Official Gazette of the U.S. Patent and Trademark Office
Contamination; Electron Emission; Optical Properties; Stimulated Emission

20050167858 NASA Ames Research Center, Moffett Field, CA, USA
Diffraction-Based Optical Switch
Sperno, Stevan M., Inventor; Fuhr, Peter L., Inventor; Schipper, John F., Inventor; January 25, 2005; 15 pp.; In English
Patent Info.: Filed 18 Jan. 2002; US-Patent-6,847,749; US-Patent Appl-SN-058873; NASA-Case-ARC-14638-1; No Copyright; Avail: CASI; A03, Hardcopy

Method and system for controllably redirecting a light beam, having a central wavelength lambda, from a first light-receiving site to a second light-receiving site. A diffraction grating is attached to or part of a piezoelectric substrate, which

is connected to one or two controllable voltage difference sources. When a substrate voltage difference is changed and the diffraction grating length in each of one or two directions is thereby changed, at least one of the diffraction angle, the diffraction order and the central wavelength is controllably changed. A diffracted light beam component, having a given wavelength, diffraction angle and diffraction order, that is initially received at a first light receiving site (e.g., a detector or optical fiber) is thereby controllably shifted or altered and can be received at a second light receiving site. A polynomially stepped, chirped grating is used in one embodiment. In another embodiment, an incident light beam, having at least one of first and second wavelengths, lambda1 and lambda2, is received and diffracted at a first diffraction grating to provide a first diffracted beam. The first diffracted beam is received and diffracted at a second diffraction grating to produce a second diffracted beam. The second diffracted beam is received at a light-sensitive transducer, having at least first and second spaced apart light detector elements that are positioned so that, when the incident light beam has wavelength lambda1 or lambda2 (lambda1 not equal to lambda2), the second diffracted beam is received at the first element or at the second element, respectively; change in a selected physical parameter at the second grating can also be sensed or measured. A sequence of spaced apart light detector elements can be positioned along a linear or curvilinear segment with equal or unequal spacing. Official Gazette of the U.S. Patent and Trademark Office

Diffraction; Optical Switching; Control Theory

20050168089 NASA Marshall Space Flight Center, Huntsville, AL, USA

Fabrication of Fiber Optic Grating Apparatus and Method

Wang, Ying, Inventor; Sharma, Anup, Inventor; Grant, Joseph, Inventor; March 29, 2005; 8 pp.; In English

Patent Info.: Filed 8 Apr. 2002; US-Patent-6,873,762; US-Patent-Appl-SN-118626; NASA-Case-MFS-31569-1; No Copyright; Avail: CASI; A02, Hardcopy

An apparatus and method for forming a Bragg grating on an optical fiber using a phase mask to diffract a beam of coherent energy and a lens combined with a pair of mirrors to produce two symmetrical virtual point sources of coherent energy in the plane of the optical fiber. The two virtual light sources produce an interference pattern along the optical fiber. In a further embodiment, the period of the pattern and therefore the Bragg wavelength grating applied to the fiber is varied with the position of the optical fiber relative the lens.

Author

Bragg Gratings; Optical Fibers; Coherent Light

20050168193 Los Alamos National Lab., NM, USA

Development of an high pressure diagnostic based on optical raman backscatter measurements in diamond

Rodriguez, G.; Roberts, J. P.; Taylor, A. J.; Gallegos, C. M.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 442-447; In English; See also 20050168165; Copyright; Avail: Other Sources

High pressure diagnostics for pulsed power high energy density physics experiments require time resolved measurements under shock loading conditions with pressures exceeding a megabar. A high pressure diagnostic based on the optical Raman spectrum in oriented crystalline diamond is discussed. By placing the diamond probe in a preferred crystallographic orientation, shock loading due to the pressure wave induces a crystal strain proportional to the applied stress. A strain induced optical frequency shift in the Raman spectrum of diamond is measured temporally with a streak camera to permit real time determination of the pressure wave amplitude. Diamond Raman should provide a first step in achieving a high pressure probe standard for shock loading conditions and large density compression studies exceeding megabar stresses.

Author

Diamonds; High Pressure; Diagnosis; Raman Spectra; Backscattering; Optical Measurement

20050168194 Bechtel Nevada Corp., Los Alamos, NM, USA

Shadowgraph Illumination Techniques for Framing Cameras

Malone, R. M.; Fluer, R. L.; Frogget, B. C.; Sorenson, D. S.; Holmes, V. H.; Obst, A. W.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 454-459; In English; See also 20050168165; Copyright; Avail: Other Sources

Many pulse power applications in use at the Pegasus facility at the Los Alamos National Laboratory require specialized imaging techniques. Due to the short event duration times, visible images are recorded by high-speed electronic framing cameras. Framing cameras provide the advantages of high speed movies of back light experiments. These high-speed framing cameras require bright illumination sources to record images with 10 ns integration times. High-power lasers offer sufficient light for back illuminating the target assemblies; however, laser speckle noise lowers the contrast in the image. Laser speckle noise also limits the effective resolution. This discussion focuses on the use of telescopes to collect images 50 feet away. Both

light field and dark field illumination techniques are compared. By adding relay lenses between the assembly target and the telescope, a high-resolution magnified image can be recorded. For dark field illumination, these relay lenses can be used to separate the object field from the illumination laser. The illumination laser can be made to focus onto the opaque secondary of a Schmidt telescope. Thus, the telescope only collects scattered light from the target assembly. This dark field illumination eliminates the laser speckle noise and allows high-resolution images to be recorded. Using the secondary of the telescope to block the illumination laser makes dark field illumination an ideal choice for the framing camera.
Author
Framing Cameras; High Speed Cameras; Imaging Techniques; Shadowgraph Photography

20050169154 NASA Lewis Research Center, Cleveland, OH, USA
Atomic-Oxygen-Durable Microsheet Glass Reflector
[1995]; 1 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Advanced solar dynamic concentrator concepts being considered by the NASA Lewis Research Center for space power systems include one utilizing microsheet glass coated with silver. For this material, a 5000-angstrom layer of silver is deposited on the back side of a contoured piece of microsheet glass, 0.2-mm thick. The silvered side is then bonded to a contoured aluminum, magnesium, or graphite epoxy face sheet with a space-qualified, pressure-sensitive thin-film adhesive. Experience gained from the development of this technology suggests that this material may reduce the cost and improve the performance of solar dynamic concentrators. This microsheet glass technology provides an effective barrier to atomic oxygen attack and provides the opportunity to utilize silver-reflective coatings in low-Earth-orbit solar dynamic applications.
Author
Solar Collectors; Spacecraft Power Supplies; Optical Materials; Metal Coatings; Silver

20050169291 Osaka Electro-Communication Univ., Japan
Three-Dimensional Analysis of Light-Beam Scattering from Pit and Emboss Marks of Optical Disk Models
Kojima, Toshitaka; Wakabayashi, Kenji; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 882-885; In English; See also 20050169243; Copyright; Avail: Other Sources

Scattering problems of beam waves from various shapes of objects have been analyzed by many research workers. From a practical point of view, the scattering of an optical beam from pit and emboss marks of optical disk models has attracted much attention for achieving higher-density version of conventional CD-ROM type of optical disks. In our previous papers, the two- and three-dimensional analyses of a light beam scattering from arbitrary shapes of pits and pre-grooves of optical disks have been carried out by solving the integral equations. The present paper treats two different shapes of pit and emboss as the marks of recorded signal, i.e., cylinder type and conical trapezoid type. The readout characteristics of sum and differential signals are calculated by solving the three-dimensional integral equation. Moreover, the dependence of those signals on the size of the pit and emboss marks is examined.
Author
Three Dimensional Models; Light Beams; Wave Scattering

20050169315 WaveBand Corp., Torrance, CA, USA
Optically Controlled Scanning Antennas Comprising a Plasma Grating
Manasson, V. A.; Sadovnik, L. S.; Yepishin, V. A.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1228-1231; In English; See also 20050169243
Contract(s)/Grant(s): N00178-96-C-003; DAAB07-96-C-S804; Copyright; Avail: Other Sources

The mainstream developers of electronically or photonically controlled steering antennas employ phased array architectures (PAA) which suffer from high cost and therefore have limited applications. The main challenge is to reduce the cost of the key parts of phased arrays, the phase shifters or the true time delay elements. On that score, the desired progress has not yet been achieved. However, as recently demonstrated, photonically controlled scanning can be achieved even without using the above mentioned discrete elements. In this paper we present two novel architectures for millimeter wave (MMW) scanning antennas controlled by light. They are based on the interaction of MMW, with photonically created electron-hole plasma in a semiconductor medium and are thus radically different from PAAs. The new antennas are expected to be much more cost effective than phased array antennas.
Author
Optical Control; Scanners; Antenna Arrays; Plasmas (Physics); Cost Reduction

20050169380 TRW Antenna Products Center, Redondo Beach, CA, USA

Luneberg Lenses Performance Limitations Due to Fabrication Process

Ingerson, P. G.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 862-865; In English; See also 20050169243; Copyright; Avail: Other Sources

Luneberg lenses are commonly fabricated from a number of constant dielectric concentric shells to approximate the continuous dielectric distribution of the Luneberg lens formula. This paper discusses the relationship between the number of shells and the aperture efficiency as well as the adverse effects that air gaps between layers can have on the lens gain. Author

Dielectrics; Fabrication; Radar Corner Reflectors

20050169423 National Taiwan Univ., Taipei, Taiwan, Province of China

A Method-of-Lines Based Efficient Method for Optical Waveguide Discontinuity Problems

Chou, Yih-Peng; Chang, Hung-chun; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1224-1227; In English; See also 20050169243

Contract(s)/Grant(s): NSC86-2215-E-002-008; Copyright; Avail: Other Sources

By using the Pad6 approximation, an efficient method is proposed for the analysis of the optical waveguide discontinuity problem. The eigenvalue problem of the original formulation based on the method of lines is replaced by a rational function of the characteristic matrix. The computation time and memory are further reduced by adopting the multistep method. Author

Optical Waveguides; Computation; Matrices (Mathematics)

75
PLASMA PHYSICS

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

20050166412 Lawrence Livermore National Lab., Livermore, CA

DIII-D Experiments and Modeling of Core Confinement in Quiescent Double Barrier Plasmas

Casper, T. A.; Burrell, K. H.; Doyle, E. J.; Gohil, P.; Greenfield, C. M.; Oct. 24, 2003; 14 pp.; In English

Report No.(s): DE2004-15009740; UCRL-CONF-200553; No Copyright; Avail: Department of Energy Information Bridge

We continue to explore Quiescent Double Barrier (QDB) operation on DIII-D to address issues of critical importance to internal transport barrier (ITB) plasmas. QDB plasmas exhibit both a core transport barrier and a quiescent, H-mode edge barrier. Both experiments and modeling of these plasmas are leading to an increased understanding of this regime and it's potential advantages for advanced-tokamak (AT) burning-plasma operation. These near steady plasma conditions have been maintained on DIII-D for up to 4s, times greater than 35(tau)(sub E), and exhibit high performance with (beta)(sub N) \g 2.5 and neutron production rates S(sub n) (approx.) 1 x 10(sup 16)s(sup -1). Recent experiments have been directed at exploring both the current profile modification effects of electron cyclotron current drive (ECCD) and electron cyclotron (ECH) heating-induced changes in temperature, density and impurity profiles.
NTIS

Plasmas (Physics); Mathematical Models; Plasma Control

20050167860 Air Force Research Lab., Hanscom AFB, MA USA

Investigation of Ion Beam Neutralization Processes With 2-D and 3-D PIC simulations

Wheelock, Adrian; Cooke, David L.; Gatsonis, Nicholas A.; Dec. 2004; 10 pp.; In English

Contract(s)/Grant(s): F49620-00-1-0278; F49620-03-1-0219; Proj-1010

Report No.(s): AD-A431750; AFRL-VS-HA-TR-2004-1179; No Copyright; Avail: CASI; A02, Hardcopy

While it is common knowledge that ion beams are easily neutralized for both current and charge density using a variety of means, the precise process of neutralization remains unknown. With the increasing importance of electric propulsion, and in particular micropropulsion systems, this question is of significant importance. Additionally, it has bearing on thruster design, space instrument calibration, electrodynamic tethers, and ionospheric research. A review of the present state of knowledge on this topic is presented as well as results from ion beam simulations using 2D and 3D Particle-in-Cell (PlC) codes. We investigate both the early 'filing' problem of the beam starting to move away from the spacecraft and the steady state problem

where the beam encounters a wall at an infinite distance from the spacecraft.
DTIC
Beam Neutralization; Ion Beams; Simulation

20050168169 Forschungszentrum Karlsruhe G.m.b.H., Karlsruhe, Germany
Low-Intensity Laser-Triggering of Rail-Gaps with Magnesium-Aerosol Switching-Gases
Frey, W.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 322-327; In English; See also 20050168165; Copyright; Avail: Other Sources

In this paper a new approach to low-intensity laser-triggering of overvolted, gas-insulated spark gaps is demonstrated. The method is based on the addition of Mg-particles with a diameter of about 100 nm to the switching gas. The spheric particles are suspended in Ar/SF6 and N2/SF6 gas mixtures and illuminated by unfocused nitrogen laser radiation. A laser energy of only a few 100 nJ is required for releasing seed electrons by photoemission from Mg-aerosol particles causing spark-gap ignition with a jitter less than 1 ns.
Author
Magnesium; Aerosols; Nitrogen Lasers; Spark Gaps; Particulates; Electric Pulses

20050168179 Sandia National Labs., Albuquerque, NM, USA
New Developments and Applications of Intense Pulsed Radiation Sources at Sandia National Laboratories
Cook, Don; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 25-36; In English; See also 20050168165; Copyright; Avail: Other Sources

In the past thirty-six months, tremendous strides have been made in x-ray production using high-current z-pinches. Today, the x-ray energy (1.9 MJ) and power (200 TW) output of the Z accelerator (formerly PBFA-II) is the largest available in the laboratory. These z-pinch x-ray sources are being developed for research into the physics of high energy density plasmas of interest in weapon behavior and in inertial confinement fusion. Beyond the Z accelerator current of 20 MA, an extrapolation to the X-1 accelerator level of 60 MA may have the potential to drive high-yield ICF reactions at affordable cost if several challenging technical problems can be overcome. New developments have also taken place at Sandia in the area of high current, mm-diameter electron beams for advanced hydrodynamic radiography. On SABRE, x-ray spot diameters were less than 2 mm, with a dose of 100R at 1 meter in a 40 ns pulse.
Author
Zeta Pinch; Laboratories; Pulsed Radiation; Plasma Accelerators; Electron Beams

20050168187 Siemens A.G. Corporate Technology, Erlangen, Germany
High-Power Low-Pressure Gas Discharge Switches with Internal Magnetic Field Generation
Hartmann, Werner; Romheld, Michael; Teichmann, Joerg; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 308-312; In English; See also 20050168165; Copyright; Avail: Other Sources

A possible solution to the problem of electrode deterioration in high-power gas discharge switches is the application of magnetic fields in order to magnetically sweep the plasma channel over the switch electrodes. Transverse magnetic field configurations have been investigated in low-pressure switches in order to improve the lifetime and extend the switching capabilities. With spiral type electrodes, arc speeds of over 100 km/s have been measured. Although limited to less than 40 kA due to intense plasma-wall interaction, this configuration is well suited for the investigation of fundamental physics concerning arc movement and plasma-electrode interaction in low-pressure gas discharge devices. In a coaxial electrode configuration, a cumulative lifetime of \g 1800 C has been achieved, at a peak current of 100 kA and a pulse duration of 28 microseconds.
Author
Magnetic Fields; Plasma Electrodes; Switches; Electric Pulses

20050168214 Los Alamos National Lab., NM, USA
Overview of the Atlas Project
Trainor, R. J.; Parsons, W. M.; Ballard, E. O.; Bartsch, R. R.; Benage, J. F.; Bennett, G. A.; Bowers, R. L.; Bowman, D. W.; Brownell, J. H.; Cochrane, J. C., et al.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 37-46; In English; See also 20050168165; Copyright; Avail: Other Sources

Atlas is a high energy pulsed power facility under development at Los Alamos National Laboratory to perform high energy-density experiments in support of the Department of Energy's stockpile stewardship responsibility. Its design is

optimized for materials properties and hydrodynamics experiments under extreme conditions. Atlas will be operational in late-1999 and is designed to provide 100 shots per year. The Atlas capacitor bank design consists of a 36-MJ array of 240-kV Marx modules. The system is designed to deliver a peak current of 40-50 MA with a 4-5 microsecond risetime. The Marx modules are designed to be reconfigured to a 480-kV configuration, if needed, for opening switch development. The bank is resistively damped to limit fault currents and capacitor voltage reversal. The system is configured for very low-inductance operation (total inductance approx. 10 nH) to rapidly implode heavy liner loads. An experimental program for testing and certifying prototype components is currently underway. For many applications the Atlas liner will be a nominal 70g aluminum cylinder. Using composite inner layers and a variety of interior target designs, a wide variety of experiments in approx. cm volumes may be performed. These include shock compression experiments up to approx. 3 TPa (30 Mbar), quasi-adiabatic compressions up to 6-fold compression and pressures above 10 TPa, hydrodynamic instability studies in nonlinear and turbulent regimes over multi-cm propagation lengths, experiments with dense plasmas in the so-called high-gamma regime, studies of materials response at very high strains and strain rates, and materials studies in ultrahigh magnetic fields (above 10(exp 3) T).
Author
Pulse Generators; Test Facilities; Laboratories; Electric Pulses; Electric Generators; Plasma Generators

20050168216 Delegation Generale de l'Armement, Gramat, France
Syrinx Technological Program, Developments, and Recent Results
Avrillaud, G.; Bayol, F.; Huet, D.; Foussat, A.; Johan, A.; Kovacs, Francis; Lassalle, F.; Leon, J. F.; Mechenin, J.; Monjaux, P., et al.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 47-58; In English; See also 20050168165; Copyright; Avail: Other Sources

The future of PRS programs is oriented towards very high pulsed power generators of few tens of MJ. At the present moment SATURN and mainly PBFA2-Z are at the door of this range. It may happen that their technologies, even if they produce excellent results, are not easily extrapolable to higher power, in terms of cost, volume and efficiency. From this investigation, one may conclude that meeting requirements of future powerful plasma radiation sources needs to develop new technological concepts, in order to deliver the appropriate power to a Z-pinch load at affordable cost. This is the main motivation of the SYRINX program which was initiated by the French Defense Department in 1993. The Centre d'Etude de Gramat was asked to realize this research and developement program in order to prepare the construction of future large pulsed power facilities for X-rays production which could be used by several customers.
Author
Electric Generators; Plasma Radiation; Radiation Sources; Plasma Generators

20050168239 Mission Research Corp., Albuquerque, NM, USA
Circuit-code Modeling of the PBFA Z for Z-pinch Experiments
Struve, K. W.; Martin, T. H.; Spielman, R. B.; Stygar, W. A.; Corcoran, P. A.; Douglas, J. W.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 162-167; In English; See also 20050168165
Contract(s)/Grant(s): DE-AC04-94AL-85000; Copyright; Avail: Other Sources

The SCREAMER and the TL codes were used to design the z-pinch modification of PBFA II, which is now called Z. In the design phase an equivalent voltage was used to initiate the simulations. Good agreement between the measured waveforms and design simulations has been achieved. Recently, full-circuit, shortened-circuit, and equivalent-circuit simulations have been used. All use a loss model that discards the plasma current in the vacuum magnetically insulated transmission lines (MITL's) at the post hole convolute (PHC). Voltage measurements provide an equivalent voltage which is used as a starting point for four-level circuit and equivalent-circuit simulations. Both full-circuit and shortened-circuit simulations use a four-line model. The thirty-six lines are lumped into four, nine-line equivalent circuits. The full circuit includes the erected Marx bank, the intermediate store water capacitor, the laser-triggered spark gap, the line 1, 2 and 3 pulse forming lines, the coax to biplate transition, the water biplates, the vacuum stack with water and vacuum flares, the MITL's, the PHC, and the z-pinch load. Because of the difficulty in making load current measurements, the model has been used to infer load current and implosion characteristics. The model has also been used to predict optimal pinch load configurations.
Author
Zeta Pinch; Simulation; Plasma Currents; Waveforms

20050168253 Fraunhofer-Inst. fuer Lasertechnik, Aachen, Germany

Investigations of a Radial Multichannel Pseudospark Switch for Currents Higher than Hundred kA

Bergmann, K.; Kiefer, J.; Neff, W.; Lebert, R.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 313-317; In English; See also 20050168165

Contract(s)/Grant(s): BMBF-13N6806; BMBF-13N6036; BMBF-13N6085; Copyright; Avail: Other Sources

A radial multichannel pseudospark switch for currents of several hundred kA is under investigation. In this switch the current is distributed to several discharge channels which are arranged around one common hollow cathode. A parallel ignition of up to 12 discharge channels could be demonstrated. Investigation of the cathode spots reveal that only spots with low erosion appear even if increasing the current per channel above the threshold value of about 50 kA known from single channel switches. In the multichannel switch this low erosion mode is supported by the plasma movement due to magnetic forces. In lifetime tests of more than 200,000 pulse with a peak current of 220 kA, a pulse duration of about 15 microseconds and a repetition rate up to 2 Hz (200.000 As total charge transfer) the erosion was shown to be less than 0.1 micro g/C, which is at least two orders of magnitude lower compared to conventional spark gaps.

Author

Spark Gaps; Switches; Electric Pulses; Plasmas (Physics)

20050168254 Tetra Corp., Albuquerque, NM, USA

Performance of a High Current, Low Pressure Hydrogen Radial Pseudospark Switch

Cravey, W. R.; Devlin, G. L.; Savage, M. E.; Simpson, W. W.; 11th IEEE International Pulsed Power Conference, Volume I; [1997], pp. 318-321; In English; See also 20050168165; Copyright; Avail: Other Sources

Tetra, under contract to Sandia National Laboratory has designed, built, and tested a high current low pressure radial pseudospark switch. The new switch utilizes a diffuse radial discharge (from which the name Radial Pseudospark Switch is derived) which greatly reduces electrode erosion and increased overall life-time. Switch testing was performed in two stages: low current testing at Tetra, and high current testing at Sandia. Low current tests were performed on the switch at voltage levels of 10 - 20 kV, peak currents of over 200 kA, and switched energies of 100 kJ. High currents tests were performed on the Sandia Switch Test Stand at energy levels of greater than 300 kJ and peak currents in excess of 500 kA.

Author

Switches; Electric Discharges; Plasmas (Physics); Electric Pulses

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*.

20050167058 Utah State Univ., Logan, UT, USA, ATK-Thiokol Propulsion, Brigham City, UT, USA

Effects of Incident Electron Fluence and Energy on the Election Yield Curves and Emission Spectra of Dielectrics

Sim, Alec; Dennison, J. R.; Thomson, Clint; January 2005; 1 pp.; In English; Annual American Physical Society March Meeting, 21-25 Mar. 2005, Los Angeles, CA, USA

Contract(s)/Grant(s): NAS8-03082; No Copyright; Avail: Other Sources; Abstract Only

We present an experimental study of evolution of electron emission yields and spectra as a result of internal charge build up due to electron dose. Reliable total, backscattered and secondary yield curves and electron emission spectra for un-charged insulators using a low fluence, pulsed electron beam (= or \h 5 microsec at = or \h 3 nA/sq mm or = or \h 10(exp 5) e/sq mm per pulse) with low energy electron and UV flooding to neutralize the charging between pulses. Quantifiable changes in yield curves are observed due to \h 100 fC/sq mm fluences for several excellent dielectric thin film materials. We find good agreement with a phenomenological argument based on insulator charging predicted by the yield curve; this includes an approximately linear decrease in the magnitude of the yield as incident energies approach the crossover energies and an exponential decrease in yield as accumulated internal charge reduces the landing energy to asymptotically approach a steady state surface charge and unity yield. We also find that the exponential decay of yield curves with fluence exhibit an energy dependent decay constant, alpha(E), over a broad range of incident energies below, between and above the crossover energies. Finally, we present some preliminary physics-based models for this energy dependence and attempt to relate our charging measurements to knowledge of how charge is deposited within the insulator, the mechanisms for charge trapping and transport,

and how the profile of trapped charge affects the transport and emission of charges from insulators.
Author
Dielectrics; Fluence; Electron Flux Density

20050167730 Florida Univ., Gainesville, FL USA
Low Dimensional K(Nb, Ta)O3 Thin Film Structures
Norton, David P.; Mar. 2005; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-1-0508
Report No.(s): AD-A431683; ARO-41885.2-MS; No Copyright; Avail: Defense Technical Information Center (DTIC)

The objective of this project is to investigate the synthesis and properties of thin film and low-dimensional dielectric thin-film structures, focusing on the K(Nb,Ta)O3 system. K(Ta,Nb)O3 is attractive for non-linear optical waveguides and tunable microwave technologies. In this reporting period, the growth and dielectric properties of several oxide materials were examined. This work included asymmetric superlattice structures that were investigated in order to determine the effects of reduced dimensionality on the ferroelectric phase transition and dielectric properties. In order to understand the growth of these structures, the controlled formation of unit cell steps on the KTaO3 substrate surface was investigated. The dielectric properties of doped and undoped K(Ta,Nb)O3 films were also studied. For undoped K(Ta,Nb)O3 films, losses as low as tan delta = 0.03 were realized. In addition, the effect of hole doping via Ti substitution was also investigated. We also investigated properties of related oxides, including CaHfO3 and TiO2 thin films.
DTIC
Thin Films; Dielectrics; Phase Transformations; Ferroelectricity; Microwaves

20050167896 NASA Glenn Research Center, Cleveland, OH, USA
Method for the Production of Nanometer Scale Step Height Reference Specimens
Abel, Phillip B., Inventor; Powell, Anthony, Inventor; Neudeck, Philip G., Inventor; March 22, 2005; 27 pp.; In English
Patent Info.: Filed 17 Jul. 2002; US-Patent-6,869,480; US-Patent-Appl-SN-198668; NASA-Case-LEW-17157-1; No Copyright; Avail: CASI; A03, Hardcopy

Methods are disclosed that provide for structures and techniques for the fabrication of ordered arrangements of crystallographically determined nanometer scale steps on single crystal substrates, particularly Sic. The ordered nanometer scale step structures are produced on the top surfaces of mesas by a combination of growth and etching processes. These structures sometimes referred to herein as artifacts are to enable step-height calibration, particularly suitable for scanning probe microscopes and profilometers, from less than one nanometer (nm) to greater than 10 nm, with substantially no atomic scale roughness of the plateaus on either side of each step.
Official Gazette of the U.S. Patent and Trademark Office
Fabrication; Scale Height; Single Crystals; Crystallography

20050168105
Feasibility Study on the Upgrade of the ISIS microSR Spectrometers
Manolopoulos, S.; French, M.; Gannon, B.; King, P.; Lord, J.; May 28, 2004; 30 pp.; In English
Report No.(s): PB2005-103058; RAL/TR-2004-013; Copyright; Avail: National Technical Information Service (NTIS)

The muon spin research (pSR) instruments at ISIS' would benefit from improvements to their detectors to improve their scientific output and maintain the international leading edge. pSR hosts a variety of techniques that are used to investigate the structure and dynamics of materials at the microscopic level. This is done by implanting well spin-polarized muons to a sample, where they thermalize and subsequently decay at rest to positrons and neutrinos with a characteristic lifetime of 2.2 ps . The detection of the positron emission intensity as a function of time is used to determine the evolution of the muon spin polarization inside the sample. This allows the muons to act like miniature magnets that probe local microscopic domains with atomic precision. The positron detection is conventionally done by arrays of scintillators arranged around the sample in two concentric rings that detect the forward/backward emitted positrons.
NTIS
Spectrometers; Detectors; Feasibility

20050169416 Queens Univ., Kingston, Ontario, Canada
An Active Transversal Filter MMIC for Very High Speed Lightwave Systems
Jamani, Y.; Freundorder, A. P.; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1232-1235; In English; See also 20050169243; Copyright; Avail: Other Sources

An equalizer using cascode MESFET's in a distributed structure has been designed for pulse shaping data in high speed lightwave systems. Pulse shaping is accomplished by controlling the gain of each individual cascode stage separately in the distributed circuit. The circuit was fabricated in a microwave monolithic integrated circuit (MMIC) implementation using Nortel's 0.8 microns GaAs MESFET technology. Frequency response measurements demonstrate that the bandwidth can be controlled up to 8 GHz. Eye pattern measurements demonstrate the ability to control the pulse shape at 5 Gb/s.
Author
Integrated Circuits; Microwave Circuits; Fabrication

80
SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula. For specific topics in these areas see *categories 81 through 85*.

20050167023 Raytheon Information Technology and Scientific Services, Moffett Field, CA, USA
Students and Teachers Help Scientists on Mars
Bowman, C. D.; Aubin, B.; Bebak, M.; Smith, C.; Stocco, K.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Program Description: As the Mars Rovers initial 90 sols drew to an end in April/May 2004, so did the student-scientist research program, the Athena Student Interns Program (ASIP). The program was designed to allow high school students to get personally involved in the Mars Exploration Rover mission. It consisted of 13 teams, each composed of one high school teacher and two students, as well as a scientist-mentor who engaged the team in Mars research. To prepare for their participation, students and teachers attended teleconferences on various subjects relating to the mission, worked with their scientist mentors, and shared what they were learning through outreach activities targeting both schools and communities. Each team visited the Jet Propulsion Laboratory twice, once to participate in an operational test as a whole team and as part of landed operations. For this second visit each team made the week-long trip as an individual unit and played a small but important role alongside their mentors as scientific investigations were carried out on the surface of Mars.
Derived from text
Education; Students; Roving Vehicles; Research; Mars Surface

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ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20050166916 General Accounting Office, Washington, DC, USA
Survey of NASA's Lessons Learned Process
Li, Allen; September 05, 2001; 18 pp.; In English
Report No.(s): GAO-01-1015R; No Copyright; Avail: CASI; A03, Hardcopy

You asked us to assess whether the National Aeronautics and Space Administration (NASA) has adequate mechanisms in place to ensure that past lessons learned from mission failures are being applied. As part of your request, you asked that we provide the results of our survey regarding the collection and sharing of lessons learned by NASA program and project managers. This letter provides the results. We plan to issue a more detailed report on the effectiveness of NASA's lessons learned process early next calendar year. As part of our assessment of NASA's effectiveness in applying lessons learned, we surveyed all of NASA's program and project managers to obtain their perspectives on (1) the collection, access, and use of lessons learned, (2) the strengths and limitations of current NASA's lessons learned processes, procedures, and systems, including the Lessons Learned Information System (LLIS), (3) the challenges or barriers to the sharing of lessons learned, and (4) suggested areas of improvement. This represented 192 managers overseeing about 240 programs and projects. On August 6 and 8, 2001, we briefed your staff on the results of our survey and this report summarizes those results. The briefing slides are included as enclosure I. We conducted our work from September 2000 through July 2001 in accordance with generally accepted government auditing standards. Enclosure II describes our objectives, scope and methodology.
Author
NASA Programs; Project Management; Management Methods; Surveys; Congressional Reports

20050167080 National Academy of Engineering, Washington, DC, USA

Accident Precursor Analysis and Management: Reducing Technological Risk Through Diligence

Phimister, James R., Editor; Bier, Vicki M., Editor; Kunreuther, Howard C., Editor; [2004]; 206 pp.; In English

Contract(s)/Grant(s): NNA04CC16G

Report No.(s): LC-2004110743; Copyright; Avail: CASI; A10, Hardcopy

Almost every year there is at least one technological disaster that highlights the challenge of managing technological risk. On February 1, 2003, the space shuttle Columbia and her crew were lost during reentry into the atmosphere. In the summer of 2003, there was a blackout that left millions of people in the northeast USA without electricity. Forensic analyses, congressional hearings, investigations by scientific boards and panels, and journalistic and academic research have yielded a wealth of information about the events that led up to each disaster, and questions have arisen. Why were the events that led to the accident not recognized as harbingers? Why were risk-reducing steps not taken? This line of questioning is based on the assumption that signals before an accident can and should be recognized. To examine the validity of this assumption, the National Academy of Engineering (NAE) undertook the Accident Precursors Project in February 2003. The project was overseen by a committee of experts from the safety and risk-sciences communities. Rather than examining a single accident or incident, the committee decided to investigate how different organizations anticipate and assess the likelihood of accidents from accident precursors. The project culminated in a workshop held in Washington, D.C., in July 2003. This report includes the papers presented at the workshop, as well as findings and recommendations based on the workshop results and committee discussions. The papers describe precursor strategies in aviation, the chemical industry, health care, nuclear power and security operations. In addition to current practices, they also address some areas for future research.

Author

Safety Management; Conferences; Risk

20050167105 General Accounting Office, Washington, DC, USA

National Aeronautics and Space Administration: Significant Actions Needed to Address Long-standing Financial Management Problems

Kutz, Gregory D.; Li, Allen; [2004]; 27 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

NASA has fundamental problems with its financial management operations that not only affect its ability to externally report reliable information, but more important, hamper its ability to effectively manage and oversee its major programs, such as the space station and the shuttle program. NASA s financial audits during the 1990s masked serious problems with its financial management operations that continue today. Specifically, from 1996 through 2000, NASA was one of the few agencies to be judged by its independent auditor at the time, Arthur Andersen, as meeting all of the federal financial reporting requirements. However, our work at NASA during this same period told a different story. During this period, we issued a wide range of reports that detailed the agency s difficulties associated with (1) overseeing its contractors and their financial and program performance, (2) controlling program costs and producing credible cost estimates, and (3) supporting the amounts that it had reported to the Congress as obligated against statutory spending limits for the space station and related space shuttle support. We also concluded, based on work we performed related to a misstatement in NASA's fiscal year 1999 financial statements, that Arthur Andersen s work did not meet professional standards, and we questioned NASA management s and its auditor's determination that the agency's systems substantially complied with federal standards. The results of NASA s fiscal year 2003 financial statement audit confirm that NASA's financial management problems continue today. NASA's independent auditor, Pricewaterhouse Coopers (PwC), disclaimed an opinion on NASA s fiscal year 2003 financial statements; reported material weaknesses in internal controls; and for the third straight year, concluded, just as we reported in November 2003,1 that the agency's new financial management system did not comply with the requirements of the Federal Financial Management Improvement Act of 1996 (FFMIA). Although NASA attributed the auditor's disclaimer of opinion to the agency's implementation of a new financial management system, many of the reported problems were long-standing issues not related to implementation of the new system.

Derived from text

Financial Management; NASA Programs; Project Management

20050167121 General Accounting Office, Washington, DC, USA

Before the Subcommittee on Government Efficiency, Financial Management and Intergovernmental Relations, Committee on Government Reform, House of Representatives. Leadership and Systems Needed to Effect Financial Management Improvements

Kutz, Gregory D.; Li, Allen; [2002]; 12 pp.; In English

Report No.(s): GAO-02-551T; No Copyright; Avail: CASI; A03, Hardcopy

For the past 5 years NASA was one of the few agencies to be judged by its auditors as meeting all of the federal financial reporting requirements - an unqualified opinion on its financial statements, no material internal control weaknesses, and financial management systems that are in substantial compliance the requirements of the Federal Financial Management Improvement Act (FFMIA). This implied that NASA not only could generate reliable information once a year for external financial reporting purposes but also could provide accurate, reliable information for day-to-day decision-making. In contrast with the unqualified or 'clean' audit opinions of its previous auditor, Arthur Andersen, for fiscal years 1996 through 2000, NASA's new independent auditor, PricewaterhouseCoopers, disclaimed an opinion on the agency's fiscal year 2001 financial statements because of significant internal control weaknesses. PricewaterhouseCoopers also concluded that NASA's financial management systems do not substantially comply with the requirements of FFMIA. Although the auditor's report draws attention to the issue, NASA's financial management difficulties are not new. NASA has been on GAO's High-Risk list for contract management since 1990, in part, because the agency has failed to successfully implement a modern, integrated financial management system, which is central to producing accurate and reliable financial information needed to support contract management.

Author

Congressional Reports; NASA Programs; Financial Management; Management Methods

20050167711 General Accounting Office, Washington, DC, USA

Testimony Before the Columbia Accident Investigation Board. NASA: Major Management Challenges and Program Risks

Li, Allen; [2003]; 17 pp.; In English

Report No.(s): GAO-03-849T; No Copyright; Avail: CASI; A03, Hardcopy

Since its inception, NASA has undertaken numerous programs that have greatly advanced scientific and technological knowledge. As you are aware, NASA's activities span a broad range of complex and technical endeavors. But the agency is at a critical juncture, and major management improvements are needed. In January of this year, we identified four challenges facing NASA: 1) Strengthening strategic human capital management; 2) Improving contract management; 3) Controlling International Space Station costs; 4) Reducing space launch costs. Weak contract management and financial controls pose risks across the agency. Therefore, we have placed this area on our high-risk list. In summary, these challenges affect NASA's ability to effectively run its largest programs. NASA's ultimate challenge will be in tackling the root problems impeding those programs. This will require (1) Instituting a results-oriented culture that fosters knowledge sharing and empowers its workforce to accomplish programmatic goals; (2) Ensuring that the agency adheres to management controls to prevent cost overruns and scheduling problems; (3) Transforming the financial management organization so it better supports NASA's core mission; (4) Sustaining commitment to change.

Author (revised)

Congressional Reports; NASA Programs; Risk; Management Methods; Project Management

20050167712 General Accounting Office, Washington, DC, USA

Summary Report to the Committee on Commerce, Science and Transportation, US Senate, and the Committee on Science, House of Representatives. Business Modernization: NASA's Challenges in Managing Its Integrated Financial Management Program

November 2003; 17 pp.; In English

Report No.(s): GAO-04-255; No Copyright; Avail: CASI; A03, Hardcopy

The National Aeronautics and Space Administration's (NASA) activities encompasses a broad range of complex and technical endeavors - from investigating the composition and resources of Mars to providing satellite and aircraft observations of Earth for scientific and weather forecasting purposes. Over the past decade, NASA has advanced space exploration, scientific knowledge, and international cooperation, and has accomplished unparalleled feats of engineering. More than two-thirds of NASA's workforce is made up of contractors and grantees, and 90 percent, or roughly $13 billion, of NASA's annual budget is spent on work performed by its contractors. Yet since 1990, we have identified NASA's contract management as a high-risk area - in part because the agency has failed to implement a modern, fully integrated financial management system. The lack of such a system has hampered NASA's ability to oversee contracts, control program costs, and ensure an effective human capital strategy - raising serious concerns about NASA's management of its largest and most costly programs, including the space shuttle program and the International Space Station. In April 2000, NASA initiated its third and most recent effort to implement an effective financial management system - the Integrated Financial Management Program (IFMP). Through IFMP, NASA plans to replace the separate and incompatible financial management systems used by NASA's 10 centers with one integrated system. The new system is expected to provide better decision data, consistent information across

centers, and improved functionality, thereby improving agencywide management of NASA's resources. However, 3 years into the development of IFMP - with significant investment already made in the program - we found that NASA's acquisition strategy has increased the risk that the agency will implement a system that will cost more and do less than planned. As a result, the Congress requested reviews of IFMP in three areas: enterprise architecture, financial reporting, and program cost and schedule control. This report provides a summary of the results of these reviews.
Author (revised)
NASA Programs; Management Systems; Contract Management; Financial Management; Congressional Reports

20050167714 General Accounting Office, Washington, DC, USA
Results Act: Observations on NASA's May 1997 Draft Strategic Plan
July 22, 1997; 34 pp.; In English
Report No.(s): GAO/NSIAD-97-205R; B-277470; No Copyright; Avail: CASI; A03, Hardcopy

Our overall objective was to review and evaluate the latest version of NASA's draft strategic plan. Specifically we (1) assessed the draft plan's compliance with the act's requirements and its overall quality; (2) determined if NASA's key statutory authorities were reflected; (3) identified whether decisions about crosscutting functions and interagency involvement were included; (4) determined if the draft plan addressed major management problems; and (5) discussed NASA's capacity to provide reliable information about its operations and performance. Our overall assessment of NASA's draft plan was generally based on our knowledge of NASA's operations and programs, our numerous reviews of the agency, and other existing information available at the time of our assessment. We conducted our assessment between June 13, and July 11, 1997, in accordance with generally accepted government auditing standards. We based our assessment on the May 1997 draft strategic plan that NASA provided to the House of Representatives congressional staff team working with the agency. However, we did not examine other related planning documents or examine the strategic plans prepared by NASA's four enterprises: Mission to Planet Earth, Aeronautics and Space Transportation Technology, Human Exploration and Development of Space, and Space Science. NASA considers these enterprises to be its four principal business units, and each enterprise has developed its own strategic plan to supplement the overall NASA plan. The Results Act anticipated that it may take several planning cycles to perfect the process and that the final plan would be continually refined as various planning cycles occur. Thus, our comments reflect a snapshot status of the plan at a given point in time. We recognize that developing a strategic plan is a dynamic process and that NASA is continuing to revise the draft with input from OMB, congressional staff, and other stakeholders.
Author (revised)
Congressional Reports; NASA Programs; Management Planning

20050169209 General Accounting Office, Washington, DC, USA
Space Station: Inadequate Planning and Design Led to Propulsion Module Project Failure. Report to Congressional Requesters
June 2001; 21 pp.; In English; Original contains black and white illustrations
Report No.(s): GAO-01-633; No Copyright; Avail: CASI; A03, Hardcopy

The National Aeronautics and Space Administration (NASA) faces many challenges in developing and supporting the International Space Station. These challenges, such as Russian difficulty in completing its components on schedule, led NASA to pursue development of a U.S. propulsion capability for the space station to serve as an alternative to the planned Russian capability. In 1998, NASA accepted a proposal from Boeing Reusable Space Systems for a U.S. propulsion module. NASA's initial effort to develop this module was not successful in meeting the program's performance, cost, and schedule goals. The effort failed to produce a design that met mission requirements, increased its estimated cost by $265 million (from $479 to $744 million), and slipped its schedule by about 2 years. NASA eventually canceled the program and initiated a follow-on effort. Although the follow-on propulsion module has since been terminated due to projected cost increases in the space station as a whole, we analyzed the initial propulsion module project to help NASA avoid similar problems in the future. Specifically, we assessed NASA's processes for program planning and ensuring that the proposed design met technical requirements. In addition, this report describes NASA's evaluation of alternative approaches for the follow-on propulsion module effort and the results of NASA's lessons learned studies from the failed initial program. We have reported separately on NASA's decision to develop the initial propulsion module under the Boeing space station prime contract.
Author (revised)
International Space Station; NASA Space Programs; Project Planning; Launch Vehicles; Government Procurement

20050169421

The International Telecommunications Union

IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997]; See also 20050169243; Copyright; Avail: Other Sources

The International Telecommunication Union (ITU) is the oldest specialized agency of the United Nations, far older, in fact, than the UN itself. This year, the ITU is marking its 132nd anniversary, having been established as the International Telegraph Union in 1865. The ITU has changed considerably over the past 132 years and today, it is continuing to transform itself to meet the needs of its membership. The ITU is unique in the sense that while it is first and foremost an inter-governmental organization, it very much is a partnership between the public and private sectors. Indeed, given the explosive growth occurring in the telecommunication sector and the transformations occurring around the world, this partnership is its very strength. And radio-communications is playing an ever increasing role in the technological evolution which we are witnessing. This presentation will review briefly the history of the ITU, the recent changes in its structure and functioning and measures being considered to further adapt the ITU to the changing telecommunication environment.

Author

Radio Communication; Organizations

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*.

20050165781 National Inst. of Information and Communications Technology, Japan

Mechanisms of Dynein Functions as Information Processing Devices

Sakakibara, Hitoshi; Review of the National Institute of Information and Communications Technology, Volume 50, Nos. 3/4; September/December 2004, pp. 17-24; In Japanese; See also 20050165771; Copyright; Avail: Other Sources

We study mechanisms of motor-protein functions to find sources of new technology of information processing devices. I introduce here our recent results of the functions of flagellar dynein, which generate the force of flagellar beating of eukaryote and function as oscillator. We succeeded to measure the motility of single molecules of inner-arm dynein subspecies c (dynein c) and found that dynein c is a single headed processive motor, which is capable to move on protein filament without detachment in multiple steps. We also revealed new structure details of dynein c by using negative staining electron microscopy and single particle image analysis. In the work, we compared the structures of pre- and post-power stroke of dynein c and indicated aspects of dynein power-stroke. These evidences are very important to clarify the mechanisms of dynein functions.

Derived from text

Information Systems; Image Analysis; Molecules; Proteins; Data Processing

20050166380 Kentucky Univ., KY, USA, Science Applications International Corp., USA

Robust Requirements Tracing via Internet Search Technology: Improving an IV and V Technique, Phase 2

Hayes, Jane; Dekhtyar, Alex; February 13, 2004; 34 pp.; In English

Contract(s)/Grant(s): NAG5-12868

Report No.(s): UK-NASA-04001-Phase-2; No Copyright; Avail: CASI; A03, Hardcopy

There are three major objectives to this phase of the work. (1) Improvement of Information Retrieval (IR) methods for Independent Verification and Validation (IV&V) requirements tracing. Information Retrieval methods are typically developed for very large (order of millions - tens of millions and more documents) document collections and therefore, most successfully used methods somewhat sacrifice precision and recall in order to achieve efficiency. At the same time typical IR systems treat all user queries as independent of each other and assume that relevance of documents to queries is subjective for each user. The IV&V requirements tracing problem has a much smaller data set to operate on, even for large software development projects; the set of queries is predetermined by the high-level specification document and individual requirements considered as query input to IR methods are not necessarily independent from each other. Namely, knowledge about the links for one requirement may be helpful in determining the links of another requirement. Finally, while the final decision on the exact form of the traceability matrix still belongs to the IV&V analyst, his/her decisions are much less arbitrary than those of an Internet search engine user. All this suggests that the information available to us in the framework of the IV&V tracing problem can be successfully leveraged to enhance standard IR techniques, which in turn would lead to increased recall and precision. We

developed several new methods during Phase II; (2) IV&V requirements tracing IR toolkit. Based on the methods developed in Phase I and their improvements developed in Phase II, we built a toolkit of IR methods for IV&V requirements tracing. The toolkit has been integrated, at the data level, with SAIC's SuperTracePlus (STP) tool; (3) Toolkit testing. We tested the methods included in the IV&V requirements tracing IR toolkit on a number of projects.
Derived from text
Information Retrieval; Internets; Computer Programs

20050166399 General Accounting Office, Washington, DC
Information Security: Securities and Exchange Commission Needs to Address Weak Controls Over Financial and Sensitive Data
Mar. 2005; 34 pp.; In English
Report No.(s): PB2005-104950; GAO-05-262; No Copyright; Avail: CASI; A03, Hardcopy

The Securities and Exchange Commission (SEC) relies extensively on computerized systems to support its financial and mission-related operations. As part of the audit of SEC's fiscal year 2004 financial statements, GAO assessed the effectiveness of the commission's information system controls in protecting the integrity, confidentiality, and availability of its financial and sensitive information.
NTIS
Information Systems; Security

20050167234 Brown Univ., Providence, RI USA
Monitoring and Mining Data Streams
Zdonik, Stanley B.; Oct. 2004; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-02-2-0048
Report No.(s): AD-A431589; No Copyright; Avail: CASI; A02, Hardcopy

This work is preliminary since funding for this piece was only received 6 months ago. We have so far managed to complete a revision of the Borealis code base making it much more usable for general applications. We have worked closely with personnel from USARIEM to identify special processing needs for PAN's in a WPSM setting and have redesigned major portions of the Borealis code base to reflect this. It takes a novel position with respect to dealing with failure in a sensor network. The Aurora stream processing engine was a very valuable exercise to gain understanding about the basic technical questions that must be addressed by any stream processing engine. These issues included memory management, tuple scheduling, and load control. Aurora was designed to run on a single server, and its primary optimization goal was low-latency processing. This set of assumptions was chosen because it gave us the best opportunity to study the fundamentals, and it was useful for a large class of monitoring applications.
DTIC
Data Flow Analysis; Data Mining; Data Processing

20050167262 Illinois Univ., Chicago, IL USA
Energy-Efficient TDMA For Sensor Fusion
Yao, Y.; Giannakis, G. B.; Dec. 2004; 3 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-2-0011
Report No.(s): AD-A431659; No Copyright; Avail: Defense Technical Information Center (DTIC)

We consider the problem of minimizing the energy needed for data fusion in a large scale sensor network by varying the transmission times assigned to different sensor nodes. The optimal scheduling protocol is derived. based on which. we develop a low-complexity inverse-log scheduling algorithm that achieves near-optimal energy efficiency. To eliminate the communication overhead required by centralized scheduling protocols. we also develop a distributed inverse-log protocol that is applicable to networks with a large number of nodes. Simulations demonstrate that this distributed scheduling protocol achieves substantial energy savings over uniform time division multiple access protocol.
DTIC
Multisensor Fusion; Time Division Multiple Access

20050167297 Army War Coll., Carlisle Barracks, PA USA
A Way to Operationalize the DOD's Critical Infrastructure Protection Program Using Information Assurance Policies and Technologies
Friedman, Arthur R.; Mar. 2005; 35 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431755; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Department of Defense (DoD) Defense Critical Infrastructure Protection Program has recently reorganized under the Office of the Assistant Secretary of Defense for Homeland Defense under the Under Secretary of Defense for Policy. Requirements have been set forth in DoDD 3020.ff Defense Critical Infrastructure which is in final coordination and is anticipated to be published later this fiscal year. This policy states that Defense Critical Infrastructure and non-DoD infrastructures are essential to planning mobilizing deploying and sustaining military operations within the U.S. as well as globally shall be available when required. Today's Combatant Commanders do not have the ability to quickly and efficiently share information that identifies critical infrastructure assets and single points of failure to prevent physical or cyber attacks from impairing the Global Information Grid. The intent of this paper is to provide a construct to Operationalize the DoD's Critical Infrastructure Protection Program through the use of Information Assurance policies methodologies and technologies and to identify strategic implications of vulnerabilities to the Combatant Commander and supporting agencies.
DTIC
Policies; Protection

20050167302 Texas Univ., Austin, TX USA
Strategic Partnership for Research in Nanotechnology (Spring)
Barbara, Paul F.; Jan. 2005; 5 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0272
Report No.(s): AD-A431780; AFRL-SR-AR-TR-05-0144; No Copyright; Avail: CASI; A01, Hardcopy

SPRING is rapidly building a network of shared centers that will propel this region to the forefront of nanotechnology research. SPRING is achieving this through the development of intellectual and experimental centers for nanotechnology research that enable research collaborations both internal and external to the SPRING partnership, and instrumentation usage by companies and other universities throughout the state. FY2003 funding of SPRING was a significant first step but funding in subsequent years has been and will continue to be necessary to build an effective infrastructure and to effectively operate the SPRING network of collaborations. SPRING complements recent major nanotechnology initiatives in other state, and will help Texas and the nation lead in the race for scientific and technological breakthroughs and product commercialization. By establishing SPRING, the participating universities are leveraging their combined capabilities and minimizing the cost of equipment necessary to advance the state of the art of nanotechnology. Significant funding for SPRING began in FY03. In 2004-2005, the collaboration will add the University of Texas at Arlington as the fourth partner and spin off a project called Nano at the Border with our two border sister campuses, the University of Texas at Brownsville and the University of Texas Pan American.
DTIC
Computer Networks; Nanotechnology

20050167347 Sandia National Labs., Albuquerque, NM USA
Advanced Decision Support System (ADSS) for Spiral Technology Investments
Chapman, Leon D.; Elmore, Mark T.; Homan, Rossitza A.; Treadwell, Jim D.; Boyack, Kevin; Chamberlin, Phil; Minsk, Brian; Dec. 2004; 3 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431928; No Copyright; Avail: Defense Technical Information Center (DTIC)

Decisions related to spiraling forward technologies to the warfighter are complex. There is a myriad of technologies and strategies, a large number of shareholders with related information, and capabilities are spread across U.S. Army, other DoD laboratories, other government and private Federally Funded Research and Development Centers (FFRDCs), and academia. The Advanced Decision Support System (ADSS) offers a mechanism for bringing together data that is distributed in location, diverse in content, and disparate in format. ADSS provides access to appropriate data, mechanisms for coalescing the data, tools for refining the data, and visualizations for human understanding of the data. ADSS provides effective means for gaining spiral technology investment insights and enhancing spiral technologies and R&D decision-making support.
DTIC
Decision Support Systems; Information Transfer

20050167348 Army War Coll., Carlisle Barracks, PA USA
Information Technology - Information Overload for Strategic Leaders
Cotton, Anthony J.; Mar. 2005; 33 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431929; No Copyright; Avail: Defense Technical Information Center (DTIC)

Technology has provided senior leaders with a plethora of 'battlefield' information literally at their fingertips. Thousands

of miles from the fight, 'reachback' capability has provided senior leaders near real time information in the decision-making process. With the advent of technology, information has grown from an insightful strategic leadership tool to one that has burdened leaders with information overload. The tradeoff of this proliferation of information is the possibility of increased stress for Soldiers, Sailors, Airmen and Marines as well as the blending of operational and tactical levels of war. Information technology has also eroded the concept of centralized control and decentralized execution. This paper seeks to identify weaknesses associated with information technology and increase the awareness of its undesired effects. The paper will first describe systems essential to network - centric warfare and then transition to the drawbacks information overload, a product of network -centric warfare has on operators, senior leaders and organizations. It will conclude with considerations needed to ensure information technology is seen as a commodity and not a detriment.
DTIC
Decision Making; Information Systems; Information Transfer

20050167356 Defence Science and Technology Organisation, Salisbury, Australia
Coalition Theatre Logistics (CTL) Advanced Concept Technology Demonstration (ACTD) Architecture Overview
Kuster, Egon; Dec. 2004; 34 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431949; DSTO-TN-0607; DODA-AR-013-302; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper gives a basic background to the Coalition Theatre Logistics (CTL) Advanced Concept Technology Demonstration (ACTD) program and details the proposed information sharing architecture to be used therein. Outlined are the main components of the CTL architecture and how each component interacts with the others. Although the architecture outlined in this document has been developed specifically for the logistics space, it could also be adapted for use within other distributed information sharing projects. The architecture addresses issues with releasing data into coalition environments, transferring and transforming data between national environments and providing coalition planning and information services.
DTIC
Information Retrieval; Information Systems; Logistics

20050167357 Defence Research and Development Canada, Ottawa, Ontario Canada
Secure Access Management: A Cots-Based Proof-Of-Concept
Zeber, S.; Magar, A.; Dec. 2004; 3 pp.; In English; Original contains color illustrations
Report No.(s): AD-A431950; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper describes the successful demonstration of secure policy-based authorization using commercial products in a content-based information security architecture.
DTIC
Management Information Systems; Proving; Security

20050167382 Army Research Lab., Adelphi, MD USA
Balancing Technology and Risk in the Future Combat Systems
Mait, Joseph N.; Dec. 2004; 9 pp.; In English
Report No.(s): AD-A431995; No Copyright; Avail: Defense Technical Information Center (DTIC)

While all the lessons of Operation Iraqi Freedom will not be known for some time, one already seems clear: large, well-armed ground forces are still needed for many expeditionary wars. Heavy U.S. Army forces, however, still lack the capacity to deploy overseas swiftly enough to wage these wars. The result is a deficiency in the capacity of U.S. military forces to prosecute modern wars in distant areas. This will be especially true for wars in which air power is not a cure-all and major ground combat operations must be launched. Addressing the problem of slow Army deployment rates, the Army Transformation Roadmap 2003 states the goal of transformation is to 'identify and build required capabilities now and while developing future force capabilities essential to provide relevant, ready, responsive, and dominant land power to the Future Joint Force.' Indeed, one aspect of the Army's transformation efforts is force redesign to develop an active component capable of deploying a responsive, agile expeditionary force in the first fifteen days of an operation.
DTIC
Armed Forces (United States); Balancing; Combat; Risk; Warfare

20050167384 George Mason Univ., Fairfax, VA USA

Information Age Warfare - Intelligent Agents in the Classroom and the Strategic Analysis Center

Bowman, Michael; Tecuci, Gheorghe; Boicu, Mihai; Comello, Jerome; Dec. 2004; 9 pp.; In English

Contract(s)/Grant(s): F30602-00-2-0546; F49620-00-1-0072

Report No.(s): AD-A431997; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper presents a unique research and development project conducted over the past four years by the George Mason University (GMU) Learning Agents Center (LAC) and the U.S. Army War College. This research synergistically integrates cutting edge artificial intelligence research, military strategy research, and the practical use of agents in strategic analysis and education in the context of Information Age Warfare and Network- Centric Operations. This research has produced a collaborative assistant for rapid knowledge formation (RKF) and reasoning, called Disciple-RKF. Disciple-RKF enables a team of subject matter experts who do not have prior knowledge engineering experience to rapidly build and use intelligent knowledge-based agents, with limited assistance from a knowledge engineer. Each subject matter expert teaches a personal Disciple-RKF agent while collaborating with it in solving specific problems. During this process, each Disciple-RKF agent learns from its expert and builds its knowledge base. These knowledge bases are then merged into an integrated knowledge base for Disciple-RKF. Disciple-RKF has been successfully applied to develop knowledge-based agents for military center of gravity analysis which have been used in the curriculum of the US Army War College.

DTIC

Knowledge Based Systems; Warfare

20050167385 Lockheed Martin Advanced Technology Labs., Cherry Hill, NJ USA

Shared Situation Awareness for Networked Dismounted Soldiers

Barry, Kevin; Stoneking, Craig; Carpenter, Cyndi; Goselin, Karen; Dec. 2004; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A431998; No Copyright; Avail: Defense Technical Information Center (DTIC)

The effectiveness of the network-edge dismounted soldier is maximized when the soldier acts as both a consumer and producer of Situation Awareness (SA) data within the larger tactical network. Providing this degree of information sharing in a tactical military environment presents unique technical challenges. This paper will discuss the design of a prototype demonstration system, jointly planned by the Army's Electronics Research Development and Engineering Center (CERDEC) and Lockheed Martin's Advanced Technology Laboratories (ATL), that integrates CERDEC's C2MINCS tactical information sharing framework, and ATL's data fusion and Grapevine intelligent data dissemination technologies to more fully address the problem of bringing shared situation awareness to a team of networked dismounted soldiers.

DTIC

Multisensor Fusion; Situational Awareness

20050167410 Bulgarian Academy of Sciences, Sofia, Bulgaria

The Digital Library - The Bulgarian Case

Krastev, Dincho; Dec. 2004; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A432054; No Copyright; Avail: Defense Technical Information Center (DTIC)

No abstract available

Digital Systems; Libraries

20050167434 Bae Systems Mission Solutions, Inc., San Diego, CA USA

Logistics Control and Information Support (LOCIS)

Hardenburg, Gary; Moskop, Clark; Potts, John; Curtis, Christopher K.; Vinson, Kelly; Lemery, David; Sep. 2004; 121 pp.; In English

Contract(s)/Grant(s): F33615-99-C-6010; Proj-4923

Report No.(s): AD-A432097; TR-1007832; AFRL-HE-WP-TR-2004-0166; No Copyright; Avail: CASI; A06, Hardcopy

This technical report contains the results of the Air Force Logistics Control and Information Support (LOCIS) project. The LOCIS objective was to perform logistics research and development in a series of spirals that concentrated on information technologies applied to wing level decision makers and to support the Agile Combat Support and the Air Expeditionary Force. More specifically, the objective was to explore, develop and integrate information technologies that automatically access critical information; display clear and concise information; help the user solve difficult problems by suggesting alternative courses of action; and autonomously take action that benefits the user. These objectives were implemented through

the%following technological areas: Information Fusion, Proactive Decision Support, and Dynamic User Interface. In summary, an effective LOCIS system will provide multiple benefits including more timely information, minimized search time, reduced data interpretation, predictive simulations, and dynamic re-planning.
DTIC
Command and Control; Decision Support Systems; Information Systems; Logistics; Logistics Management

20050167441 Brooke Army Medical Center, Fort Sam Houston, TX USA
Compliance Performance: Effects of a Provider Incentive Program and Coding Compliance Plan
Tudela, Joseph A.; Jun. 2004; 122 pp.; In English; Original contains color illustrations
Report No.(s): AD-A432106; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this project is to study provider and coder related performance, i.e., provider compliance rate and coder productivity/accuracy rates and average dollar difference between coder and auditor, at Brooke Army Medical Center (BAMC) as a function of data dated performance (i.e., baseline vs. post-program implementation) and select attributes and experience/training variables. For BAMC's provider incentive program, analysis reveals statistical significance for record compliance rates with data dated measures, F(underscored)(1,103)= 4.74, p(underscored) = .03. For the coding compliance program, analysis reveals statistical significance for coding accuracy rates with data dated measures, F(underscored)(1,16) = 9.67, p(underscored) \h .01. Statistical significance was not found for coding productivity rate, F(underscored)(1,16) = 2.08, p(underscored) = .17, and coding average dollar difference, F(underscored)(1,16) = 3.29, p(underscored) = .09, with data dated measures. Health leaders can use these findings to establish programs and effective policies to improve upon provider and coder performance to improve coding and billing compliance.
DTIC
Coding; Incentives; Medical Services; Productivity; Project Planning

20050167447 Ohio State Univ., Columbus, OH USA
Perceptual and Action Routines in Diagrammatic Reasoning for Entity-Reidentification
Banerjee, Bonny; Chandrasekaran, B.; Dec. 2004; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-2-0009
Report No.(s): AD-A432116; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Objective Force requirements of responsiveness, agility and versatility call for digitized graphical decision support interfaces that automate or otherwise help in various reasoning tasks, including reasoning with visual and diagrammatic representations that are ubiquitous in Army situation understanding, planning and plan monitoring. In earlier papers, we described a diagrammatic reasoning architecture, and demonstrated the approach for instances of maneuver recognition and information fusion for entity-reidentification problems. The current paper characterizes the computational properties of the core perception and path-finding algorithms that are an important part of the technology's application for a class of fusion problems. This analysis is important since the practicality of automating diagrammatic reasoning for Army applications depends on developing algorithms with manageable complexity.
DTIC
Algorithms; Decision Support Systems; Diagrams; Visual Perception

20050167448 Army High Performance Computing Research Center, Minneapolis, MN USA
MINDS: A New Approach to the Information Security Process
Eilertson, E. E.; Ertoz, L.; Kumar, V.; Long, K. S.; Dec. 2004; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A432117; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper describes the work the University of Minnesota is doing with the U.S. Army Research Laboratory to advance the state-of-the-art in network intrusion detection. The Minnesota Network Intrusion Detection System (MINDS) is a data mining based system for detecting unusual network behavior, and emerging cyber threats. MINDS is enjoying great operational success in the ARL's Interrogator information assurance architecture and at the University of Minnesota. MINDS routinely detects brand new attacks and other malicious behaviors which could not have been detected by signature based systems. In addition to detecting new attacks MINDS is very effective at discovering rogue communication channels and the exfiltration of data that are very difficult to identify with other tools.
DTIC
Detection; Information Retrieval; Security; Warning Systems

20050167700 Office of the Deputy Under Secretary of Defense for Industrial Policy, Arlington, VA USA
Business Combinations Desk Book
Sep. 2003; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A432075; No Copyright; Avail: Defense Technical Information Center (DTIC)

Department of Defense (DoD) research, development, and acquisition policies, funding and program decisions, have a major impact on competition and industry transformation. DoD assessments of proposed business combinations (generally, domestic and foreign firm mergers, acquisitions, and joint ventures) must complement such policies and decisions to sustain credible competition in an evolving industrial environment. This deskbook describes the process that the Department of Defense uses to ensure that its evaluations of proposed business combinations: ' facilitate the creation and maintenance of a competitive, cost-effective industrial base; ' protect the industrial and technological capabilities needed to supply critical warfighting products; ' provide a robust foundation from which DoD decision makers can develop a Department view; ' provide a timely, fair review for the companies (parties) involved; and ' ensure a single DoD voice within the interagency review process and a coordinated U.S. Government position to the companies.
DTIC
Commerce; Data Acquisition; Supplying

20050167851 Defence Science and Technology Organisation, Edinburgh, Australia
Coalition Theatre Logistics (CTL) Advanced Concept Technology Demonstration (ACTD)Architecture Overview
Kuster, Egon; December 2004; 34 pp.; In English; Original contains black and white illustrations
Report No.(s): DSTO-TN-0607; DODA-AR-013-302; Copyright; Avail: Other Sources

This paper gives a basic background to the Coalition Theatre Logistics (CTL) Advanced Concept Technology Demonstration (ACTD) program and details the proposed information sharing architecture to be used therein. Outlined are the main components of the CTL architecture and how each component interacts with the others. Although the architecture outlined in this document has been developed specifically for the logistics space, it could also be adapted for use within other distributed information sharing projects. The architecture addresses issues with releasing data into coalition environments, transferring and transforming data between national environments and providing coalition planning and information services.
Author
Architecture (Computers); Computer Networks; Information Systems; Military Technology; General Overviews; Logistics

20050168119 Federal Aviation Administration, Cambridge, MA, USA
Intelligent Transportation Systems and Truck Parking
Smith, S. B.; Baron, W.; Gay, K.; Ritter, G.; Feb. 2005; 28 pp.; In English
Report No.(s): PB2005-105734; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this report is to provide background information and lay out the issues for prospective offerors responding to the solicitation in a Broad Agency Announcement seeking concept papers for a demonstration of a technology that conveys real-time information on parking availability for truckers on the road. The report addresses the following questions: (1) is there a shortage of parking; (2) is the truck parking shortage likely to worsen; (3) what are potential solutions; and (4) what can be done to better match supply and demand.
NTIS
Trucks; Real Time Operation; Transportation

20050168148 Istituto Superiore di Sanita, Rome, Italy
IV Natioal Workshop Enter-net Italia. Surveillance system of Enteric Infections: Diagnosis and Epidemiology Foodborne Zoonoses
Caprioli, A.; Luzzi, I.; Lana, S.; Nov. 2004; 126 pp.; In Italian; IV Natioal Workshop Enter-net Italia. Surveillance system of Enteric Infections: Diagnosis and Epidemiology Foodborne Zoonoses, 25-26 Nov. 2004, Rome, Italy
Report No.(s): PB2005-103039; ISTISAN-C-04/C4; Copyright; Avail: National Technical Information Service (NTIS)

Enter-net is an international network for the surveillance of human gastrointestinal infections. which monitors salmonellosis and Verocytotoxin producing E. coli (VTEC) 0157, including their antimicrobial resistance. Main objectives of Enter-net are the harmonization of typing methods, the establishment of a regularly updated international database including the antimicrobial susceptibility of the isolates, the recognition and investigation of outbreaks. The Istituto Superiore di Saniti (ISS) represents Italy in the network and coordinates a national surveillance system that involves laboratories operating in the medical, veterinary and environmental fields. Since 2001, Enter-net Italia activities are presented in an annual workshop. This

year the workshop is structured as a meeting that, beside presenting Enter-net activities, will provide an updating of the research project 'Foodborne zoonoses: harmonization and application of innovative methods in the medical and veterinary fields'. The project is funded by the Italian Ministry of Health.
NTIS
Gastrointestinal System; Infectious Diseases; Antiinfectives and Antibacterials

20050169210 General Accounting Office, Washington, DC, USA
Report to Congressional Committees. Information Technology: Enterprise Architecture Use Across the Federal Government Can Be Improved
February 2002; 184 pp.; In English
Report No.(s): GAO-02-6; No Copyright; Avail: CASI; A09, Hardcopy

Enterprise architectures (EA) provide a clear and comprehensive picture of an entity, whether an organization (e.g., federal department, agency, or bureau) or a functional or mission area that cuts across more than one organization (e.g., financial management). The concept of such architectures first emerged in the mid-1980s, and over the years various frameworks for defining the content of EAs have been published. Our work in the early 1990s identified architectures as a critical success factor for organizations that effectively leveraged IT in meeting their mission goals, and it advocated federal agency use of architectures. Since then, we have worked with the Congress, OMB, and the federal CIO Council to recognize the importance of architectures and assist agencies in developing and using them. Nevertheless, our reviews of agency IT management practices and major systems modernization programs continue to identify the lack of architectures as a major IT management weakness, and they have produced numerous recommendations to address this important area. In some cases, most notably the U.S. Customs Service, our work has shown that EA management has improved significantly.
Derived from text
Governments; Information Management; Technologies

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ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20050166384 American Inst. of Aeronautics and Astronautics, Reston, VA, USA
NASA Budget Reflects Major Reorganization
Aerospace America; April 2005; ISSN 0740-722X; Volume 43, No. 4, pp. 10-11, 44; In English; Original contains color illustrations; Copyright; Avail: Other Sources

President Bush's FY06 NASA budget request is divided into three appropriation accounts: science, aeronautics, and exploration (SAE), exploration capabilities (EC), and inspector general (IG). Under the first two accounts, the budget is organized according to mission directorates (NASA's primary areas of activity) and themes, or programmatic subdivisions of mission directorates that function as program 'investment portfolios.' The SAE appropriation account includes the Office of Education and three mission directorates: science, exploration systems, and aeronautics research. The EC appropriation account includes the Space Operations Mission Directorate.
Author
NASA Programs; Federal Budgets

20050167101 General Accounting Office, Washington, DC, USA
NASA: International Space Station and Shuttle Support Cost Limits
Kutz, Gregory D.; August 31, 2001; 8 pp.; In English
Report No.(s): GAO-01-1000R; No Copyright; Avail: CASI; A02, Hardcopy

Section 202 of the National Aeronautics and Space Administration (NASA) Authorization Act for Fiscal Year 2000 (P.L. 106-391) establishes general cost limitations on the International Space Station and Space Shuttle programs. Under the act, through substantial completion of the space station, NASA may not obligate more than $25 billion for space station development or more than $17.7 billion for shuttle launches in connection with space station assembly. The act further stipulates that for the purpose of calculating launch costs not more than $380 million per launch shall be used. Finally, the act requires that NASA, as part of its annual budget request, update the Congress on its progress by (1) accounting for and reporting amounts obligated against the limitations to date, (2) identifying the amount of budget authority requested for the future development and completion of the space station, and (3) arranging for GAO to verify the accounting submitted to the

Congress within 60 days after the submission of the budget request. In responding to the legislative requirement for verifying NASA's accounting, we planned to (1) assess NASA s methodology for accumulating and allocating amounts obligated against the space station and shuttle limits and (2) audit the underlying obligation data supporting these amounts. We also agreed to (1) evaluate whether NASA's costs, relative to the status of space station completion, were reasonable and (2) assess the significance of amounts not reported against the limits due to exclusions set forth under the act. In performing our work, we spoke with officials responsible for preparing NASA's accounting for the space station and shuttle limits and identified and reviewed the methodology they used. To test the completeness and accuracy of NASA's accounting, we requested transaction-level support for amounts obligated for fiscal years 1998 though 2000. Except for the limits imposed by NASA's inability to provide us with timely data, we conducted our work from March through June 2001 in accordance with generally accepted government auditing standards.
Author (revised)
International Space Station; Space Transportation System; Space Shuttles; Cost Analysis; Congressional Reports

20050167103 General Accounting Office, Washington, DC, USA
Business Modernization: NASA's Integrated Financial Management Program Does Not Fully Address Agency's External Reporting Issues
November 2003; 44 pp.; In English
Report No.(s): GAO-04-151; No Copyright; Avail: CASI; A03, Hardcopy

If NASA continues on its current track, the core financial module and IFMP will fail to achieve the agency s stated objective of providing reliable, timely financial information for both internal management decision-making and external reporting purposes. Thus far, NASA has focused on deploying the system on its established schedule, rather than ensuring that it satisfies the agency s internal management and external reporting requirements. To meet its schedule, NASA has put off addressing user requirements that would necessitate significant business process reengineering or extensive software configuration. While NASA is meeting its implementation milestones, it is only able to do so because the agency has deferred critical system capabilities, such as the ability to properly capture, record, and account for its PP&E and material; process budgetary accounting entries; and provide managerially relevant cost information. Until, and unless, the agency deals with these issues, NASA risks making a substantial investment in a system that will fall far short of its stated goal of providing meaningful information for both internal management and external reporting purposes.
Derived from text
Financial Management; NASA Programs; Commerce

20050167710 General Accounting Office, Washington, DC, USA
Recent Estimates of Fiscal Impact of 2001 Terrorist Attack on New York. Report to Congressional Requesters
March 2005; 67 pp.; In English; Original contains color and black and white illustrations
Report No.(s): GAO-05-269; No Copyright; Avail: CASI; A04, Hardcopy

To identify government studies of impacts on New York tax revenues completed since our 2002 report, we reviewed the economics literature and searched the Internet, and we contacted officials at the U.S. Bureau of Labor Statistics (BLS), Federal Reserve Bank of New York, New York City Office of Management and Budget, New York State Division of Budget, and other state and local agencies. We identified studies completed by the (1) New York City Office of Management and Budget in 2004, (2) New York State Office of the State Comptroller in 2003, and (3) New York City Office of the Comptroller in 2002. To review the studies, we used standard economic criteria, such as whether the studies measured the incremental effect of the attacks, used sound economic reasoning, and were based on current data. We discussed the impact of the attack with officials in the New York City Office of Management and Budget, New York State Office of the State Comptroller, and New York City Office of the Comptroller, as well as with officials at BLS, the Federal Reserve Bank of New York, New York City Independent Budget Office, New York State Division of Budget, New York State Financial Control Board, and the Securities Industry Association. We also discussed these issues with economics staff of the New York State Assembly Ways and Means Committee. In doing this work, we did not independently estimate the impact of the terrorist attack on New York tax revenues. Unless we note otherwise, we determined that the data were sufficiently reliable for purposes of this report (app. I has more detail). We conducted our work from July 2004 through March 2005 in accordance with generally accepted government auditing standards. Two other Government Accountability Office (GAO) reports are attached to this one, 'Tactical Aircraft: F/A-22 and JSF Acquisition Plans and Implications for Tactical Aircraft Modernization' and 'Kennedy Center: Stronger Oversight of Fire Safety Issues, Construction Projects, and Financial Management Needed'
Derived from text
Congressional Reports; New York City (Ny); Terrorism; Air Piracy; Damage Assessment; Cost Estimates; Economic Impact

20050167713 General Accounting Office, Washington, DC, USA

Report to the Chairman, Subcommittee on Defense, Committee on Appropriations, House of Representatives. National Space Issues: Observations on Defense Space Programs and Activities

August 16, 1994; 30 pp.; In English

Report No.(s): NSIAD-94-253; B-297974; No Copyright; Avail: CASI; A03, Hardcopy

Our scope of work encompassed the four U.S. space sectors - military, intelligence, civil, and commercial - with the primary emphasis on matters associated with national security. It included a review of national and DOD space policies; DOD space organizations and missions; plans, programs, and budgets associated with launch vehicles, launch infrastructure, satellites, and satellite control; and space-related issues in the commercial sector. We analyzed budget information; program and system requirements; acquisition, modernization, and funding plans; agency and program directives; and supporting reports, studies, and briefings. We discussed space topics with representatives of the Executive Office of the President; Office of the Secretary of Defense; Joint Staff; Departments of the Air Force, Army, and Navy; and U.S. Space, Air Force Space, Naval Space, and Army Space Commands. We also interviewed NASA, NOAA, the Department of Transportation, and selected contractor representatives. As requested, we did not obtain written agency comments. However, based on our briefing to agency representatives, we intend to obtain their comments and will provide them and our evaluation to your staff. Since we are continuing to review the issues contained in this report, we will also consider any agency comments in our ongoing work. We performed our review from September 1993 through July 1994 in accordance with generally accepted government auditing standards.

Derived from text

Armed Forces (United States); Defense Program; Military Spacecraft; Congressional Reports

20050168082 Federal Aviation Administration, Washington, DC, USA

LEO Commercial Market Projections, July 25, 1997

Jul. 25, 1997; 18 pp.; In English

Report No.(s): PB2005-105694; No Copyright; Avail: CASI; A03, Hardcopy

The Federal Aviation Administrations Associate Administrator for Commercial Space Transportation (AST) has prepared projections of the low Earth orbit (LEO) commercial payload and launch markets for the period between 1997 and 2006. This assessment includes market projections for all commercial systems in orbits other than geostationary Earth orbit (GEO), including systems planned for LEO, medium Earth orbits (MEO) and elliptical orbits (ELI). This report was developed based on AST research and discussions with industry, including satellite service providers, satellite manufacturers, launch service providers, and independent analysts. This assessment represents an update of prior AST studies of the LEO market conducted in March 1994, May 1995, and April 1996.

NTIS

Low Earth Orbits; Launch Vehicles; Payloads; Market Research; Forecasting; Predictions; Commercial Spacecraft; Space Commercialization

20050169217 NASA, Washington, DC, USA

First Cut

Morring, Frank, Jr.; Aviation Week and Space Technology; May 09, 2005; ISSN 0005-2175; Volume 162, No. 19, pp. 32-33; In English; Copyright; Avail: Other Sources

Lockheed Martin and a Northrop Grumman/Boeing team expect the Crew Exploration Vehicle proposals they submitted last week to change, given the new top-down push at NASA to close the gap between space shuttle retirement and launch of the new crew carrier. Still, delivery of the proposals gives a first glimpse of at least one of the concepts for a space shuttle replacement. Instead of the ballistic capsule approach put forward in some early CEV concept work, Lockheed Martin proposed a lifting body shape with a two-stage thermal protection system, coupled with a cylindrical mission module to give crews of four to six extra room on trips to the Moon, and a trans-Earth injection module (TEIM) for the return powered-at least in the first cut-by a couple of Pratt & Whitney RL10 rocket engines.

Author

Contractors; Aerospace Industry; Space Shuttles; Replacing; Spacecraft Design; Manned Spacecraft

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LAW, POLITICAL SCIENCE AND SPACE POLICY

Includes aviation law; space law and policy; international law; international cooperation; and patent policy.

20050167076 Library of Congress, Washington, DC, USA
Legal Problems of Space Exploration: A Symposium
1961; 1429 pp.; In English; Legal Problems of Space Exploration
Contract(s)/Grant(s): S-Doc-26; GPO-63137; No Copyright; Avail: CASI; A99, Hardcopy

If the purposes pursued in the new dimension of outer space can be governed by law, a significant advance will be made toward world peace. Space exploration begins from the earth and has an impact from outer space upon all aspects of international relations - political, economic, psychological, and as a defense against weapons of mass destruction. In the words of the United Nations General Assembly, the desire is 'to avoid the extension of present national rivalries into this new field' which holds the promise of unique benefits for all mankind. The advent of the space age offers new opportunities for advancing toward this objective. As satellites operate in global orbits which disregard the boundary lines of nation states, they create certain requirements for international cooperation. A worldwide network of ground observing stations is essential to track space probes and satellites because no nation encompasses within its own boundaries the range of latitude and longitude necessary for adequate tracking. Such a network requires agreements among the nations involved. The limitation of the radio spectrum is a scientific fact which also necessitates agreements between nations on practicable methods for allocating frequencies. The alternative could be chaos in communications, both for terrestrial radio transmissions and those from outer space. The re-entry of space vehicles into the atmosphere and their landing on earth will create problems which can only be met by international agreements based upon a common understanding of the methods by which such situations are to be handled. The determination of liability for damage or injury resulting from space craft, the identification and registration of vehicles, and the scientific need to prevent the contamination of celestial bodies - all such problems point up the need for nations to cohere in devising solutions which are mutually satisfactory. Space exploration requires additional factors which can be used to develop patterns of international cooperation.
Author (revised)
International Cooperation; Space Law; Policies; Congressional Reports; Legal Liability

20050167847 Committee on Aeronautical and Space Sciences (U.S. Senate), Washington, DC, USA
International Aspects of the Exploration and Use of Outer Space, 1954-1962
May 9, 1963; 418 pp.; In English
Report No.(s): GPO-91-298; S-Doc-18; No Copyright; Avail: CASI; A18, Hardcopy

The roots of the U.S. interest in space exploration lie deep in the experimental activities of many scientific, industrial, and military researchers. An important beginning was made by Dr. Robert H. Goddard, of Clark University, in his experiments with rockets and rocket fuels between 1915 and 1945. During World War II Goddard worked for the Army Air Force and the Navy to develop the jet-assist takeoff (JATO) device for aircraft. At the time of his death in 1945 he was working for the Navy to develop liquid-fuel engines of variable thrust. Studies of space have an important antecedent in the research carried on by the National Advisory Committee for Aeronautics (NACA), which was established by Congress in 1915 to direct the scientific study of the problems of flight. Space science also owes much to the scientific research programs carried out by the Jet Propulsion Laboratory of the California Institute of Technology, to the research programs of certain industries, and to the development of military weapons by scientific and military specialists during World War II. The years between the two World Wars witnessed scientific activity in Europe that was to contribute substantially to the space age. German, Russian, French, and British scientists all made important contributions. One of the most notable was that of the German scientists in the area of rocketry. As early as 1934 the Germans launched from an island in the North Sea two rockets both of which attained an altitude of some 7,000 feet. Although this feat received little notice at the time, German experimentation in the field continued.
Author (revised)
Congressional Reports; Histories; Space Law; Space Exploration; United States; International Relations; NASA Space Programs

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.

20050169155 NASA Lewis Research Center, Cleveland, OH, USA
Automated Hydrogen Gas Leak Detection System
[1995]; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The Gencorp Aerojet Automated Hydrogen Gas Leak Detection System was developed through the cooperation of industry, academia, and the Government. Although the original purpose of the system was to detect leaks in the main engine of the space shuttle while on the launch pad, it also has significant commercial potential in applications for which there are no existing commercial systems. With high sensitivity, the system can detect hydrogen leaks at low concentrations in inert environments. The sensors are integrated with hardware and software to form a complete system. Several of these systems have already been purchased for use on the Ford Motor Company assembly line for natural gas vehicles. This system to detect trace hydrogen gas leaks from pressurized systems consists of a microprocessor-based control unit that operates a network of sensors. The sensors can be deployed around pipes, connectors, flanges, and tanks of pressurized systems where leaks may occur. The control unit monitors the sensors and provides the operator with a visual representation of the magnitude and locations of the leak as a function of time. The system can be customized to fit the user's needs; for example, it can monitor and display the condition of the flanges and fittings associated with the tank of a natural gas vehicle.
Author
Aerospace Technology Transfer; Product Development; Gas Detectors; Hydrogen; Leakage

20050169165 NASA Lewis Research Center, Cleveland, OH, USA
Combustion Technology Outreach
[1995]; 1 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Lewis' High Speed Research (HSR) Propulsion Project Office initiated a targeted outreach effort to market combustion-related technologies developed at Lewis for the next generation of supersonic civil transport vehicles. These combustion-related innovations range from emissions measurement and reduction technologies, to diagnostics, spray technologies, NOx and SOx reduction of burners, noise reduction, sensors, and fuel-injection technologies. The Ohio Aerospace Institute and the Great Lakes Industrial Technology Center joined forces to assist Lewis' HSR Office in this outreach activity. From a database of thousands of nonaerospace firms considered likely to be interested in Lewis' combustion and emission-related technologies, the outreach team selected 41 companies to contact. The selected companies represent oil-gas refineries, vehicle/parts suppliers, and manufacturers of residential furnaces, power turbines, nonautomobile engines, and diesel internal combustion engines.
Author
Technology Utilization; Aerospace Technology Transfer; Combustion; Pollution Control

88
SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

20050167104 General Accounting Office, Washington, DC, USA
NASA: Lack of Disciplined Cost-Estimating Processes Hinders Effective Program Management
May 2004; 79 pp.; In English
Report No.(s): GAO-04-642; No Copyright; Avail: CASI; A05, Hardcopy

Many of the NASA programs that we reviewed cost more and took longer than was proposed at the time of congressional approval. Several factors continue to put NASA projects at risk of increased cost and schedule delays. Most notably, NASA lacks the basic cost-estimating processes needed to establish priorities, quantify risks, and make informed investment decisions for its programs. Further, NASA has limited ability to collect, analyze, and use program cost and schedule data to identify and mitigate impediments to program success. Current baseline development cost estimates for the 27 programs we reviewed varied considerably from the programs initial baseline estimates. More than half of the programs development cost estimates

increased, and for some programs, this increase was significant as much as 94 percent. In addition, the baseline development estimates for each of 10 programs that we reviewed in detail were rebaselined some as many as four times. For 7 of the 10 programs, the new baseline development estimate was an increase over the previous baseline estimate. Although NASA cited specific reasons for the cost growth and the recalculated baselines, such as technical problems and funding shortages, the variability in the cost estimates and the rebaselinings indicate that the programs lacked sufficient knowledge needed to make informed acquisition decisions.
Derived from text
NASA Space Programs; Project Management; Aerospace Sciences; Cost Estimates

20050167112 General Accounting Office, Washington, DC, USA
SPACE SHUTTLE: Actions Needed to Better Position NASA to Sustain Its Workforce through Retirement. Report to Congressional Requesters
March 2005; 30 pp.; In English
Report No.(s): GAO-05-230; No Copyright; Avail: CASI; A03, Hardcopy
In this report, we are recommending that NASA take steps aimed at better positioning the Space Shuttle Program to sustain a critically skilled workforce through retirement. In particular, we are recommending that the Space Shuttle Program begin identifying its future workforce needs based upon various future scenarios the program could face. In written and oral comments on a draft of this report, NASA concurred with our findings, conclusions, and recommendation.
Derived from text
Space Shuttles; NASA Space Programs; Retirement

20050167114 General Accounting Office, Washington, DC, USA
NASA's Space Vision: Business Case for Prometheus 1 Needed to Ensure Requirements Match Available Resources. Report to Cpngressional Requesters
February 2005; 35 pp.; In English
Report No.(s): GAO-05-242; No Copyright; Avail: CASI; A03, Hardcopy
NASA is quickly approaching one of the most critical phases in its acquisition of Prometheus 1 the preliminary design phase. While the impetus for the changes made to the program subsequent to our providing a draft of this report to NASA for comment recognize the technical, schedule, and operational risk of this program, there is still much work to be done. Based on the information presented at PMSR, now scheduled for summer 2005, NASA will need to decide at what level to fund the project. However, NASA will be challenged to develop the information required at PMSR, given the compressed time frames. Although PDR is still several years out, NASA will face significant challenges in meeting this milestone, given the immaturity of the revolutionary technologies that NASA anticipates will be needed to successfully launch Prometheus 1. While NASA is developing well-defined criteria tables for maturing Prometheus 1 technologies, the many inherent unknowns in developing technologies frequently results in unanticipated difficulties and delays. NASA s current policy does not require projects to develop knowledge-based business cases that match requirements to available resources and include controls to ensure that sufficient knowledge has been attained and therefore the agency had not planned to develop such a business case for Prometheus 1. We have found, however, that establishing a formal business case based on a knowledge-based approach that includes matching requirements and available resources which include technical and engineering knowledge, time and funding and controls to ensure that sufficient knowledge has been attained at critical junctures within the product development process is an essential part of any product development justification. The risk associated with failing to meet these challenges is considerable. If NASA decides to move forward without adequate information at PMSR that matches requirements and available resources and provides NASA decision makers with a clear understanding of Prometheus 1 s potential return on investment Prometheus 1 may be unable to compete for funding within NASA. Ultimately, NASA could find, as it has in the past, that the program must be cancelled after having invested millions of dollars.
Derived from text
NASA Space Programs; Prometheus; Project Management

20050167116 General Accounting Office, Washington, DC, USA
EReport to the Chairman and Ranking Minority Member, Committee on Science, House of Representatives. Export Controls: International Space Station Technology Transfers
November 1999; 34 pp.; In English
Report No.(s): GAO/NSIAD-00-14; B-283363; No Copyright; Avail: CASI; A03, Hardcopy

Since April 1995, the Commerce Department has issued nine Individual Validated Licenses to export specific items and one special comprehensive license that allows NASA to export certain preapproved items without seeking Commerce's approval each time NASA needs to export them for the International Space Station Program. Although the special comprehensive license was intended to preclude the need for individual licenses, NASA has only used it once because it has not been updated and, according to NASA officials, individual licenses are easier to obtain than updating the special comprehensive license. As new export requirements have materialized, NASA has elected to apply for individual licenses rather than amend the special comprehensive license. The State Department has not issued any licenses to NASA to export technology or commodities for the International Space Station. However, NASA erroneously authorized the export of radiation-hardened electronic parts to Russia in 1997 without first obtaining a license from State. NASA expects to export encryption technology for use in the program but has not determined whether a license is needed. NASA expects that such exports will be limited to its Japanese and European partners. Internal and external reviews of NASA's export control activities have identified weaknesses, including a need for greater management involvement in export-related decisions and additional training to educate employees involved with technology control about export laws, regulations, and procedures. NASA has taken steps to correct these weaknesses; however, some additional actions are needed. For example, annual internal audits have not provided sufficient information to assess the effectiveness of NASA's export controls for the International Space Station Program. Resulting reports of audits that were issued in 1997 and 1998 provide little detail and analyses beyond completing a required audit checklist. This report recommends improvements aimed at improving the quality of NASA's internal audits.

Derived from text

International Space Station; Technology Transfer; NASA Space Programs

20050167762 Florida Gulf Coast Univ., Fort Myers, FL, USA

Project LAUNCH: Bringing Space into Math and Science Classrooms

Fauerbach, M.; Henry, D. P.; Schmidt, D. L.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 1 pp.; In English; See also 20050167736; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Project LAUNCH is a K-12 teacher professional development program, which has been created in collaboration between the Whitaker Center for Science, Mathematics and Technology Education at Florida Gulf Coast University (FGCU), and the Florida Space Research Institute (FSRI). Utilizing Space as the overarching theme it is designed to improve mathematics and science teaching, using inquiry based, hands-on teaching practices, which are aligned with Florida s Sunshine State Standards. Many students are excited about space exploration and it provides a great venue to get them involved in science and mathematics. The scope of Project LAUNCH however goes beyond just providing competency in the subject area, as pedagogy is also an intricate part of the project. Participants were introduced to the Conceptual Change Model (CCM) [1] as a framework to model good teaching practices. As the CCM closely follows what scientists call the scientific process, this teaching method is also useful to actively engage institute participants ,as well as their students, in real science. Project LAUNCH specifically targets teachers in low performing, high socioeconomic schools, where the need for skilled teachers is most critical.

Derived from text

Space Exploration; Education; Instructors; Launching

20050167772 Washington Univ., Saint Louis, MO, USA

NanoSIMS D/H Imaging of Isotopically Primitive Interplanetary Dust Particles

Floss, C.; Stadermann, F. J.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The presence of large and variable H and N isotopic anomalies in interplanetary dust particles (IDPs) is well-established and is generally attributed to the preservation of interstellar materials within these particles [e.g., 1]; recent studies have shown that IDPs also contain organic matter with anomalous C isotopic compositions [2, 3] and grains with highly anomalous O and/or C isotopic compositions that are indicative of a circumstellar origin [3-5]. We have been carrying out a comprehensive isotopic (C, N, O) imaging survey of IDPs in order to better understand the origin and distribution of isotopic anomalies in these particles. Here we report the results of a survey of the H isotopic compositions of the same particles. We also report the results of S and B isotopic measurements.

Derived from text

Interplanetary Dust; Stellar Envelopes; Isotopic Labeling; Imaging Techniques

20050167792 NASA Ames Research Center, Moffett Field, CA, USA

Life in the Atacama - Year 2: Geologic Reconnaissance Through Long-Range Roving and Implications on the Search for Life

Dohm, J. M.; Cabrol, N. A.; Grin, E. A.; Moersch, J.; Diaz, G. Chong; Cockell, C.; Coppin, P.; Fisher, G.; Hock, A. N.; Ori, G. G., et al.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The 'Life in the Atacama' (LITA) project included two field trials during the 2004 field season, each of which lasted about a week. The remote science team had no prior knowledge of the local geology, and relied entirely on orbital images and rover-acquired data to make interpretations. The sites for these trials were in different locations, and are designated 'Site B' and 'Site C' respectively. The primary objective of the experiment is to develop and test the means to locate, characterize, and identify habitats and life remotely through long-range roving, which included field testing the rover, named Zoe. Zoe has onboard autonomous navigation for long-range roving, a plow to overturn rocks and expose near-surface rock materials, and high-resolution imaging, spectral, and fluorescence sampling capabilities. Highlights from the experiment included characterizing the geology in and near the landing ellipse, assessing pre-mission, satellite-based hypotheses, and improving the approach and procedures used by the remote and field teams for upcoming experiments through combined satellite, field-based, and microscopic perspectives and long-range roving.

Author

Field Tests; Fluorescence; Geology; Habitats; Imaging Techniques; Navigation; Rocks; Sampling

20050167829 Paris-Sud Univ., France

Laboratory Study of the Irradiation and Thermal Processing of Silicate Dust Analogs

Djouadi, Z.; dHendecourt, L.; Leroux, H.; Borg, J.; Jones, a. P.; Deboffle, D.; Chauvin, N.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 1 pp.; In English; See also 20050167788; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: Before the results from the Short Wavelength Spectrometer instrument (SWS) on board the Infrared Space Observatory (ISO) in the 90 s, it was largely thought that all silicate dust in space was totally amorphous. The extensive results provided by ISO have shown the existence of different forms (e.g. crystalline, amorphous and/or both of them), depending essentially on the astrophysical environment where they are detected. Various studies on silicate dust analogs have shown that chemical as well as structural modifications can take place. Most of these studies have been devoted to an understanding of the primary modifications (structure and chemical composition) due to ion irradiation or thermal processes, but very little has been done regarding further evolution of irradiated silicates. In order to evaluate the dust ability to recrystallize in cold environments, we have studied thermal processing of silicates after a further irradiation stage.

Author

Silicates; Chemical Composition; Crystallinity; Dust; Irradiation

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20050165769 Laurin Publishing Co., Inc., Pittsfield, MA, USA

Mid-IR Imaging Suggests Recent Collisions Around Beta Pictoris

Burgess, Daniel S., Editor; Photonics Spectra; April 2005; ISSN 0731-1230; Volume 39, No. 4, pp. 51-52, 55; In English; Copyright; Avail: Other Sources

In the two decades since the Infrared Astronomical Satellite mission revealed the presence of a dust disk around Beta Pictoris, astronomers have turned to the main sequence star for clues to better comprehend how our own solar system came to be. Now an international team of scientists has used a mid-IR camera at the 8-m Gemini South telescope 9000 feet up in the Chilean Andes to collect images of what may be the remnants of a recent collision of planetesimals in the circumstellar disk.

Author

Infrared Astronomy; Protoplanets; Protoplanetary Disks; Extrasolar Planets; Planetary Systems

20050165786 NASA Marshall Space Flight Center, Huntsville, AL, USA

Discovery of a Be/X-Ray Binary Consistent with the Location of GRO J2058+42

Wilson, Colleen; Weisskopf, Martin; Finger, Mark H.; Coe, M. J.; Greiner, Jochen; Reig, Pablo; Papamastorakis, Giannis; The Astrophysical Journal; April 1, 2005; Volume 622, pp. 1024-1032; In English; Copyright; Avail: CASI; A02, Hardcopy

GRO J2058+42 is a 195 s transient X-ray pulsar discovered in 1995 with BATSE. In 1996, RXTE located GRO J2058+42 to a 90% confidence error circle with a 4 radius. On 2004 February 20, the region including the error circle was observed with Chandra ACIS-I. No X-ray sources were detected within the error circle; however, two faint sources were detected in the ACIS-I field of view. We obtained optical observations of the brightest object, CXOU J205847.5+414637, which had about 64 X-ray counts and was just 013 outside the error circle. The optical spectrum contains a strong Ha line and corresponds to an inhued object in the Two Micron All Sky Survey catalog, indicating a Be/X-ray binary system. Pulsations were not detected in the Chandra observations, but similar flux variations and distance estimates suggest that CXOU J205847.5+414637 and GRO J2058+42 are the same object. We present results from the Chandra observation, optical observations, new and previously unreported RXTE observations, and a reanalysis of a ROSAT observation.

Author

X Ray Astronomy; Pulsars; X Ray Binaries

20050166933 Carnegie Institution of Washington, Washington, DC, USA

Scanning Micro-Raman Spectroscopy on Carbon-rich Residues of Primitive Chondrites: A Tool for Chondrite Classification and Stardust Analysis

Busemann, H.; O'DAlexander, C. M.; Fries, M.; Nittler, L.; Steele, A.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Organic matter in primitive meteorites may have mostly been formed in the interstellar medium [e.g. 1-3]. After formation of the solar system these molecules have been incorporated into the parent bodies of the various primitive meteorites [2]. Subsequent aqueous alteration and thermal metamorphism have altered the - initially similar - set of compounds including their carbonaceous microstructures.

Derived from text

Meteorites; Microstructure; Metamorphism (Geology); Interstellar Matter; Raman Spectroscopy; Organic Materials

20050166946 Imperial Coll. of Science and Technology, London, UK

Determination of the Acoustic Fluidization Parameters as Applied to Impacts on the Icy Satellites

Bray, V. J.; Collins, G. S.; Morgan, J. V.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Impact craters on the icy satellites offer direct probes of the moons subsurface, and may hold the key to understanding their geologic evolution. It has been suggested that two transitions in crater shape that occur with increasing crater diameter reflect rheologic changes at depth within the moons [1]. To test this hypothesis we performed some numerical simulations of impacts on the icy satellites. This new work builds on earlier numerical studies [2, 3], and aims to better constrain the impact process and the effect of rheologic target variations on crater depth and morphology.

Derived from text

Craters; Icy Satellites; Targets

20050166952 Manchester Univ., UK

I-Xe Dating of Mineral Separates and Integration with the Mn-Cr Timescale

Busfield, A.; Gilmour, J. D.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The I-129-Xe-129 dating technique has recently been successfully applied to dating of mineral separates and individual mineral grains [1], where it has been shown to correlate with results from other dating techniques (e.g. [2]). The mineral separate approach to I-Xe dating allows the development of a more detailed understanding of the distribution and evolution of iodine and xenon in the early solar system than is possible from whole rock studies. This work extends the database of mineral separates dated by the I-Xe technique and incorporates these data into a combined chronology of the early solar system.

Derived from text

Chronology; Time Measurement; Xenon; Enstatite; Iodine; Minerals; Chondrites

20050166963 University of Northern Arizona, Flagstaff, AZ, USA

Martian Impact Craters as Revealed by MGS and Odyssey

Barlow, N. G.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923

Contract(s)/Grant(s): NAG5-12510; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A variety of ejecta and interior morphologies were revealed for martian impact craters by Viking imagery. Numerous studies have classified these ejecta and interior morphologies and looked at how these morphologies correlate with crater diameter, latitude, terrain, and elevation [1, 2, 3, 4]. Many of these features, particularly the layered (fluidized) ejecta morphologies and central pits, have been proposed to result when the crater formed in target material containing high concentrations of volatiles. The Catalog of Large Martian Impact Craters was originally derived from the Viking 1:2,000,000 photomosaics and contains information on 42,283 impact craters 5-km diameter distributed across the entire martian surface. The information in this Catalog has been used to study the distributions of craters displaying specific ejecta and interior morphologies in an attempt to understand the environmental conditions which give rise to these features and to estimate the areal and vertical extents of subsurface volatile reservoirs [4, 5]. The Catalog is currently undergoing revision utilizing Mars Global Surveyor (MGS) and Mars Odyssey data [6]. The higher resolution multispectral imagery is resulting in numerous revisions to the original classifications and the addition of new elemental, thermophysical, and topographic data is allowing new insights into the environmental conditions under which these features form. A few of the new results from analysis of data in the revised Catalog are discussed below.

Derived from text

Mars Global Surveyor; Mars Craters; Terrain; Topography

20050166964 Oregon State Univ., Corvallis, OR, USA

Planetary Eddies in the MGS TES Data and Winter Argon Transports

Barnes, J. R.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: The MGS TES atmospheric temperature data set has allowed a basic characterization of planetary eddy activity in the Martian atmosphere. The planetary eddies include midlatitude weather systems (baroclinic eddies), forced quasi-stationary waves, and thermal tides. All of these eddy circulation systems can transport heat. momentum. dust, and water substances into and out of the polar regions. Recently, it has been become evident that they also are acting to transport the minor atmospheric constituent Argon into and out of the polar regions [1]. During the winter season, this transport acts to reduce the enrichment of Argon which would otherwise occur (by transporting Argon equatorward), while during early spring the transport due to the eddies reduces the depletion of Argon (by transporting Argon poleward). At present the Argon data from the MGS GRS experiment have been analyzed only for the Southern Hemisphere, but it certainly can be expected that an analogous polar Argon enrichment/depletion and transport takes place in the Northern Hemisphere also. The analyses of the MGS GRS data [1] have allowed estimates of meridional eddy mixing coefficients to be made for the southern fall, winter, and spring seasons. The mixing coefficient values have been found to vary greatly during this time period, and it is thus of interest and importance to compare them with direct observations of the planetary eddy activity allowed by the MGS TES experiment. winter the weather systems are extremely weak in comparison to those in the north. Model studies have indicated that this is basically a consequence of the large-scale topography in the south, as well as of the seasonally asymmetric thermal forcing produced by the large eccentricity of the orbit of Mars [3]. An additional basic aspect of the weather systems is that they tend to have very deep structures in the northern hemisphere under relatively dusty conditions, and are generally less deep in the southern hemisphere. In both hemispheres, the weather systems tend to be less deep in early fall and in late winter and spring; the seasonal variation in vertical structure is much more pronounced in the north. As stated above, the weather systems in the TES atmospheric temperature data are very weak during the southern fall and early winter seasons. However, during the remainder of winter and continuing into the early spring season, the weather activity is found to be strongly enhanced, particularly at lower atmospheric levels. This can be seen in Figure 1, which shows the weather system temperature variance (isolated from that due to both the stationary waves and the thermal tides) at two relatively low atmospheric levels as a function of latitude and time, for the first MGS mapping year. At higher levels the variances are much smaller and reach maximum values earlier in the winter. The seasonal variation in the weather activity as measured by the TES temperature variance shown in Figure 1 (the seasonal

Derived from text

Vortices; Mars Atmosphere; Dust; Argon; Trace Elements; Atmospheric Temperature

20050166965 NASA Johnson Space Center, Houston, TX, USA

Impact into Coarse Grained Spheres

Barnouin-Jha, O. S.; Cintala, M.; Crawford, D. A.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Several experimental studies [1,2,3] indicate that differences in the grain size of the target relative to the projectile could influence the cratering process. Impacts into coarse sand grains of size comparable to the projectile show some discrepancies with existing relationships for crater growth [e.g. 4]. Similarly, targets of ne grained, uniform in diameter glass spheres show differences in crater depth, transient crater diameter, and volume of ejecta excavated as a function of grain size [2,3]. The purpose of this work is to continue investigating how the relative grain size may influence early time coupling between a projectile and target, with implications for subsequent ejecta excavation and crater growth. In previous efforts we used numerical techniques to focus on the propagation of shock waves in coarse, granular media emphasizing the influence of relative grain size on crater growth, ejecta production, cratering efficiency, target strength, and crater shape [5,6,7]. In this study, we use experimental techniques - in part as a reality check for the numerical studies - to report on how coarse grained targets might influence ejecta excavation and crater shape. This body of work possesses important implications for ejecta excavation and cratering efficiency on asteroids that may possess rubble pile-like structures, and on planets that may possess either pre-fractured surfaces or large-scale heterogeneities in shock impedance.

Author

Spheres; Grain Size; Targets; Shock Wave Propagation; Asteroids; Cratering; Projectiles

20050167028 NASA Johnson Space Center, Houston, TX, USA

Osmium Isotope Evidence for an S-Process Carrier in Primitive Chondrites

Brandon, A. D.; Puchtel, I. S.; Humayun, M.; Zolensky, M.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The degree of isotopic mixing in the solar nebula and the nature of pre-solar components that have contributed to our solar system remain subjects of vigorous debate. Isotopic anomalies have been identified in Ca-Al inclusions in chondrites [1-4]. This indicates that refractory pre-solar components were not completely homogenized or processed away at the high temperatures experienced by CAIs. Pre-solar grains (SiC, C, etc.) are prevalent in primitive chondrites, and preserve isotopic heterogeneity resulting from the nucleosynthetic processes occurring in the stars from which these grains formed [2,4]. Several recent studies employing precise techniques for measuring Ru, Mo and Zr isotopes in bulk meteorites, have come up with varying conclusions on the degree of effectiveness of nebular mixing on the scale of bulk meteorite material. Some of these studies have reported isotopic anomalies in Mo and Ru [3,5-7], while others have not observed anomalies in Mo, Ru, or Zr [8-10]. Debate over the quality of the data, the normalization techniques employed, the absence or presence of isobaric interferences during the measurements on different types of instruments (e.g. TIMS versus ICP-MS), and other factors, has ensued [11,12].

Derived from text

Osmium Isotopes; Chondrites; Zirconium Isotopes; Molybdenum Isotopes; Ruthenium Isotopes; Nuclear Fusion; Inclusions; Solar Nebula

20050167029 Arizona Univ., Tucson, AZ, USA

Ejected Boulders: Implications for Secondary Craters and the Age Dating of Surfaces

Bart, Gwendolyn D.; Melosh, H. J.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The size-frequency distribution (SFD) of craters on the Moon, Mars, and Mercury turns up at very small crater diameters; for the Moon the upturn occurs near 3 km [1, 2]. Neukum, Ivanov, and Hartmann [2] propose that this upturn is a result of collisional process in the asteroid belt and represents the impacting population. On the other hand, Shoemaker [3] and others [1, 4, 5] propose that this upturn is a result of secondary cratering, wherein solid material ejected from an impact crater itself impacts the surface, forming a crater. Secondary craters are formed from solid blocks (or groups of blocks) ejected from impact craters. Therefore, to better understand whether secondary craters cause this upturn in the SFD, we examined ejected boulders scattered around four small craters three on the Moon and one on Mars. We compare the observed distribution of these boulders to the distribution of secondary craters around large primary craters. Lee et al. [6] also examined boulders

ejected from craters and constructed sizefrequency plots, though they do not specifically address the issue regarding secondaries and the SFD.
Derived from text
Rocks; Cratering; Chronology; Size Distribution; Mars Craters; Frequency Distribution

20050167047 Carnegie Institution of Washington, Washington, DC, USA
Ancient Volcanic Xenon in Single Glass Grains from the D'Orbigny Angrite
Busemann, H.; Busfield, A.; Gilmour, J. D.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: Angrites are basaltic meteorites that cooled rapidly early in the evolution of the solar system [1]. They are widely thought to be products of differentiation and partial melting [2-4], though it has been suggested that they condensed from vapor in the solar nebula [5,6]. D Orbigny ('D O') is vesicular and has abundant glass [2,5-7]. This has been interpreted as volcanic and seen as further evidence for magmatism on the angrite parent body ('APB').
Derived from text
Xenon; Volcanoes; Vapor Phases; Solar Nebula; Meteoritic Composition; Igneous Rocks; Magma; Melting

20050167049 Image Again, Middletown, NJ, USA
Gravity Focusing of Swarms of Potential Impactors
Byrne, Charles J.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A meteor shower is caused by a coherent swarm of objects, potential impactors, that cross Earth.s orbit about the Sun, approaching Earth from an apparent direction called the radiant. The radiant represents the vector sum of the velocity of the swarm as it encounters the Earth and the velocity of Earth at that point. Those members of the swarm that encounter Earth.s atmosphere produce the spectacular flash of meteors. But what happens to those objects that miss Earth and its atmosphere entirely? Their paths are deflected by Earth into a focussed line, directly opposite to the radiant line.
Derived from text
Gravitation; Angular Momentum; Impactors; Meteoroid Showers; Potential Energy

20050167059 NASA Marshall Space Flight Center, Huntsville, AL, USA
The Amazing SGR 1806-20, Part 2
Kouveliotou, Chryssa; [2005]; 1 pp.; In English; 2005 SWIFT Team Meeting, 1-2 Mar. 2005, State College, PA, USA; No Copyright; Avail: Other Sources; Abstract Only

On 2004 December 27, the brightest gamma-ray flare ever recorded was detected by several instruments to be coming from the Soft Gamma Repeater SGR 1806-20. The flare even caused an ionospheric disturbance recorded around the globe by ionizing the Earth's upper atmosphere. SGRs belong to a class of slowly spinning (P = approx. 5-12 seconds) neutron stars with extremely high surface magnetic fields, B approx. 10(exp 15) G. The high magnetic fields of these objects were suggested by Duncan & Thompson, who called them 'magnetars' to reflect the nature of the energy source that produces their quiescent and flaring X-ray luminosities. Very rarely, magnetars emit giant flares, extreme events with total energies typically approx. 10(exp 44) ergs, at least a factor of 1000 higher than the more frequent, repeating SGR bursts. Previously, only two giant flares have been recorded: from SGR 0526-66 in 1979 and from SGR 1900+14 in 1998. In this letter we report the detection of a very bright but rapidly fading radio afterglow that indicates a moderately relativistic expansion of plasma ejected from the magnetar. The radio afterglow is estimated to be at least 700 times brighter than that of the Aug 27 event, and is consistent with the hypothesis (also suggested by gamma-ray and X-ray data) that it was intrinsically a much more powerful event. I will discuss here the VLA results and their implications for the SGR flare energetics.
Author
Gamma Ray Bursts; Soft Gamma Repeaters; Gamma Ray Astronomy

20050167127 California Univ., La Jolla, CA, USA
Evaluation of CO Self-Shielding as a Possible Mechanism for Anomalous Oxygen Isotopic Composition of Early Solar System Materials
Chakraborty, Subrata; Thiemens, M. H.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Following the discovery by Thiemens and Heidenreich [4] of a chemically produced mass independent isotope effect that identically reproduces that observed in meteorites, the possibility that these meteoritic anomalies arise from chemical processes became possible. This is a major issue given that the observed anomalies are large and oxygen is the major element; therefore, the source of these anomalies is a major process in the formation of the solar system. The concept of self shielding in the solar nebula was introduced to explain the enhanced C-13C and O-18 signatures observed by radio astronomers at the edges of interstellar molecular clouds in CO [4, 5, 6]. Thiemens and Heidenreich [4] also suggested that self shielding of nitrogen might account for observed meteoritic heavy isotope enrichments. Recently, self-shielding of CO has been revitalized to explain the Oisotopic anomalies in meteorites [7].
Derived from text
Isotope Effect; Oxygen 18; Chemical Reactions; Shielding; Solar Nebula

20050167134 Academia Sinica, Taipei, Taiwan, Province of China
Developing SNMS for Full-Spectrum High-Sensitivity In-Situ Isotopic Analysis of Individual Comet Grains Collected by Stardust?
Chen, Chun-Yen; Shen, Jason Jiun-San; Lee, Typhoon; Calaway, Wallis; Veryovkin, Igor; Moore, Jerry; Pellin, Michael; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations
Contract(s)/Grant(s): NASA Order W-19895; NASA Order W-10091; W-31-109-Eng-38; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In anticipation of the return of comet (and ISM?) dust grains by the Stardust mission [1] in mid-January next year, Academia Sinica (AS) and Argonne National Laboratory (ANL) have entered into a collaboration to develop instrument and method for the isotopic analysis of these samples. We need to achieve the highest possible sensitivity so that we can analyze individual grains one at a time to the smallest possible size. Only by doing so can we hope to reach one of the main science goals of the mission, namely the recognition of those isotopically distinct grains each carrying the characteristic signature of a particular nucleosynthetic stage of its parent star. In order to facilitate the interpretation of these grains the second requirement of our method is that the measurements must be made over the widest possible mass range before samples exhaustion. For instance, the thermonuclear fusion reactions that produced the isotopes of various major elements of a wide mass range required drastically different temperatures. Therefore their abundances could constrain the conditions at greatly varying depth inside the source star hence its structure and evolution.
Derived from text
Comets; Isotopes; Thermonuclear Reactions; Dust

20050167162 Johns Hopkins Univ., Laurel, MD, USA
Asteroid Collisional Evolution: Implications for Internal Structure
Cheng, A. F.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A new model of asteroid collisional evolution is developed, based upon the well-known Dohnanyi [1] formalism and upon scale-dependent collision and fragmentation physics using the prescription suggested by Cheng [2]. The model is constrained by a size distribution inferred from crater size distributions on the Moon, Mercury and Mars, which are known to be remarkably similar from prior work [3], and which is assumed to apply at the end of the massive early bombardment, 3.9 Gy ago. The asteroid size distribution is constrained to evolve over 3.9 Gy from this condition to the present day size distribution as inferred from observation. In this evolution model, the survival of a basaltic crust on Vesta can be accommodated, together with formation of \g100 exposed metal cores. The new evolution model has the property of convergence toward an equilibrium state, forgetting the details of the initial state except at the largest sizes, although the collisional equilibrium state is not a simple power law. To fit observational constraints, the new collisional model suggests that asteroid fragmentation is not described by a simple Weibull flaw distribution with self-gravity strengthening, but that asteroids of about 10 km size are stronger than such a fragmentation law would predict. This may result from parent body geologic processes. The model predicts that the asteroid population from about 1 to about 200 km size, 3.9 Gy ago, was only a few times larger than today, and it predicts the size distribution below 1 km size to be shallower than the Dohnanyi index 2.5 power law.
Derived from text
Asteroids; Collisions; Gravitation; Fragmentation; Craters; Crusts; Basalt

20050167739 Florida Gulf Coast Univ., Fort Myers, FL, USA
Photometric Lightcurve Measurements of Asteroids
Fauerbach, M.; Bennett, T.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Photometric lightcurve measurements of asteroids provide a great opportunity for small telescopes (0.2m-0.4m) to become involved with useful astronomical research. Many amateurs and small university telescopes collaborate with professional astronomers in this endeavor. The list of potential targets, and the reasons for studying them are many. Even for unfiltered, non-calibrated observations, there are numerous opportunities, like 1) asteroids that are targets for radar observations, or spacecraft flybys, 2) studies of (potentially) binary asteroids, 3) asteroids for which no known lightcurve exists, 4) asteroids that have reported periods with high uncertainties 5) asteroids that have been extensively studied and which are targets for shape modeling programs, such as [1]. More involved observational programs using BVRI filters and absolute magnitude calibration to standard stars is even more useful, as the data can be easily combined with spectroscopic measurements taken at larger observatories to provide detailed information about the target asteroids. A list of potential target asteroids can be found at the Collaborative Asteroid Lightcurve Link (CALL) webpage [2], and associated links.
Derived from text
Asteroids; Light Curve; Photometry; Calibrating

20050167748 Kharkov National Aerospace Univ., Ukraine
Photometrical Peculiarities and Outburst Activity of Two Target Comets
Filonenko, V. S.; Churyumov, K. I.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Today two space missions to comets are actually. The spacecraft 'ROSETTA' had been successfully launched at the March 2, 2004. It will be a rendezvous with short-period comet 67P/Churyumov- Gerasimenko at the Aug. 2014. The launching of the spacecraft 'Deep Impact' to the short-period comet 9P/Tempel 1 is planned at January 12, 2005. It will be a rendezvous with comet at July 4, 2005. In this sense the investigations of photometrical properties and their evolution of target comets are very topical.
Derived from text
Comets; Targets; Stellar Evolution

20050167807 Chicago Univ., Chicago, IL, USA
Uranium-Thorium Cosmochronology
Dauphas, N.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The age of the solar system (T) is well constrainedfrom meteorite measurements at 4.567.2+/-0.6 Gy [5].The age of the Milky Way must lie between these twoages but is very poorly constrained. Four approachescan be used to estimate this value.(i) White dwarfs are remnants of stars lower than 8M in mass. They radiate energy into space and thereforebecome less luminous with time. Comparison withtheory gives ages for the oldest white dwarfs in theGalaxy of approximately 8-14 Gy [6].(ii) Globular clusters are clusters of stars of differentmasses formed simultaneously. As the cluster ages,stars of lower masses exhaust their hydrogen fuel andleave the main sequence in the Hertzsprung-Russelldiagram, providing a useful chronometer. Globularclusters impose a minimum age for the Galaxy of 10.4 Gy [7].
Derived from text
Solar System; Chronometers; Milky Way Galaxy; Nuclear Physics; Star Clusters; Uranium; Thorium

20050167826 Academy of Sciences (USSR), Moscow, USSR
Siderophile Behavior of P in Impact Processes
Dikov, Yu. P.; Gerasimov, . V.; Yakovlev, O. I.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788
Contract(s)/Grant(s): RFBR-04-05-64338; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Earth s mantle and the Moon are depleted in siderophile elements compared to CI carbonaceous chondrites. It is considered that siderophile elements in the Earth were preferably transported into the core during the process of global metal-silicates partitioning. According to Ringwood s model [1] the Earth was formed from material analogous to carbonaceous chondrites. This circumstance implies that many elements with siderophile properties were initially in oxidized (lithophile) state. The principal question here is: what was the main process during the accretion which provided the reduction of elements and the origin of metallic phase. It is widely accepted that the origin of the Earth resulted in high temperatures

and reduced environmental conditions, which were the main cause of reduction of siderophiles. Ringwood [1] considered that 'impacts of planetesimals could result in high local heating and consequent reduction of iron from oxidized to metallic state due to reactions with carbonaceous material'. As a rule, the reduction of iron and other siderophiles is considered to be a result of exchange reactions with any reducing specie. The possibility of direct thermal reduction of siderophiles by dissociation of oxides is not much considered. Experiments which model conditions of impact related vaporization shows that the reduction of siderophiles only due to dissociation of oxides can be rather efficient (e.g. [2]). Here we present experimental results to prove the possibility of reduction of phosphorus due to dissociation reactions during high-temperature processes.
Derived from text
Siderophile Elements; Carbonaceous Chondrites; Earth Mantle; Moon; High Temperature; Planetary Evolution

20050167833 California Univ., Berkeley, CA, USA
Modeling Large Interstellar Dust Grain Impacts in Sample Return Missions
Dominguez, G.; Westphal, A. J.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Observations by the Galileo and Ulysses missions (1) have established that interstellar dust from the local ISM enters the Solar System and that the largest of these grains penetrate into the inner solar system (2) . These observations provide much of the basis for what we know of the interstellar dust grains in the local Galactic environment. Observations by the AMOR radar facilities strongly suggest that another source of extrasolar dust exists nearby, apparently in the direction of Pictoris (3,4). Aerogel-based sample return missions, like Stardust, promise to provide new insights into the local population of interstellar dust grains. However, Stardust is expected to collect only a few large (\g1 micron) interstellar dust grains. Detailed characterization of the local interstellar dust will require that a large area (approx. 3sq m) collector be deployed for an extended period of time. An economical way of achieving this is to deploy such an array in low-Earth orbit (LEO). However, the LEO environment is cluttered with anthropogenic debris, and thus extraterrestrial dust grains captured in aerogel arrays in LEO must be filtered from this background.
Derived from text
Interstellar Matter; Aerogels; Cosmic Dust; Earth Orbital Environments; Low Earth Orbits

20050169418 Space Telescope Science Inst., Baltimore, MD, USA
HST: The Half-Way Point
Hayes, Jeffrey; IEEE Antennas and Propagation Society International Symposium 1997. Volume 2: Digest; [1997], pp. 1246; In English; See also 20050169243; Copyright; Avail: Other Sources

The Hubble Space Telescope was launched in April 1990 with a great deal of media coverage. When the telescope was subsequently found to suffer from spherical aberration, the project was declared a failure. However, even with the spherical aberration problem, the telescope performed very well and obtained science observations that could not have been otherwise done. In December 1993, the first in a series of planned servicing missions was flawlessly carried out by the crew of the shuttle Endeavour. In the 3 years since that mission, HST has not only performed in a spectacular fashion, but has produced thousands of truly remarkable images, including the very depths of the observable Universe for the Hubble Deep Field project. Indeed, the astronomical community is poised to answer some of the fundamental questions about the size and age of the Universe we live in, and this is in no small part due to the observations made with HST.
Derived from text
Hubble Space Telescope; Universe; Observation

20050169461 Ohio Univ., Athens, OH, USA
Coordinated Broadband Monitoring of Variable X-Ray Sources in NGC 1313
Boettcher, Markus; April 30, 2005; 1 pp.; In English
Contract(s)/Grant(s): NNG04GC65G; No Copyright; Avail: Other Sources; Abstract Only

The nearby (3.7 Mpc) late-type barred spiral galaxy NGC 1313 contains three ultraluminous X-ray sources (ULXs) that are offset from the center of the galaxy. Two of these have been associated with optical ionized nebulae, and their spectral and variability properties indicate that they contain black holes. The third ULX is SN 1978K, which was the second supernova to be detected and recognized as a supernova from its radio emission, and the first from its X-rays. In this project, we have started a long-term program of X-ray (XMM-Newton), optical (VLT), and radio (ATCA) observations of these and other sources in NGC 1313. This program has been continued through Cycle 3. XMM-Newton observations in cycle 2 consisted

of eight 10 ksec priority A monitoring observations between 2003 November 25 and 2004 January 16. The data obtained from these observations have been fully analyzed, and the results have been published in Smith et al. (2004). The results included the identification of the optical counterpart of ULX X-2, and firm upper limits for the radio counterparts of ULXs X-1 and X-2. Previously unknown X-ray spectral variability has been detected in ULXs X-1 and X-2. For SNR 1978K, we were able to extend and refine the X-ray decay light curve. In tandem, we developed a semi-analytical model for the spectral variability of microquasar jets, which will be refined and applied to the combined results from our cycle 2 + 3 observations after the cycle-3 data have been fully analyzed.
Author
Broadband; Mathematical Models; X Ray Sources; Spiral Galaxies; Black Holes (Astronomy)

20050169487 Kazan State Univ., USSR
Fine Phenomena of the Lunar Libration
Gusev, A.; Kawano, N.; Petrova, N.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The idea is to detect fine variations in the lunar rotation caused by a complex stratigraphy of lunar interior, using the high-precision astronomical observations of the lunar rotation in the forthcoming mission SELENE [9]. An occurrence of additional oscillations in the polar motion of the Moon is one of manifestations of heterogeneous of a lunar body on its Eulerian (free) rotation. An evaluation of the eigenfrequencies describing the free librations of the Moon may be obtained as a solution of homogeneous equations for libration angles. The Hamiltonian approach, developed by Getino et al. [5] to description of nonrigid, three-layer Earth with dissipation, may be adopted to study of the analogous effects in free rotation motion of the Moon. It is only necessary to take into account that there is a coincidence of the rotational and orbital period when transferring to the lunar dynamical system of coordinate [1, 14].
Derived from text
Librational Motion; Lunar Rotation; Polar Wandering (Geology); Stratigraphy; Heterogeneity

20050169494 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA
The Solar System in Its Universal Context: Ideas, Misconceptions, Strategies and Programs to Enhance Learning
Grier, G. A.; Reinfeld, E. L.; Dussault, M. E.; Steel, S. J.; Gould, R.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Universe Forum conducts a variety of education programs in formal, informal and community venues, giving us an opportunity to collect a wide range of data regarding student and teacher ideas about the universe. We will present the preliminary analysis of our data relevant to learning about the solar system, particularly relating to its place within the context of the larger universe. Data have been collected from surveys, interviews, modeling activities, specifically tailored multiple-choice assessments and other forms of evaluation. Our data suggest that some of the misconceptions relating to the size of the solar system, placement, distance, scale and hierarchy of astronomical objects are introduced or reinforced by not including the solar system in a consistent, coherent picture within the rest of the galaxy and universe. If these ideas and misconceptions are not addressed, they can form barriers to developing new and more accurate internal models, and impede the assimilation of any new evidence or ideas within those models.
Derived from text
Solar System; Education; Universe; Astronomy

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ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20050166882 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA
New Features in the ADS Abstract Service
Eichhorn, Guenther; Accomazzi, Alberto; Grant, Carolyn S.; Kurtz, Michael J.; Henneken, Edwin A.; Thompson, Donna M.; Murray, Stephen S.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 1 pp.; In English; See also 20050166869
Contract(s)/Grant(s): NCC5-189; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The NASA-ADS Abstract Service provides a sophisticated search capability for the literature in Astronomy, Planetary Sciences, Physics/Geophysics, and Space Instrumentation. The ADS is funded by NASA and access to the ADS services is free to anybody world-wide without restrictions. It allows the user to search the literature by author, title, and abstract text. Derived from text

Astronomy; Meteorites; Geophysics; Astrophysics

20050166889 Whitman Coll., Walla Walla, WA, USA

Elevation-Dependent Flow Rates on Olympus Mons

Enevoldsen, A. A.; Sakimoto, S. E. H.; Cooley, C. R.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Using current Mars Orbiter Laser Altimeter (MOLA) and Mars Odyssey's Thermal Emission and Imaging Spectrometer (THEMIS) data, we attempt to determine the volume flow rates of small lava flows (lengths of 1-15km) on Olympus Mons and quantify the difference between flow rates of low-elevation and high-elevation flows. With the new data provided by MOLA, THEMIS, the Mars Observer Camera (MOC), and the Mars Express High Resolution Stereo Camera (HRSC), as well as Sakimoto s 2001 flow-rate equations [1], we should be able to get more accurate flow rates with smaller error margins than did previous research based on lower-resolution Viking data and Hulme s 1975 flow-rate equations [2]. The lowest flow rate we have found so far is 4.0x10(exp 1)cu m/s and the highest is 5.8x10(exp 3)cu m/s.

Derived from text

Elevation; Fluid Flow; Flow Velocity; Thermal Emission; 2001 Mars Odyssey; Imaging Spectrometers

20050166901 Pennsylvania State Univ., University Park, PA, USA

The Physical Nature of the Sharp Spectral Feature at 7 keV Detected in 1H0707-495

Brandt, Niel; [2005]; 1 pp.; In English

Contract(s)/Grant(s): NAG5- 12804; No Copyright; Avail: CASI; A01, Hardcopy

XMM-Newton acquired data on the accepted target, 1H0707-495, on 2002 October 13 during revolution 0521. The observation was successful, with only about 5% data loss due to background flaring. We compared the data from this observation with earlier data taken on this Narrow-Line Seyfert 1 about two years before, performing interpretation studies in the context of the partial-covering model. Our second longer observation once again displays a sharp (\h 200 eV) spectral drop above 7 keV. However, in comparison to the first observation, the edge depth and energy have changed significantly. In addition to changes in the edge parameters, the high-energy spectrum appears steeper. The changes in the high-energy spectrum can be adequately explained in terms of a partial-covering absorber out-flowing from the central region. The low-energy spectrum also shows significant long-term spectral variability, including (1) a substantial increase in the disk temperature, (2) detection of an approx. 0.9 keV emission feature, and (3) the presence of ionized absorption that was detected during the ASCA mission. The large increase in disk temperature, and the more modest rise in luminosity, can be understood if we consider a slim-disk model for 1H0707-495. In addition, the higher disk luminosity could be the driving force behind the outflow and the re-appearance of an ionized medium during the second XMM-Newton observation.

Author (revised)

Seyfert Galaxies; X Ray Astronomy; X Ray Spectra

20050166989 Washington Univ., Saint Louis, MO, USA

Constraints on Grain Formation Around Carbon Stars from Laboratory Studies of Presolar Graphite

Bernatowicz, T. J.; Akande, O. W.; Croat, T. K.; Cowsik, R.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923

Contract(s)/Grant(s): NNG04GG13G; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We report the results of an investigation into the physical conditions in the mass outflows of asymptotic giant branch (AGB) carbon stars that are required for the formation of micron-sized presolar graphite grains, either with or without internal crystals of titanium carbide (TiC). In addition to providing detailed information about stellar nucleosynthesis, the structure and composition of presolar grains give unique information about the conditions of grain formation. In the present work we use laboratory observations of presolar graphite to gain insight into the physical conditions in circumstellar outflows from carbon AGB stars. The periodic pulsation of AGB stars enhances the gas density through shocks in the stellar atmosphere above the photosphere, promoting the condensation of dust grains. Copious mass outflow occurs largely because grains are coupled to

the radiation field of the star, which accelerates them by radiation pressure; momentum is in turn transferred to gas molecules by collisions with grains. The dust/gas mixture is effectively a two-component fluid whose motion depends on atmospheric structure and which, in turn, influences that structure. In particular, the radiation pressure on the grains determines the velocity field of the outflow and thus the density distribution, while the density distribution itself determines the conditions of radiative transfer within the outflow and thus the effective radiation pressure.
Derived from text
Asymptotic Giant Branch Stars; Carbon Stars; Graphite; Grain Size; Titanium Carbides

20050167072 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Evolution of Pre-Main Sequence Accretion Disks
Hartmann, Lee W.; April 2005; 8 pp.; In English
Contract(s)/Grant(s): NAG5-9670; No Copyright; Avail: CASI; A02, Hardcopy

The aim of this project was to develop a comprehensive global picture of the physical conditions in, and evolutionary timescales of, premain sequence accretion disks. The results of this work will help constrain the initial conditions for planet formation. To this end we developed much larger samples of 3-10 Myr-old stars to provide better empirical constraints on protoplanetary disk evolution; measured disk accretion rates in these systems; and constructed detailed model disk structures consistent with observations to infer physical conditions such as grain growth in protoplanetary disks.
Derived from text
Accretion Disks; Pre-Main Sequence Stars; Planetary Evolution; Astrophysics

20050167197 Washington Univ., Saint Louis, MO, USA
Internal Grains Within KFC Graphites: Implications for Their Stellar Source
Croat, T. K.; Stadermann, F. J.; Bernatowicz, T. J.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: Despite the assumed contribution of AGB carbon stars to the presolar grains population, few Murchison KFC graphites (approx. = 4%) appear in the 40 less than or = C-12/C-13 less than or = 70 range typically observed in the photospheres of AGB stars and in isotopic measurements of presolar silicon carbides. Instead, most have lighter carbon (75% with 12C/13C \g 90) and a significant group has very heavy carbon (15% between 0 less than or = C-12/C-13 less than or = 20). On the basis of bulk isotopic composition alone, a supernova (SN) origin was thought possible for many of the isotopically light carbon graphites, as they fall into the same carbon isotopic range as most SiC-X grains. Recent coordinated TEM and nanoSIMS studies of the same graphite population have shown that many in this light carbon group also contain refractory carbides with s-process enrichments (high Zr, Mo and Ru), indicative of an AGB origin. There is a much smaller subset which likely do have a SN origin, namely those containing pure TiCs without s-process elements or other rare phases (such as iron, iron carbide, and metallic osmium) unlikely to form before graphite around AGB stars.
Author
Asymptotic Giant Branch Stars; Carbon; Graphite; Isotopes

20050167720 New Mexico Univ., Albuquerque, NM, USA
Introductory Astronomy and Astrophysics
Zeilik, Michael; Gregory, Stephen A.; Smith, Elske v. P.; [1992]; 589 pp.; In English
Report No.(s): LC-91-053096; Copyright; Avail: Other Sources

This textbook is intended for introductory astrophysics courses at a college or university level. The book provides a general overview of astronomy, with an emphasis on phyical processes and concepts.
CASI
Astrophysics; Astronomy; Textbooks; General Overviews; Solar System; Stars; Milky Way Galaxy; Universe

20050167794 Chicago Univ., Chicago, IL, USA
Protracted Core Differentiation in Asteroids from 182Hf-182W Systematics in the Eagle Station Pallasite
Dauphas, N.; Foley, C. N.; Wadhwa, M.; Davis, A. M.; Janney, P. E.; Qin, L.; Goepel, C.; Birck, J.-L.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Observations of remote stellar systems have reached a point where meaningful comparisons can be made between these

astronomical observations, astrophysical models, and meteorite measurements. Among the parameters that can be compared are the timescales of formation of protoplanetary disks and subsequent condensation, aggregation, and differentiation of solids. With a Hf-182 half-life of 8.90 plus or minus 0.09 My, the Hf-182 W-182 pair is well suited to answer these questions. There are, however, some caveats to the application of short-lived nuclides to early solar system chronology. Some short-lived nuclides may have been produced by irradiation in the early solar system or may have been injected in the disk by the explosion of a nearby supernova that may have triggered the protosolar nebula into collapse. In either case, the extinct radionuclides may have been heterogeneously distributed in time and space, thus blurring to some extent the chronological information that can be retrieved from these nuclides. Another complication is related to the presence of nucleosynthetic anomalies that may cause the daughter nuclides to vary regardless of the abundance of the parent nuclides. We address these two issues for the Hf-182-W-182 system.
Derived from text
Asteroids; Astrophysics; Hafnium Isotopes; Protoplanetary Disks; Tungsten Isotopes

20050168114 Boston Univ., Boston, MA, USA
Probing the Relativistic Jets of Active Galactic Nuclei with Multiwavelength Monitoring
Marscher, Alan P.; Jorstad, Svetlana G.; Aller, Margo; [2005]; 10 pp.; In English
Contract(s)/Grant(s): NAG5-13074; No Copyright; Avail: CASI; A02, Hardcopy

The work completed includes the analysis of observations obtained during Cycle 7 (March 2002-February 2003) of the Rossi X-ray Timing Explorer (RXTE). The project was part of a longer-term, continuing program to study the X-ray emission process in blazars and radio galaxies in collaboration with Dr. Ian McHardy (U. of Southampton, UK) and Prof. Thomas Balonek (Colgate U.). The goals of the program are to study the X-ray emission mechanism in blazars and radio galaxies and the relation of the X-ray emission to changes in the relativistic jet. The program includes contemporaneous brightness and linear polarization monitoring at radio and optical wavelengths, total and polarized intensity imaging at at 43 GHz with a resolution of 0.1 milliarcseconds with the VLBA, and well-sampled X-ray light curves obtained from a series of approved RXTE programs. The objects studied in the time period covered by the grant were 3C 120, 3C 279, PKS 1510-089, and 3C 273, all with radio jets containing bright knots that appear to move at superluminal speeds. During RXTE Cycle 7, the project was awarded RXTE time to monitor PKS 1510-089 two times per week, 3C 273 and 3C 279 three times per week, and 3C 120 four times per week. In addition, 3C273 and 3C 279 were observed several times per day during a ten-day period in April 2002. The X-ray data, including those from earlier cycles, were compared with radio measurements obtained in the centimeter-wave band by the monitoring program of Drs. Margo and Hugh Aller at the University of Michigan Radio Astronomy Observatory, monthly imaging observations with the VLBA at 43 GHz, and optical observations obtained at several telescopes around the world.
Author (revised)
X Ray Timing Explorer; X Ray Astronomy; Blazars; Radio Galaxies

20050168116 Michigan Univ., Ann Arbor, MI, USA
Connection Between X-Ray Dips and Superluminal Ejections in the Radio Galaxy 3C 120
Aller, Margo F.; [2005]; 4 pp.; In English
Contract(s)/Grant(s): NNG04GD97G; No Copyright; Avail: CASI; A01, Hardcopy

This work represents a part of a long-term study of the X-ray flux variability of 3C 120 and its relation to flux and structural changes in the radio jet of this galaxy. The grant included fiinding for the rediiction and analysis of data obt,ained during the time pwiod of Rossi XTE cycle 8 (March 1, 2003-February 29, 2004). Prior RXTE observations, combined with single dish monitoring at centimeter wavelengths and 43 GHz mapping (monthly until February 1999 and bimonthly thereafter) of the inner jet with the VLBA, had identified the presence of X-ray dips in the light curves and X-ray spectral hardening 4 weeks prior to the ejection of new VLBI components in the radio jet. This suggested a picture in which the radio jet was fed by accretion events near the black hole. The specific goals of the cycle 8 observations were to better define the relation between the X-ray dips and the radio events using higher sampling, to include more events in the correlation and hence improve the statistics, to look for a possible optical X-ray connection, and to search for quasi periodicities on timescales of 1-3 days. In cycle 8 this project was awarded time for 4 pointings weekly with RXTE.
Author (revised)
X Ray Astronomy; Radio Galaxies; Light Curve; Periodic Variations

20050169208 Laurin Publishing Co., Inc., Pittsfield, MA, USA

Infrared Astronomy Takes Saturn's Temperature

Gaughan, Richard, Editor; Photonics Spectra; April 2005; ISSN 0731-1230; Volume 39, No. 4; 2 pp.; In English; Copyright; Avail: Other Sources

As anyone who has been caught in a rainstorm without an umbrella can testify, weather modeling and prediction are not exact sciences. Although the basic physics underlying atmospheric dynamics is relatively straightforward, complexity grows rapidly as the scale of the interactions increases. That is one reason why scientists are interested in investigating weather on other planets. The advanced technology of the 10-m Keck I telescope on Mauna Kea in Hawaii, combined with the long-wavelength spectrometer, recently made it.possible to measure temperature variation in the atmosphere of Saturn. As they report in the Feb. 4 issue of Science, Glenn S. Orton and Padma A. Yanamandra-Fisher of the Jet Propulsion Lab in Pasadena, Calif., spent six hours last year using the instrument to collect snapshots of Saturn. The spectrometer is based on a 128 x 128 Si:As blocked-impurity-band array that is sensitive to wavelengths from about 4 to nearly 26 pm and that can produce a 10.8 x 10.8-arc-sec image. The researchers stitched these images together to produce mosaics of the visible surface of the ringed planet with a 3000-km resolution. Images taken with five bandpass filters centered on wavelengths from 8.0 to 24.5 microns provided information about different layers in the Saturnian atmosphere. After the data was processed, they generated two thermal maps of the planet. One represents the troposphere, close to the surface, and the other shows the temperature profile of the stratosphere.

Derived from text

Infrared Astronomy; Saturn Atmosphere; Planetary Temperature; Saturn (Planet)

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*.

20050165765 Laurin Publishing Co., Inc., Pittsfield, MA, USA

Multispectral Imaging of Mars Reveals a Long-Dry Planet

Hogan, Hank, Editor; Photonics Spectra; April 2005; ISSN 0731-1230; Volume 39, No. 4, pp. 59-60; In English; Copyright; Avail: Other Sources

The latest word on martian water and the possibility of life on the Red Planet comes courtesy of Observatoire pour la Mineralogie, I'Eau, les Glaces et l'Activite, or Omega, a visible and infrared mapping spectrometer aboard the European Space Agency's Mars Express orbiter. Mars, as confirmed by results from Omega, has been cold and dry for billions of years.

Author

Mars Express; Mars (Planet); Water; Planetary Mapping; Infrared Spectrometers

20050166383 American Inst. of Aeronautics and Astronautics, Reston, VA, USA

Mapping the Moon's Resources

Sietzen, Frank, Jr.; Aerospace America; April 2005; ISSN 0740-722X; Volume 43, No. 4, pp. 28-32; In English; Original contains color illustrations; Copyright; Avail: Other Sources

When President Bush set forth his Vision for Space Exploration a year ago, he proposed unprecedented collaboration between robotic and human explorers. Under the plan detailed by NASA soon after his announcement, robots not only would work with astronauts during their explorations of the Moon and Mars, but would also begin these missions before the arrival of human crews and continue working after each team of explorers returned to Earth. In this way, the robotic pathfinders would lead in incremental steps to the day when permanent facilities on the Moon, and eventually on Mars, are occupied by both humans and robots. To explore in the depth and detail proposed in the vision, robot scouts are to blaze a trail back to the Moon in a series of advanced research mission beginning in 2008. Carrying out the first of these missions will be the Lunar Reconnaissance Orbiter (LRO), a 2008 spacecraft whose primary task is a year-long resource allocation mission mapping the lunar surface from orbit.

Author (revised)

Lunar Maps; Thematic Mapping; Lunar Probes; Lunar Resources

20050166869 Lunar and Planetary Inst., Houston, TX, USA

Lunar and Planetary Science XXXVI, Part 5

[2005]; ISSN 1540-7845; In English; Lunar and Planetary Science XXXVI, 14-18 Mar. 2005, Houston, TX, USA; See also 20050166870 - 20050166893

Contract(s)/Grant(s): NCC5-679

Report No.(s): LPI-Contrib-1234-Pt-5; Copyright; Avail: CASI; C01, CD-ROM

Topics discussed include: Automation Recognition oF Crater-Like Structures in Terrestrial and Plantary Images; Condensation from Cluster-IDP Enriched Vapor Inside the Snow Line: Implications for Mercury, Asteroids, and Enstatite Chondrites; Tomographic Location of Potential Melt-Bearing Phenocrysts in Lunar Glass Spherules; Source and Evolution of Vapor Due to Impacts into Layered Carbonates and Silicates; Noble Gases and I-Xe Ages of the Zag Meteorite; The MArs Hand Lens Imager (MAHLI) for the 209 Mars Science Laboratory; The Sedimentary Rocks of Meridiani Planum, in Context; Three-System Isotopic of Lunar Norite 78238: Rb-Sr Results; Constraints on the Role of Curium-247 as a Source of Fission Xenon in the Early Solar System; New Features in the ADS Abstract Service; Cassini RADAR's First Look at Titan; Volcanism and Volatile Recycling on Venus from Lithospheric Delamination; The Fate of Water in the Martian Magma Ocean and the Formation of an Early Atmosphere; Mars Odyssey Neutron Spectrometer Water-Equivalent Hydrogen: Comparison with Glacial; Landforms on Tharsis; Using Models of Permanent Shadow to Constrain Lunar Polar Water Ice Abundances; Martian Radiative Transfer Modeling Using the Optimal Spectral Sampling Method; Petrological and Geochemical Consideration on the Tuserkanite Meteorite; and Mineralogy of Asteroids from Observations with the Spitzer Space Telescope.

Derived from text

Asteroids; Geochemistry; Mars (Planet); Mars Surface; Meteorites; Mineralogy; Petrology; Sedimentary Rocks

20050166871 Malin Space Science Systems, San Diego, CA, USA

The Sedimentary Rocks of Meridiani Planum, in Context

Edgett, K. S.; Malin, M. C.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The sedimentary rocks examined by MER-B, the Mars Exploration Rover, Opportunity [1], are part of a stratigraphic sequence of \g 1 km thickness that covers a broader area than previous investigators [2-5] recognized. These rocks are not superimposed on heavily cratered terrain, but rather are an integral part of it. They record a rich, diverse, and complex history. Similar rocks occur on the plains cut by the Valles Marineris chasms, Ius, Melas, and Candor.

Derived from text

Sedimentary Rocks; Planetary Craters; Mars Exploration

20050166872 Los Alamos National Lab., NM, USA

Using Models of Permanent Shadow to Constrain Lunar Polar Water Ice Abundances

Elphic, R. C.; Lawrence, D. J.; Feldman, W. C.; Prettyman, T. H.; Maurice, S.; Bussey, D. B. J.; Spudis, P. D.; Lucey, P. G.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Reservoirs of volatiles cold-trapped in permanent shadow at the lunar poles are scientifically valuable and a potential in situ resource for exploration. While Clementine radio science data was interpreted in favor of the presence of lunar polar ice [1], this has been disputed [2]. Nevertheless, it is clear that there are polar enhancements of hydrogen, and it has been argued that these are in the form of shallow buried ice [3,4,5]. Radar results have not shown the expected return due to large bodies of ice, however [6]. This does not preclude the existence of interstitial ice. We have previously reported on efforts to use models of permanent shadow to help constrain Lunar Prospector neutron spectrometer (LPNS) water-equivalent hydrogen abundances [7]. Here we report on further work in which we find that the LPNS data are consistent with small regions of \g 1wt% WEH.

Derived from text

Reservoirs; Neutron Spectrometers; In Situ Resource Utilization; Ice

20050166873 American Museum of Natural History, New York, NY, USA

Condensation from Cluster-IDP Enriched Vapor Inside the Snow Line: Implications for Mercury, Asteroids, and Enstatite Chondrites

Ebel, D. S.; Alexander, C. M. OD.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color illustrations

Contract(s)/Grant(s): NAG5-12855; NAG5-13040; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Enstatite chondrites (EC) contain highly reduced matrix minerals (e.g.- (Mg,Fe,Mn)S solid solution, CaS) that probably formed in thermodynamic equilibrium with a vapor phase. EC chondrules contain enstatite, Fs5 to Fs30, in which iron was reduced after formation, also by interaction with vapor [1, 2]. The origin and location of this reducing vapor bears upon the formation of the terrestrial planets (Mercury to Mars), the remnant chemical zoning of the asteroid belt (E, S, C, D-types), and the cosmochemistry of metals in the early solar system.

Derived from text

Enstatite; Chondrites; Minerals; Thermodynamic Equilibrium; Vapor Phases

20050166874 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

The Mars Hand Lens Imager (MAHLI) for the 209 Mars Science Laboratory

Edgett, K. S.; Bell, J. F., III; Herkenhoff, K. E.; Heydari, E.; Kah, L. C.; Minitti, M. E.; Olson, T. S.; Rowland, S. K.; Schieber, J.; Sullivan, R. J., et al.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The MArs Hand Lens Imager (MAHLI) is a small, RGB-color camera designed to examine geologic material at 12.5-75 microns/pixel resolution at the Mars Science Laboratory (MSL) landing site. MAHLI is a PI-led investigation competitively selected by NASA in December 2004 as part of the science payload for the MSL rover launching in 2009. The instrument is being fabricated by, and will be operated by, Malin Space Science Systems of San Diego, California.

Derived from text

Cameras; Mars Landing Sites; Geology; Regolith; Sampling

20050166875 Los Alamos National Lab., NM, USA

Mars Odyssey Neutron Spectrometer Water-Equivalent Hydrogen: Comparison with Glacial Landforms on Tharsis

Elphic, R. C.; Feldman, W. C.; Prettyman, T. H.; Tokar, R. L.; Lawrence, D. J.; Head, J. W., III; Maurice, S.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have previously described an enhancement of water-equivalent hydrogen (WEH) derived from Mars Odyssey neutron spectrometer (NS) observations on the western slopes of Olympus Mons and the principal Tharsis Montes [1]. Recent results from the High Resolution Stereo Camera aboard Mars Express have reinforced the idea that relict water ice may still underlie certain landforms on the western slopes of Olympus Mons [2,3], and possibly the other volcanoes as well. There is abundant evidence of the past possible presence of cold-based mountain glaciers [4,5], resulting from significant snow/ice deposits in these locations during periods of high obliquity [6,7], based on global climate modeling. Here we investigate whether or not the NS data support enhanced WEH associated with previously identified glacial and periglacial landforms.

Derived from text

Neutron Spectrometers; Mars Express; High Resolution; Cameras; Ice; Climate Models

20050166876 NASA Ames Research Center, Moffett Field, CA, USA

A Gas-Poor Planetesimal Feeding Model for the Formation of Giant Planet Satellite Systems: Consequences for the Atmosphere of Titan

Estrada, P. R.; Mosqueira, I.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Given our presently inadequate understanding of the turbulent state of the solar and planetary nebulae, we believe the way to make progress in satellite formation is to consider two end member models that avoid over-reliance on specific choices of the turbulence (alpha), which is essentially a free parameter. The first end member model postulates turbulence decay once giant planet accretion ends. If so, Keplerian disks must eventually pass through the quiescent phases, so that the survival of

satellites (and planets) ultimately hinges on gap-opening. In this scenario, the criterion for gap-opening itself sets the value for the gas surface density of the satellite disk.
Derived from text
Satellite Atmospheres; Gas Giant Planets; Gas Density; Turbulence; Natural Satellites

20050166877 LogicaCMG UK Ltd., Leatherhead, UK
Automation Recognition oF Crater-Like Structures in Terrestrial and Planetary Images
Earl, Jon; Chicarro, Agustin; Koeberl, Christian; Marchetti, Pier Giorgio; Milnes, Martin; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Impact cratering is a fundamental process acting on solid bodies of the solar system. The detection of impact craters on Earth may be aided by recent advances in remote sensing technologies, although visual inspection of large number of satellite images are probably too time consuming. We describe new efforts regarding recognition and detection of impact craters on Earth and Mars by using remote sensing images. In particular, approaches based on the Hough Transform and on the Radial Consistency measure are considered and compared.
Derived from text
Cratering; Satellite Imagery; Remote Sensing; Mars Craters

20050166878 Brown Univ., Providence, RI, USA
Source and Evolution of Vapor Due to Impacts into Layered Carbonates and Silicates
Eberhardy, C. A.; Schultz, P. H.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Impacts into volatile-rich targets produce detectable vapor plumes that expand above the crater and into the transient cavity [1,2]. Most experimental and theoretical models of impact vapor production use homogeneous targets, however, most planetary surfaces are not homogenous. For example, the high latitude terrain on Mars has surface deposits of volatile H2O and CO2 [3] and the nuclei of comets possibly have layered volatile and nonvolatile deposits. Impact vapor should primarily be produced in the upper surface of the target near the point of impact where the shock pressures and temperatures are highest. In order to investigate where the impact vapor is produced and the effect of nonvolatile particulate layers on vapor production, a new set of experiments were designed using the NASA Ames Vertical Gun Range (AVGR). Spectroscopic measurements determine the location, composition and relative abundance of the vapor. Interestingly, it was observed that silicates underlying a small layer of volatile carbonates enhance vapor production relative to the vapor produced in homogeneous volatile targets.
Derived from text
Silicates; Carbonates; Planetary Geology; Vapors; Plumes; Planetary Surfaces; Point Impact; Targets

20050166879 Tokyo Univ., Hongo, Japan
Noble Gases and I-Xe Ages of the Zag Meteorite
Ebisawa, N.; Nagao, K.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Zag is an H3-6 regolith breccia recovered from Morocco (27deg20'N, 9deg20'W; August 4th/5th, 1998) totaling at least 175 kg. It consists of light-colored metamorphic clasts (45 +/- 10 vol%), dark clasts exhibiting silicate darkening (approx.5 vol%), impact-melt-rock clasts (less than or equal to 1 vol%), and clastic matrix material (50 +/- 10 vol%) [1]. It was reported that halite grains were found only within H4 parts of the matrix [2 and 3]. The halites contain fluid inclusions. Zolensky et al. [4] concluded that the fluid inclusions are aqueous salt solution, which are dominated by secondary inclusions trapped along healed fractures (~80% in Monahans). This is clear evidence that aqueous fluids were locally present after initial halite deposition. Zolensky et al [4] suggested that the fluids may have been delivered to the asteroid from a salt-containing icy object.
Derived from text
Metamorphism (Geology); Meteorites; Regolith; Breccia; Silicates; Impact Melts; Rare Gases

20050166881 Manchester Univ., UK

Constraints on the Role of Curium-247 as a Source of Fission Xenon in the Early Solar System

Edwards, Stephen; Ballentine, Chris; Gilmour, Jamie; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: Curium is the heaviest known element with isotopes possessing a geologically significant half life. Cm-247 has an alpha half life of 16 Ma, decaying to lead via U-235. Isotope 248 has a half life of 340 kyr (=91.6%, SF=8.4%). Xenon isotopes are important indicators of atmospheric, crustal and planetary evolution. They are derived in part from the initial nebular inventory, fractionated by accretion and nebular hydrodynamic processes. The other major source is decay of unstable isotopes, notably I-129 (beta decay) and Pu-244 and U-238 (spontaneous fission). As Cm-247 has a long alpha half life, it is possible that it was a significant source of fission xenon in the early solar system. However, a review of the literature and the web e.g.[1,2,3] failed to produce a fission branching ratio for Cm-247. Our aim is to seek abundance and spontaneous fission branching ratio constraints at which Cm-247 would be a significant xenon source.

Derived from text

Curium Isotopes; Xenon Isotopes; Uranium 238; Uranium 235; Plutonium 244; Radioactive Isotopes; Iodine Isotopes; Fission

20050166884 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Volcanism and Volatile Recycling on Venus from Lithospheric Delamination

Elkins-Tanton, L. T.; Hess, P. C.; Smrekar, S. E.; Parmentier, E. M.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Venus has an unmoving lithosphere, a young surface indicative of volcanic resurfacing, and a wide variety of volcanic and tectonic features. The planet s ubiquitous magmatic features include 100,000 small shield volcanoes as well as the descriptively named pancakes, ticks, and arachnoids [1]. Coronae, volcanic and tectonic features up to 2,600 km in diameter, have been attributed to lithospheric interactions with upwelling plumes [e.g., 2], but more recently to delamination of the lower lithosphere with [3] or without [4] a central upwelling. Lavas issuing from different volcanic features appear to have a range of compositions, as evidenced by their apparent viscosities and by data from Soviet landers. Steep-sided or 'pancake' domes [e.g., 5] appear to consist of more viscous magma [6], perhaps silicic compositions created by remelting basaltic crust [7]. These steep-sided domes are associated with coronae and with shield volcanoes effusing basaltic magmas [7,8] with apparently low viscosities (low enough to allow fluid flow for hundreds of km, creating channels reminiscent of water rivers on Earth). Pancake domes, in contrast, can be up to 3 km in height and have volumes from 30 to approx.3,000 km3 [calculated from data in 8], and hundreds dot the planet [6-8].

Derived from text

Volcanoes; Lithosphere; Magma; Melting; Plumes; Tectonics; Lava

20050166885 Brown Univ., Providence, RI, USA

The Fate of Water in the Martian Magma Ocean and the Formation of an Early Atmosphere

Elkins-Tanton, L. T.; Parmentier, E. M.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The quantity and source of water that went into the initial formation of Mars, its distribution between the planetary interior, surface, and atmosphere, and the extent of its loss to space over time are critical to planetary evolution. We present here initial results from modeling efforts describing the fate of water during the fractional solidification of a magma ocean that formed with the heat of accretion of the planet and solidified within 30 million years of planetary formation. The fate of water during magma ocean crystallization is critical to the locations and quantities of water in later planetary evolution: water may be trapped in mantle cumulates, available for later release to the atmosphere through melting and degassing, or the magma ocean may largely degas before crystallization is complete. If a water fraction remains in the planetary mantle it would significantly decrease silicate viscosity and augment subsequent mantle convection [1], as well as lowering the melting temperature of the mantle and facilitating the magmatism that on Mars appears to have lasted to the present day.

Derived from text

Planetary Evolution; Mars (Planet); Water; Magma; Planetary Cores

20050166886 Atmospheric and Environmental Research, Inc., Lexington, MA, USA

Martian Radiative Transfer Modeling Using the Optimal Spectral Sampling Method

Eluszkiewicz, J.; Cady-Pereira, K.; Uymin, G.; Moncet, J.-L.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color illustrations

Contract(s)/Grant(s): NNH04CC29C; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The large volume of existing and planned infrared observations of Mars have prompted the development of a new martian radiative transfer model that could be used in the retrievals of atmospheric and surface properties. The model is based on the Optimal Spectral Sampling (OSS) method [1]. The method is a fast and accurate monochromatic technique applicable to a wide range of remote sensing platforms (from microwave to UV) and was originally developed for the real-time processing of infrared and microwave data acquired by instruments aboard the satellites forming part of the next-generation global weather satellite system NPOESS (National Polarorbiting Operational Satellite System) [2]. As part of our on-going research related to the radiative properties of the martian polar caps, we have begun the development of a martian OSS model with the goal of using it to perform self-consistent atmospheric corrections necessary to retrieve caps emissivity from the Thermal Emission Spectrometer (TES) spectra. While the caps will provide the initial focus area for applying the new model, it is hoped that the model will be of interest to the wider Mars remote sensing community.

Derived from text

Radiative Transfer; Infrared Astronomy; Mars (Planet); Surface Properties; Atmospheric Chemistry; Meteorological Parameters; Remote Sensing

20050166888 NASA Ames Research Center, Moffett Field, CA, USA

Mineralogy of Asteroids from Observations with the Spitzer Space Telescope

Emery, J. P.; Cruikshank, D. P.; VanCleve, J.; Stansberry, J. A.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Visible and near-infrared (approx.0.3 to 4.0 microns) spectroscopy has been successfully employed since the early 1970 s to infer the surface compositions of asteroids. Spectroscopic observations in the thermal infrared (approx.5 to 40 microns) are similarly promising. Silicate spectra in this range are dominated by Si-O stretch and bend fundamentals, and other minerals have similarly diagnostic bands [e.g., 1,2]. Observations in this spectral range are difficult from the ground due to strong telluric absorptions and background emission. Nevertheless, spectral structure has been detected on a few asteroids in the 8 to 14-m range from the ground [3,4], as well as from orbit with the ISO satellite [e.g., 5]. The Spitzer Space Telescope can observe asteroids with much higher sensitivity over a broader wavelength range than is possible from the ground or was possible with ISO. We present results of measurements of asteroids with the Infrared Spectrograph (IRS) on the Spitzer Space Telescope.

Derived from text

Mineralogy; Asteroids; Spectroscopy; Silicates

20050166890 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Thermal Emission Variability of Zamama, Culann and Tupan on Io Using Galileo Near-Infrared Mapping Spectrometer (NIMS) Data

Ennis, M. E.; Davies, A. G.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Jovian satellite Io is the most volcanically active body in the Solar System. Previous analyses [e.g., 1-4] indicate the presence of high-temperature silicate volcanism on Io, similar to silicate volcanism occurring on Earth. Instruments onboard the Galileo spacecraft, especially the Near Infrared Mapping Spectrometer (NIMS) and the Solid State Imager (SSI), provided much data of Io s active volcanoes throughout the duration of the Galileo mission (June 1996-September 2003). NIMS data is particularly sensitive to thermal emission from active and cooling lava over cooling times of seconds to a few years. The objective of this ongoing study of Io s volcanism is to determine the variability of thermal emission from volcanoes on Io s surface, in order to better understand the styles of eruption, and to constrain the volumes of material erupted. Ultimately, this will help to constrain the contribution of active volcanism to Io s thermal budget. Data have been analyzed for the volcano Zamama, located at 173 W, 21 N, and the power output of Zamama, the volumes of lava being erupted, and the eruption rate

determined. Culann and Tupan have also been analysed in this way. This abstract primarily concentrates on Zamama.
Derived from text
Io; Volcanoes; Jupiter Satellites; Galileo Spacecraft; Infrared Imagery; Thermal Emission; Near Infrared Radiation; Infrared Spectrometers

20050166891 Brown Univ., Providence, RI, USA
Investigations of the Luminous Energy and Luminous Efficiency of Experimental Impacts and Particulate Targets
Ernst, C. M.; Schultz, P. H.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 2 pp.; In English; See also 20050166869; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A portion of a projectile fs initial kinetic energy is partitioned into heat on impact, resulting in thermal heating and, in some cases, vaporization of projectile and target materials. If the impact is sufficiently energetic, the heated materials will radiate light in the visible wavelength range. The fraction of initial kinetic energy converted into luminous energy is the luminous efficiency. Numerical simulations have considered the luminous efficiency of impacts in the visible wavelength range [1,2], however the results span many orders of magnitude (10(exp -6)-10(exp -1)) and consider only the evolving vapor phases. Estimates also have been based on laboratory experiments (10(exp -6)-10(exp -4)) [3-5] and natural observations (approx.10(exp -3)) [6]. The former studies address only impacts into solid targets, and the latter relies on uncertain projectile size estimates. The present study calculates the luminous energy and luminous efficiency of experimental impacts into particulate targets. The results have implications for planetary impact observations that currently rely on theoretical and non-particulate target luminous efficiency estimates.
Derived from text
Luminosity; Kinetic Energy; Vapor Phases; Particulates; Energy Conservation

20050166893 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Saturn System as Observed by Cassini's Ultraviolet Imaging Spectrograph
Esposito, L. W.; Hansen, C. J.; Colwell, J.; Hendrix, A. R.; McClintock, W. E.; Shemansky, D. E.; Lunar and Planetary Science XXXVI, Part 5; [2005]; 1 pp.; In English; See also 20050166869; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Cassini Ultraviolet Imaging Spectrograph (UVIS) has major new findings in all aspects of Saturn science: Saturn, its rings, Titan and the icy satellites, and the Saturn magnetosphere. Dynamic interactions between neutrals, ions, rings, moons and meteoroids produce a highly structured and time variable Saturn system. Highlights and outstanding new results will be reported, focusing on Saturn s moons and their interaction with their environment. The UVIS is one of Cassini s suite of remote sensing instruments. The UVIS instrument includes channels for extreme UV (55 to 110 nm) and far UV (110 to 190 nm) spectroscopic imaging, high speed photometry of stellar occultations, solar EUV occultation, and a hydrogen/deuterium absorption cell. UVIS has detected products of water dissociation, neutral oxygen and OH, which dominate the Saturn inner magnetosphere, in contrast to Jupiter, and H fills the entire magnetosphere apparently extending through the magnetopause at far greater density than the ion population. The O and OH and a fraction of the H are probably the products of water physical chemistry, and derived ultimately from water ice. Observed fluctuations indicate close interactions with plasma sources. Sputtering from the satellites water ice surfaces is insufficient to supply the observed mass. Stochastic events in the E ring may be the ultimate source.
Derived from text
Cassini Mission; Atmospheric Models; Extreme Ultraviolet Radiation; Imaging Techniques; Remote Sensing; Molecular Gases; Neutral Gases

20050166897 Dornheim (Michael A.), Los Angeles, CA, USA
Mars Mission Grows
Dornheim, Michael A.; Aviation Week and Space Technology; April 25, 2005; ISSN 0005-2175; Volume 162, No. 17, pp. 68-70; In English; Copyright; Avail: Other Sources

The Mars Exploration Rovers continue to surprise their masters, with Spirit making the first direct detection of water by the mission, albeit bound in a crystal, and Opportunity getting the ground truth on a new type of terrain hinted at by satellite images.
Author
Mars Exploration; Mars Roving Vehicles; Planetary Geology; Terrain; Water

20050166923 Lunar and Planetary Inst., Houston, TX, USA

Lunar and Planetary Science XXXVI, Part 2

[2005]; ISSN 1540-7845; In English; Lunar and Planetary Science XXXVI, 14-18 Mar. 2004, Houston, TX, USA; See also 20050166924 - 20050167051

Contract(s)/Grant(s): NCC5-679

Report No.(s): LPI-Contrib-1234-Pt-2; Copyright; Avail: CASI; C01, CD-ROM

Topics covered include: Ringwoodite-olivine assemblages in Dhofar L6 melt veins; Amorphization of forsterite grains due to high energy heavy ion irradiation: Implications for grain processing in ISM; Validation of AUTODYN in replicating large-scale planetary impact events; A network of geophysical observatories for mars; Modelling catastrophic floods on the surface of mars; Impact into coarse grained spheres; The diderot meteorite: The second chassignite; Galileo global color mosaics of Io; Ganymede's sulci on global and regional scales; and The cold traps near the south pole of the moon.

Derived from text

Amorphous Materials; Geophysical Observatories; Mars Surface; Forsterite; Galileo Spacecraft; Moon

20050166925 Geological Survey, Flagstaff, AZ, USA

Galileo Global Color Mosaics of Io

Becker, T.; Geissler, P.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A major goal of the Galileo Solid-State Imaging experiment (SSI) at Io was accomplished late in the mission by acquiring color coverage of the entire satellite surface at a consistent phase angle. Consistent phase angle coverage is critical to understanding Io s surface coloration because of the marked photometric variations exhibited by the satellite [1, 2, 3]. Io s appearance alters drastically with phase angle due to the distinct scattering behavior of diverse surface units such as coarse-grained ices and fine-grained frosts. The GLOCOL01 sequence recorded during orbit [3] completed longitudinal coverage at an optimum phase angle near 4 degrees, low enough to reveal subtle color variations with minimal topographic influences but high enough to exclude the opposition surge. To date, these data have yet to be incorporated into a global mosaic that shows the full range and complexity of Io's coloration. An accurate color mosaic of Io will be put to a number of immediate applications for both scientific and education/ outreach purposes. U. S. Geological Survey Astrogeology Program plans to construct three global color mosaic products of Io.

Derived from text

Galileo Spacecraft; Mosaics; Io; Solid State; Imaging Techniques; Geological Surveys

20050166927 NASA Goddard Inst. for Space Studies, New York, NY, USA

The Cassini/Huygens Doppler Wind Experiment: Results from the Titan Descent

Bird, M. K.; Dutta-Roy, R.; Allison, M.; Asmar, S. W.; Atkinson, D. H.; Edenhofer, P.; Plettemeier, D.; Tyler, G. L.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 1 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The primary objective of the Doppler Wind Experiment (DWE), one of the six scientific investigations comprising the payload of the ESA Huygens Probe, is a determination of the wind velocity in Titan's atmosphere. Measurements of the Doppler shift of the S-band (2040 MHz) carrier signal to the Cassini Orbiter and to Earth were recorded during the Probe descent in order to deduce wind-induced motion of the Probe to an accuracy better than 1 m s-1. An experiment with the same scientific goal was performed with the Galileo Probe at Jupiter. Analogous to the Galileo experience, it was anticipated that the frequency of the Huygens radio signal could be measured on Earth to obtain an additional component of the horizontal winds. Specific secondary science objectives of DWE include measurements of: (a) Doppler fluctuations to determine the turbulence spectrum and possible wave activity in the Titan atmosphere; (b) Doppler and signal level modulation to monitor Probe descent dynamics (e.g., spinrate/spinphase, parachute swing); (c) Probe coordinates and orientation during descent and after impact on Titan.

Author

Cassini Mission; Wind Velocity; Doppler Effect; Titan; Turbulence; Superhigh Frequencies; Satellite Atmospheres

20050166929 Carnegie Institution of Washington, Washington, DC, USA

Mixing and Transport of Chondrules and CAIs in the Solar Nebula

Boss, A. P.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Isotopic evidence now suggests that some Al-lende chondrules formed with an Al-26/Al-27 ratio similar to that of calcium, aluminum rich inclusions (CAIs). Chondrule formation thus appears to have begun shortly after CAI formation, and to have lasted for approx. 1 Myr or so. While chondrules are generally believed to have formed by shock-front heating at asteroidal distances, CAIs are thought to have formed much closer to the proto-sun, because of their highly refractory compositions .
Derived from text
Chondrule; Meteoritic Composition; Shock Fronts; Solar Nebula; Heating; Inclusions

20050166931 NASA Johnson Space Center, Houston, TX, USA
Iron-tolerant Cyanobacteria as a Tool to Study Terrestrial and Extraterrestrial Iron Deposition
Brown, I. I.; Mummey, D.; Cooksey, K. E.; McKay, D. S.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We are investigating biological mechanisms of terrestrial iron deposition as analogs for Martian hematite recently confirmed by. Possible terrestrial analogs include iron oxide hydrothermal deposits, rock varnish, iron-rich laterites, ferricrete soils, moki balls, and banded iron formations (BIFs). With the discovery of recent volcanic activity in the summit craters of five Martian volcanoes, renewed interest in the iron dynamics of terrestrial hydrothermal environments and associated microorganisms is warranted. In this study we describe a new genus and species of CB exhibiting elevated dissolved iron tolerance and the ability to precipitate hematite on the surface of their exopolymeric sheathes.
Derived from text
Iron; Deposition; Microorganisms; Mars (Planet); Bacteria

20050166934 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
A Network of Geophysical Observatories for Mars
Banerdt, W. Bruce; Christensen, Ulrich; Crisp, David; Dehant, Veronique; Delory, Greg; Lognonne, Philippe; Sotin, Christophe; Spohn, Tilman; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

For the past 30 years there has been a strong consensus within the international scientific community in favor of sending a network of geophysical landers to Mars to characterize the near-surface weather and climate, determine the large-scale atmospheric dynamics and explore the interior structure and composition. Despite this scientific support, there has been an unbroken string of proposed missions over the past fifteen years which have failed for programmatic reasons to progress beyond the design stage (Mars Network Mission, MESUR, Marsnet, InterMarsnet, NetLander). In this presentation, we review the scientific rationale and technical requirements for such a mission, and discuss current activities aimed toward its implementation.
Derived from text
Networks; Mars Missions; Geophysical Observatories; Climate; Atmospheric Physics

20050166937 NASA Johnson Space Center, Houston, TX, USA
Large Multispectral and Albedo Panoramas Acquired by the Pancam Instruments on the Mars Exploration Rovers Spirit and Opportunity
Bell, J. F., III; Arneson, H. M.; Farrand, W. H.; Goetz, W.; Hayes, A. G.; Herkenhoff, K.; Johnson, M. J.; Johnson, J. R.; Joseph, J.; Kinch, K., et al.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction. The panoramic camera (Pancam) multispectral, stereoscopic imaging systems on the Mars Exploration Rovers Spirit and Opportunity [1] have acquired and downlinked more than 45,000 images (~35 Gbits of data) over more than 700 combined sols of operation on Mars as of early January 2005. A large subset of these images were acquired as part of 26 large multispectral and/or broadband 'albedo' panoramas (15 on Spirit, 11 on Opportunity) covering large ranges of azimuth (12 spanning 360) and designed to characterize major regional color and albedo characteristics of the landing sites and various points along both rover traverses.
Derived from text
Mars Exploration; Roving Vehicles; Panoramic Cameras; Mars Surface; Terrain

20050166939 Arizona Univ., Tucson, AZ, USA

Constraints on the Origin of Fine Layers in Ganges Mensa and Hebes Mensa, Mars

Beyer, Ross A.; McEwen, Alfred S.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ganges Mensa is located near 311 deg. E, 7.5 deg. S, and has been studied ever since it was first resolved with the Mariner 9 spacecraft. Masursky indicated that this was a finely layered deposit, and that those layers did not match the layering seen in the canyon slopes. Sharp noted that the layers appeared near-horizontal. Hebes Mensa is located near 283 deg. E, 1 deg. S, and is within the entirely closed Hebes Chasma. Observations by the Viking spacecraft indicated that there were light and dark layers of uniform thickness within these mensae, and the similarity to other layered mesas and deposits in the Valles Marineris was noted. However, Malin and Edgett showed that some of the albedo patterns previously attributed to layering on Ganges Mensa were not bedrock layers, but topographic benches where dark toned aeolian material accumulated. Komatsu et al. show a similar example of dark toned material collecting on a topographic bench on Hebes Mensa. Ganges and Hebes Mensae are indeed layered, but the layers are too thin to have been resolved by cameras before the Mars Orbital Camera
Derived from text

Mars Surface; Topography; Wind (Meteorology); Deposits; Mesas

20050166940 Paris VI Univ., Orsay, France

Mars Surface Diversity as Observed by the OMEGA/Mars Express Investigation

Bibring, J.-P.; Langevin, Y., et al.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: on board the ESA Mars Express mission, OMEGA is a VIS-NIR hyperspectral reflectance spectrometer: it provides the composition of each resolved pixel. This coupling between imaging, down a sub-km scale, and spectroscopy, has the potential to significantly enhance our understanding of the evolution of Mars at all time scales: seasonal to geological. We will present a synthetic overview of the results acquired so far by OMEGA in terms of surface composition, and discuss some tentative implications.
Author

Mars Surface; Spectroscopy; Reflectance; Surface Layers

20050166942 Planetary Science Inst., Tucson, AZ, USA

Visualization of Mars Data Sets: Views from Hellas Basin

Bleamaster, Leslie F., III; Bjartia, Varun V.; Crown, David A.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Our objectives are to provide students, science teachers, and the public an opportunity to experience the scientific endeavor of investigating the surface of another planet, all within the broader context of understanding maps, developing map skills, and the creation and use of maps by both terrestrial and planetary geologists. In the first year of our MAPS (Mapping Planetary Surfaces) education and public outreach (E/PO) program, we are currently in the process of developing a comprehensive GIS database of the Hellas basin consisting of Viking Orbiter, Mars Global Surveyor, and Mars Odyssey datasets, and USGS map publications, to be used for both scientific research and outreach. Our E/PO products will eventually be available for use in the classroom, through the Internet, and in museum settings. Additional teacher training workshops will be developed and provided through established programs by our E/PO partners: the Flandrau Science Center, the Challenger Learning Center of the Southwest, and the Adler Planetarium.
Author

Data Bases; Structural Basins; Planetary Surfaces; Planetary Mapping

20050166943 Planetary Science Inst., Tucson, AZ, USA

Morphologic Characterization of Wall Slopes Along Dao and Harmakhis Valles, Mars: Mantle and Gully Associations

Bleamaster, L. F., III; Crown, D. A.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Young hillside gully features on Mars have stirred debate about the potential involvement and relative role of fluids at

the surface. Proposed mechanisms for gully formation include surface runoff fed by subsurface aquifers, discharge of saline ground water or brine, melting of near-surface ice due to warmer conditions in the past or geothermal heating, and melting of contemporary snow packs that accumulated due to volatile transport from the poles. Additional hypotheses that do not involve liquid water include liquid carbon dioxide breakout and dry flows of aeolian material. Systematic investigations have found that gullies and gully-related features, to first order, are preferentially located within latitudinal zones between 30 deg. and 50 deg. north and south; of these bands, the southern hemispheric zone contains more gully features. Most surveys focus on gullies forming along crater walls or short channel sections. The Dao and Harmakhis Vallis systems, however, provide a unique opportunity to evaluate gully features with respect to latitude, elevation, slope orientation, and geologic unit in a single, distinct geologic setting.
Author
Morphology; Carbon Dioxide; Craters; Walls; Mars Surface

20050166944 Planetary Science Inst., Tucson, AZ, USA
The Surface Features of 'Pristine' Flood-transported Boulders
Bourke, M. C.; Brearley, J. A.; Haas, R.; Viles, H. A.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Specific processes on Earth can be shown to produce a particular size and shape of morphological response on rocks. For example, rocks subject to fluvial transport tend to be well rounded, whilst those freshly collapsed from bedrock walls are angular. Of importance to planetary studies is an assessment of the extent to which rock breakdown (e.g. aeolian abrasion or salt weathering) masks signatures of geomorphic transport process (e.g. fluvial transport or crater ejecta). Equally important is the extent to which geomorphic processes mask past weathering. This has not been determined for rock surfaces on Earth or for other planets. The situation is complicated by the lithological imprint; some rocks respond more rapidly and in different styles to breakdown processes. Over time, the inheritance of both initial lithology and past processes may also complicate the relationship between current process and morphological response.
Derived from text
Bedrock; Floods; Geomorphology

20050166945 Ecole Normale Superieure, Lyon, France
Pb-Pb Isotope Dating of Ordinary Chondrites
Bouvier, A.; Blichert-Toft, J.; Vervoort, J.; Albarede, F.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The precision of the Pb-Pb chronology of the early Solar System has benefited recently from new developments in mass spectrometry and lowblank separation techniques. Here we report Pb isotopic data on chondrule separates from ordinary chondrites (OC) analysed by MC-ICP-MS at ENS Lyon. We selected exclusively fall-observed OC of different types (H, L, and LL 4 or 5) and with S1 or S2 shock levels.
Author
Palladium Isotopes; Chondrites; Solar System; Meteoritic Composition; Inductively Coupled Plasma Mass Spectrometry

20050166948 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Delta(O-17) of Martian Sulfate: Assessment as a Tool to Recognize the Impact of Biological Sulfur Cycling on Mars
Brunner, B.; Coleman, M. L.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Rover-missions demonstrate that there are accessible Martian sulfate deposits (evaporites) [1]. These sedimentary rocks could indicate influence of past or present biotic processes even in the absence of traces of extraterrestrial life. We evaluate the potential of the analysis of mass independent isotope fractionation of oxygen in sulfate as a biosignature.
Author
Oxygen Isotopes; Sulfates; Mars Surface; Extraterrestrial Life

20050166949 Museum of Natural History, London, UK
Fe-Ni Sulphides Within a CM1 Clast in Tagish Lake
Bullock, E. S.; Grady, M. M.; Russell, S. S.; Gounelle, M.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Tagish Lake meteorite fell in Canada in January 2000, and has been classified as a type 2 chondrite. Tagish Lake shares similarities with CI and CM chondrites, but is not similar enough to either to be incorporated into these groups. Tagish Lake consists of two different lithologies a carbonate-poor lithology, and a carbonate-rich lithology. The carbonate-poor lithology is the dominant lithology, and grades into the carbonate-rich lithology, indicating that they are genetically related. In addition to these two lithologies, a clast of CM1-like material has been identified in two thin sections. The CM1 clast is more extensively altered than the rest of the meteorite. The boundary between the CM1 lithology and the carbonate-rich and carbonate-poor lithologies is not observed in this section however it has been suggested that the CM1 clast is not genetically related to the carbonate-rich or carbonate-poor lithologies. This abstract compares the Fe-Ni sulphides in the CM1 clast with the carbonate-rich and carbonate-poor lithologies, as well as the Fe-Ni sulphides found in CI and CM chondrites.
Derived from text
Chondrites; Meteorites; Lithology; Iron; Nickel; Sulfides

20050166950 NASA Ames Research Center, Moffett Field, CA, USA
Theoretical Calculations on Sediment Transport on Titan, and the Possible Production of Streamlined Forms
Burr, D. M.; Emery, J. P.; Lorenz, R. D.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Cassini Imaging Science System (ISS) has been returning images of Titan, along with other Saturnian satellites. Images taken through the 938 nm methane window see down to Titan's surface. One of the purposes of the Cassini mission is to investigate possible fluid cycling on Titan. Lemniscate features shown recently and radar evidence of surface flow prompted us to consider theoretically the creation by methane fluid flow of streamlined forms on Titan. This follows work by other groups in theoretical consideration of fluid motion on Titan's surface.
Derived from text
Sediment Transport; Titan; Cassini Mission; Fluid Flow

20050166951 Arizona State Univ., Tempe, AZ, USA
Origin of Layered Rocks, Salts, and Spherules at the Opportunity Landing Site on Mars: No Flowing or Standing Water Evident or Required
Burt, D. M.; Knauth, L. P.; Wohletz, K. H.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The 'shallow acid sea-evaporite-concretion' interpretation for features observed at the Opportunity landing site on Mars contains so many contradictions and problems that an alternative explanation seems necessary. Compelling evidence for past surface water has long been known, as recently summarized, but the early warm, wet interval which allowed this apparently was short-lived. Loss of most of the surface water from the planet and subsequent freeze-down left residual water deep in the subsurface, probably in the form of ice, concentrated brines, and hydrated salts. Large impacts into a megaregolith containing ice, brine, and salts could have produced stratified deposits with the character observed by the Opportunity landers. This mechanism provides a simple alternative explanation to the extraordinary evaporating acid sea process, which process would not have produced the observed set of features, but, instead, an entirely different set.
Derived from text
Sedimentary Rocks; Spherules; Surface Water; Mars Surface; Salts; Mars Landing Sites

20050166953 NASA Ames Research Center, Moffett Field, CA, USA
Ice-Ridge Pile Up and the Genesis of Martian 'Shorelines'
Barnhart, C. J.; Tulaczyk, S.; Asphaug, E.; Kraal, E. R.; Moore, J.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Unique geomorphologic features such as basin terraces exhibiting topographic continuity have been found within several Martian craters as shown in Viking, MOC, and THEMIS images. These features, showing similarity to terrestrial shorelines, have been mapped and cataloged with significant effort [1]. Currently, open wave action on the surface of paleolakes has been hypothesized as the geomorphologic agent responsible for the generation of these features [2]. As consequence, feature interpretations, including shorelines, wave-cut benches, and bars are, befittingly, lacustrine. Because such interpretations and their formation mechanisms have profound implications for the climate and potential biological history of Mars, confidence

is crucial. The insight acquired through linked quantitative modeling of geomorphologic agents and processes is key to accurately interpreting these features. In this vein, recent studies [3,4] involving the water wave energy in theoretical open water basins on Mars show minimal erosional effects due to water waves under Martian conditions. Consequently, sub-glacial lake flattens the surface, produces a local velocity increase over the lake, and creates a deviation of the ice flow from the main flow direction [11]. These consequences of ice flow are observed at Lake Vostok, Antarctica an excellent Martian analogue [11]. Martian observations include reticulate terrain exhibiting sharp inter-connected ridges speculated to reflect the deposition and reworking of ice blocks at the periphery of ice-covered lakes throughout Hellas [12]. Our model determines to what extent ice, a terrestrial geomorphologic agent, can alter the Martian landscape. Method: We study the evolution of crater ice plugs as the formation mechanism of surface features frequently identified as shorelines. In particular, we perform model integrations involving parameters such as ice slope and purity, atmospheric pressure and temperature, crater shape and composition, and an energy balance between solar flux, geothermal flux, latent heat, and ablation. Our ultimate goal is to understand how an intracrater ice plug could create the observed shoreline features and how these
Derived from text
Mars Surface; Mars Environment; Shorelines; Geomorphology; Atmospheric Temperature; Atmospheric Pressure

20050166954 Academy of Sciences (Russia), Moscow, Russia
Ringwoodite-Olivine Assemblages in Dhofar 922 L6 Melt Veins
Badjukov, D. D.; Brandstaetter, F.; Kurat, G.; Libowitzky, E.; Raitala, J.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations
Contract(s)/Grant(s): BSTC Proj. 14/04; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Shock-induced melt veins stand out among different types of veins in ordinary chondrites due to their specific mineral assemblages. They often contain high pressure polymorphs of host chondrite minerals like wadsleyite, ringwoodite, majorite, akimotoite and so on. Because of a compositional similarity between chondrites and the Earth s mantle, the shock melt veins are an unique natural source of study of mantle mineralogy. Two lithologies are characteristic for the veins: silicates, oxide(s), sulfide(s) and metal crystallized from a melt and solid state re-crystallized minerals of the vein hosts. All but a few the shock veins containing high-pressure phases have been found in L6 chondrites. Using data on desert meteorites one can count the amount of L6 chondrites containing ringwoodite to be approx. 1.5 % of all L6 finds. The estimate gives a minimum value because thin sections used for meteorite descriptions do not always include such veins, even if they are present in the rock. Vein textures and mineralogy require a compressional molten state of vein matter. Different mechanisms have been proposed for the high temperature excursions during a shock pulse: adiabatic shear zones, collisions of incident shock wave fronts and collapses of open spaces. Here we report on the mineralogy of shock melt veins containing HP phases in the Dhofar 922 L6 chondrite. The aim of the work is to establish the temperature-pressure history of the veins.
Author
Veins (Petrology); Chondrites; Mineral Deposits; Meteorites; Impact Melts

20050166955 Lawrence Livermore National Lab., Livermore, CA, USA
Amorphization of Forsterite Grains Due to High Energy Heavy Ion Irradiation: Implications for Grain Processing in ISM
Bajt, S.; Baragiola, R. A.; Bringa, E. M.; Bradley, J. P.; Dai, Z. R.; Dukes, C. A.; Felter, T.; Graham, G. A.; Kucheyev, S. O.; Loeffler, M. J., et al.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations
Contract(s)/Grant(s): W-7405-eng-48; DE-AC03-76-F-00098; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Only approx. 1% of the interstellar medium (ISM) is composed of interstellar dust. However, dust plays a key role in the evolution of stars and planets. The dust consists of various materials formed in different environments by different mechanisms. Interstellar dust particles are irregulary shaped and are composed mostly of amorphous silicates and carbonaceous grains. ISO (Infrared Space Observatory) spectra indicate crystalline silicates in the envelopes around evolved stars, while the silicates in ISM show infrared features characteristic of amorphous material. The absence of crystalline silicates in diffuse ISM is intriguing, not well understood, and potentially in conflict with the abundance of crystalline presolar silicates recently identified in IDPs and polar micrometeorites. Different processes leading to amorphization of silicates in ISM have been proposed, such as grain-grain collision, formation by recondensation, amorphization by heating and quenching processes, and amorphization by ion irradiation. In this abstract we focus on ion irradiation processes. One can discriminate between two energy regimes for the stopping power of energetic ions. At keV energies, the energy deposition of ions is

dominated by nuclear collisions, while at MeV energies and above, corresponding to cosmic rays, the energy deposition is due to electronic excitations.
Derived from text
Amorphous Materials; Forsterite; Grain Size; Heavy Ions; Irradiation; Interstellar Matter

20050166956 University Coll., London, UK
Validation of AUTODYN in Replicating Large-Scale Planetary Impact Events
Baldwin, E. C.; Vocadlo, L.; Crawford, I. A.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 1 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A necessary procedure in validating a numerical code is to investigate its ability to replicate experimental data or results attained from another reputable code. AUTODYN 2D v4.3 from Century Dynamics was employed to simulate 5-15km/s impacts of iron projectiles into geologically representative materials to verify the peak-pressure decay regimes during an impact event. Euler, Lagrange and Smooth Particle Hydrodynamics (SPH) solvers were examined and results compared with (a) The Planar Impact Approximation (PIA) technique and (b) data obtained by.
Author
Planetary Structure; Impact; Iron

20050166957 Planetary Science Inst., Tucson, AZ, USA
Preliminary Results from a New Study of Transverse Aeolian Ridges (TARs) on Mars
Balme, M. R.; Bourke, M. C.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Fields of small-scale, ripple-like aeolian duneforms display many similarities in morphology to low albedo dunefields in which dune wavelengths and individual duneforms are an order of magnitude larger. Both show complex structure and secondary modification of primary bedforms. Also, there is some evidence that the smaller bedforms show thermal signatures consistent with their being formed from finer-grained material than the large, dark dunes.
Derived from text
Albedo; Dunes; Mars Surface; Ripples

20050166959 Observatoire de Midi-Pyrenees, Toulouse, France
Origins and Transport of Volcanic Sands in Iceland and Implications for the Evolution of Volcanic Material on Mars
Baratoux, D.; Mangold, N.; Arnald, O.; Gregoire, M.; Ceuleneer, G.; vanGinneken, M.; Platevoet, B.; Bardinzeff, J. M.; Chevrier, V.; Pinet, P., et al.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: The surface of Mars is covered by volcanic rocks from few tens of millions years to 3.5 by old. The presence of water and atmosphere can strongly affect these rocks, by both chemical and mechanical erosion and transport. The interpretation of multispectral and hyperspectral data (Mars Express/ OMEGA) of Mars requires a better comprehension of these surface processes in order to understand if the spectral data still corresponds to the volcanic composition at the time of formation. Volcanic material in Iceland is a good analog for the studies of possible landforms resulting from the formation, transport and deposition of basaltic sand on Mars. Iceland is amongst the unique places on Earth with a cold environment, abundant basaltic rocks and sands, and the presence of palagonite, a possible typical constituent of the Martian soil.
Author
Basalt; Deposition; Erosion; Glass; Landforms; Mars Surface; Mars Volcanoes

20050166960 Lancaster Univ., UK
Modelling Catastrophic Floods on the Surface of Mars
Bargery, A. S.; Wilson, L.; Mitchell, K. L.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations
Contract(s)/Grant(s): PPARC-PPA/G/S/2000/00521; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We explore the issues governing the flow, evaporation, freezing and sublimation of water released onto the surface of

Mars. The consequences of the rheological changes caused by ice crystal growth in water are discussed and an attempt is made to predict the relationship between water volume flux and the maximum run-out distance. Introduction: The release of large amounts of
Author
Evaporation; Floods; Ice; Mars Surface; Mathematical Models

20050166961 Observatoire de Midi-Pyrenees, Toulouse, France
New Insights for the Formation of Slope Streaks on Mars from a Systematic Mapping Using Mars Express HRSC Data: A Dry Granular Avalanche Controlled by Wind-Transported Dust
Baratoux, D.; Mangold, N.; Pinet, P.; Forget, F.; Masson, P.; Chevrel, S.; Daydou,Y.; Jehl, A.; Greeley, R.; Neukum, G.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Formation of slope streaks are among the only known processes which are active at the present time on Mars. While their mechanism of formation and triggering is still debated, they may involve liquid water. The HRSC experiment (Mars Express) provides new data for the study of their formation of these objects. While MOC and THEMIS-VIS data had a suitable resolution for slope streaks identification the coverage of these data set does not allow a systematic mapping for a given region. We thus present a systematic mapping of widths, lengths and orientations of slope streaks using HRSC data in a region north of Olympus Mons. This area extends from 28oN to 38oN and from 220oE to 224oE. 800 slope streaks were identified and measured. Their geometric properties are similar to previous results and seem to be independent of the region investigated. This observation suggests that the same physical process and probably the same geological materials are involved in slope streaks formation on Mars.
Derived from text
Planetary Mapping; Mars Surface; Slopes; Dust

20050166962 Sternberg Astronomical Inst., Moscow, USSR
Mercury: Libration, Gravitational Field and Its Variations
V. Barkin Yu.; Ferrandiz, . M.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923 Contract(s)/Grant(s): RFBR-02-05-64176; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We study possible variations of gravitational field of Mercury due to its tidal solar deformations in conditions of orbital-rotational resonance. In the framework of a plane model of elastic Mercury motion we have shown that main variations of coefficients 2 J and 22 C of its gravitational field are periodic (with period of orbital motion in 87.97 days) and are characterized by the big amplitude of the order 5x10-8 that in a few orders bigger than corresponding tidal variations of the geopotential coefficients. Librations of Mercury in longitude have been studied on the base of plane model about the motion of non-spherical celestial body with a liquid core in a central gravitational field. For accepted in the paper models of Mercury the amplitudes of periodic librations were evaluated. Due to influence of solar gravitational moments the Mercury angular velocity is varied on 0.03 %. A phenomenon of non- perturbance of Mercury rotation in vicinity of pericenter of orbit has been established. In period about 15 days the angular velocity of Mercury saves almost the permanent value. 2. Mercury models. Here we will consider this
Author
Mercury (Planet); Gravitational Fields; Orbits; Planetary Rotation; Librational Motion

20050166966 Honeybee Robotics Ltd., New York, NY, USA
Summary of Rock Abrasion Tool (RAT) Results Pertinent to the Mars Exploration Rover Science Data Set
Bartlett, P. W.; Carlson, L. E.; Chu, P. C.; Davis, K. R.; Gorevan, S. P.; Kusack, A. G.; Myrick, T. M.; Wilson, J. J., et al.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Rock Abrasion Tool (RAT) serves as the sample preparation device on the Mars Exploration Rover (MER) science payload. As an end-effector on the rover s robotic arm the RAT [1] grinds a circular spot on the order of millimeters deep into a rock face to remove surface fines and weathered layers, preparing the rock for imaging and spectral observations. As of 5

January 2005, 12 grinding operations have been performed at Gusev Crater by Spirit and 22 at Meridiani Planum by Opportunity.
Derived from text
Abrasion; Rocks; Tools; Robot Arms; Mars Exploration; Surface Layers; Mars Surface

20050166969 NASA Johnson Space Center, Houston, TX, USA
A New Model of Size-graded Soil Veneer on the Lunar Surface
Basu, Abhijit; McKay, David S.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction. We propose a new model of distribution of submillimeter sized lunar soil grains on the lunar surface. We propose that in the uppermost millimeter or two of the lunar surface, soil-grains are size graded with the finest nanoscale dust on top and larger micron-scale particles below. This standard state is perturbed by ejecta deposition of larger grains at the lunar surface, which have a coating of dusty layer that may not have substrates of intermediate sizes. Distribution of solar wind elements (SWE), agglutinates, vapor deposited nanophase Fe0 in size fractions of lunar soils and ir spectra of size fractions of lunar soils are compatible with this model. A direct test of this model requires bringing back glue-impregnated tubes of lunar soil samples to be dissected and examined on Earth.
Derived from text
Soils; Soil Sampling; Veneers; Lunar Surface; Petrology

20050166971 Moscow State Univ., Russia
Thickness of the Olympus Mons Lava Flows as Measured from the MGS MOC and MOLA Data: Volcano Caldera and Flanks
Bazilevskaya, E. A.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Here we report on the study of thicknesses of lava flows observed on the surface of Olympus Mons volcano (Figure 1). This 600 km in diameter feature was discovered in the images taken in 1972 by Mariner 9 and soon classified as shield volcano composed of accumulations of basaltic lavas [2]. Since then, this classification has been confirmed by many new missions to Mars [see, e.g., 4]. Lava flows which are subject of this study are typically 10 to 20 km long and 200 m to 2 km wide streaming down slope in directions generally radial to the volcano center. We plan to make extensive study of these lava flows based on analysis of the data taken by the Mars Express High Resolution Stereo Camera as well as Mars Global Surveyor camera MOC and laser altimeter MOLA. Here we report on the fist stage of this study that is measurements of the lava flow thicknesses.
Derived from text
Volcanoes; Lava; Mars Volcanoes; Thickness; Classifications; Fluid Flow; Laser Altimeters

20050166972 Brown Univ., Providence, RI, USA
Dunite Dikes in the Lunar Mantle?
Beck, A. R.; Morgan, Z. T.; Liang, Y.; Hess, P.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Experimentally determined multisaturation depths for the lunar picritic glasses suggest that the source region for the glasses is very deep, on the order of 500 km for the Apollo 14 picritic green glasses [1] and the Apollo 15 picritic red glasses [2]. These depths are believed to be a minimum estimate because the glasses have all experienced near surface fractionation of olivine. If multisaturation truly represents a minimum or even average depth of melting, it is very important to understand the extent to which the glasses have reacted with the lunar mantle during their long ascent to the surface. The cumulate mantle will be compositionally stratified and composed primarily of dunite and harzburgite layers but there is considerable uncertainty as to the thicknesses and relative locations of these layers. In order to better understand the physical and chemical consequences of the transport of picritic magmas in the lunar mantle, we have performed a set of harzburgite-high-Ti basalt reactive dissolution experiments similar to those reported in [3] to study melt migration in Earth's mantle.
Derived from text
Dunite; Earth Mantle; Lunar Mantle; Lithosphere; Rock Intrusions; Pyroxenes; Peridotite; Fractures (Materials); Fractionation

20050166973 Ecole Normale Superieure, Lyon, France

The Diderot Meteorite: The Second Chassignite

Beck, P.; Barrat, J.-A.; Gillet, P.; Franchi, I. A.; Greenwood, R. C.; VandeMoortele, B.; Reynard, B.; Bohn, M.; Cotten, J.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Whilst the number of identified martian meteorite has increased greatly in the last decade (with more than 30 members recognized at the time of the writing), the Chassigny meteorite, which was seen to fall in 1815, remained unique within the martian meteorite group. In August 2000, a 611 g meteorite was discovered in the Moroccan Sahara by meteorite hunters. Mineralogy, major and trace element chemistry as well as oxygen isotopes revealed an unambiguous Martian origin and strong affinities with Chassigny. Since the stone hasn't received an official name yet, the working name Diderot was given, after the French encyclopaedist born in the city of Langres, a few kilometers distant from the Chassigny village. Diderot is a dunite: olivine 89.6 % (in volume), augite 3.1 %, chromite 4.6 %, sanidine 1.6 %, orthopyroxene-pigeonite 1.0 %, and phosphate 0.2 %. The sole noticeable deviation from Chassigny mode is the total absence of plagioclase in Diderot [1]. The texture of the meteorite is that of a cumulate, dominated by millimetric anhedral to subhedral olivine crystals, sometimes poikilitically enclosed in augite. Based on textural observations, the following crystallization sequence can be inferred: chromite, chromite+olivine, chromite+ intercumulus phases (Kfeldspar, pyroxene, apatite). The two cumulate phases, olivine and chromite, display melt inclusions that contain pyroxenes, olivine, (Si, Al, K, Na)-rich glass, apatite and kaersutite.

Derived from text

Meteoritic Composition; Mars (Planet); Trace Elements; Oxygen Isotopes; Mineralogy; Meteoritic Microstructures

20050166974 Ecole Normale Superieure, Lyon, France

Timescales of Shock Processes and the Size of Martian Meteorites Source Craters, Constrained from Shock Metamorphism

Beck, P.; Gillet, P.; ElGoresy, A.; Mostefaoui, S.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Studying shocked meteorites of diverse origin can help understand the impact dynamics at different stages of evolution within the Solar system. Deciphering the shock history for each meteorite thus becomes a key issue because the duration of the peak shock pressure recorded in the meteorite is directly related to the size of the impactor responsible for the shock. The peak pressure is usually established by comparing the deformation and transformation features observed in natural meteorites with those induced in experimentally shocked samples [1]. Alternatively, peak pressures can be inferred using a combination of mineralogical phase transformations and high-pressure crystallization occurring within shock melt veins (SMV) [2]. The SMVs result from high strain rates and frictional heating that are present during the pressure increase [3, 4]. The peak pressure developed within the SMVs is hydrostatic and it is constrained to be identical with their surroundings due to stress continuity. The temperature within the SMVs is significantly higher (by up to 2500 K) than in the whole rock, leading to the formation of high-pressure assemblages and chemical diffusion that do not occur in the bulk. Here we have measured the concentrations of trace elements (Mn, Ca, Ba, Cs, Sr) in high-pressure minerals that crystallized during the peak pressure pulse. The element concentrations were obtained on a nanometer scale using secondary ion mass spectrometry (nano-SIMS). The partitioning of these elements between coexisting phases was then used to constrain the duration of the peak pressure pulse. We tested this approach on meteorite samples (Tenham L6 chondrite; Zagami shergottite) for which the shock histories were already well-characterized.

Derived from text

Metamorphism (Geology); Phase Transformations; Meteorites; Mineralogy; Deformation; Strain Rate; Impact Melts; Craters; Chondrites

20050166976 Geological Survey, Flagstaff, AZ, USA

Lunar Orbiter Revived: Update on Final Stages of Scanning, Archiving, and Cartographic Processing at USGS

Becker, T.; Weller, L.; Gaddis, L.; Soltesz, D.; Cook, D.; Archinal, B.; Bennett, A.; McDaniel, T.; Redding, B.; Richie, J.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the late 1960 s, five Lunar Orbiter (LO-I to -V) missions acquired high-spatial resolution photographic data of the lunar surface. A significant portion of this data, emphasizing global coverage of the Moon, has been digitized and processed by the U. S. Geological Survey Astrogeology Program [1- 4]. Our focus has been on scanning and processing the LO film data to

prepare for cartographic processing. The product will be a global, cartographically accurate, digital mosaic of the Moon containing combined LO III, IV and V medium-(MR) and high-resolution (HR) frames and it will be coregistered to the Clementine 750-nm global base mosaic [5]. As a concurrent effort, we have scanned and processed a selected subset of the very high resolution (VHR) data acquired by LO-III and -V [6]. This report provides an update on the status of both of these LO projects at USGS.
Derived from text
Lunar Orbiter; Geological Surveys; Mapping; Lunar Surface; Geology; Mosaics

20050166977 Northwestern Univ., Evanston, IL, USA
Ganymede's Sulci on Global and Regional Scales
Bedle, H.; Jurdy, D. M.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The sinuous, brighter albedo regions on Ganymede, termed sulci, result from episodes of tectonic deformation. Based on topographical terrains, sulci can be subdivided into smooth, grooved, and complex categories. Topographic analyses of the elevations of the different terrain types showed that the complex sulci have the highest relative elevation, and smooth, the lowest. This suggests a variety of processes that create sulci.
Derived from text
Albedo; Deformation; Ganymede; Tectonics

20050166979 Arizona State Univ., Tempe, AZ, USA
Li Isotope Studies of Olivine in Mantle Xenoliths by SIMS
Bell, D. R.; Hervig, R. L.; Buseck, P. R.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923
Contract(s)/Grant(s): NSF EAR-03-10330; NAG5-13022; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Variations in the ratio of the stable isotopes of Li are a potentially powerful tracer of processes in planetary and nebular environments [1]. Large differences in the 7Li/6Li ratio between the terrestrial upper mantle and various crustal materials make Li isotope composition a potentially powerful tracer of crustal recycling processes on Earth [2]. Recent SIMS studies of terrestrial mantle and Martian meteorite samples report intra-mineral Li isotope zoning [3-5]. Substantial Li isotope heterogeneity also exists within and between the components of chondritic meteorites [6,7]. Experimental studies of Li diffusion suggest the potential for rapid isotope exchange at elevated temperatures [8]. Large variations in 7Li, exceeding the range of unaltered basalts, occur in terrestrial mantle-derived xenoliths from individual localities [9]. The origins of these variations are not fully understood.
Derived from text
Lithium Isotopes; Planetary Environments; Crusts; Isotope Separation; Meteorites; Diffusion

20050166980 NASA Johnson Space Center, Houston, TX, USA
Experimental Shock Decomposition of Siderite to Magnetite
Bell, M. S.; Golden, D. C.; Zolensky, M. E.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The debate about fossil life on Mars includes the origin of magnetites of specific sizes and habits in the siderite-rich portions of the carbonate spheres in ALH 84001 [1,2]. Specifically [2] were able to demonstrate that inorganic synthesis of these compositionally zoned spheres from aqueous solutions of variable ion-concentrations is possible. They further demonstrated the formation of magnetite from siderite upon heating at 550 C under a Mars-like CO2-rich atmosphere according to 3FeCO3 = Fe3O4 + 2CO2 + CO [3] and they postulated that the carbonates in ALH 84001 were heated to these temperatures by some shock event. The average shock pressure for ALH 84001, substantially based on the refractive index of diaplectic feldspar glasses [3,4,5] is some 35-40 GPa and associated temperatures are some 300-400 C [4]. However, some of the feldspar is melted [5], requiring local deviations from this average as high as 45-50 GPa. Indeed, [5] observes the carbonates in ALH 84001 to be melted locally, requiring pressures in excess of 60 GPa and temperatures \g 600 C. Combining

these shock studies with the above inorganic synthesis of zoned carbonates it seems possible to produce the ALH 84001 magnetites by the shock-induced decomposition of siderite.
Derived from text
Siderites; Magnetite; Fossils; Ferromagnetic Materials; Aqueous Solutions; Spheres; Carbonates

20050166982 Washington Univ., Saint Louis, MO, USA
Iron Reduction During Metamorphism on the Winonaite/IAB Iron Meteorite Parent Body
Benedix, G. K.; McCoy, T. J.; Lauretta, D. S.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Primitive achondrites are meteorites with chondritic (primitive) compositions and non-chondritic textures. As such, they offer insight into the process of differentiation that occurred on asteroids. Of the primitive achondrite groups, the winonaites and IAB irons are the most enigmatic. The winonaites exhibit metamorphic (recrystallized) textures and reduced mineral chemistries. The IAB irons are a group of iron meteorites that are unusual in that they have geochemical trends that are inconsistent with fractional crystallization during core formation. In addition, they also contain abundant silicate inclusions. These inclusions are similar in mineralogy, texture, and oxygen isotopic composition to the winonaites.
Derived from text
Iron Meteorites; Achondrites; Crystallization

20050166983 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Three Dimensional Multi-Fluid Simulation of Comet Halley
Benna, M.; Mahaffy, P. R.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 1 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Cometary Atmosphere Simulator (CASIM) is designed to simulate in 2-D and 3-D the complex interaction between the cometary atmosphere and the hypersonic solar wind using a multi-fluid approach. Our simulator is based on the solution of multi-fluid equations using an efficient adaptive Cartesian mesh. It is designed to use the capabilities of highly parallel super-cluster computers.
Author
Three Dimensional Motion; Cometary Atmospheres; Computational Grids; Simulation

20050166984 Eotvos Lorand Univ., Budapest, Hungary
Possibility of Karst Morphology on the Martian Surface at the Meridiani Landing Site from Comparison with Terrestrial Analogs
Berczi, S.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations
Contract(s)/Grant(s): MUI-TP-154/2003-2004; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Surface morphology on images of MER-2 probe Opportunity sent from its landing site vicinity on the 70-74 sols exhibited chains of pits forming a trench. The landscape has been named Anatolia. The trench pits of Anatolia can be interpreted as dolines (closed surface depressions) and the whole surface trench pattern of Anatolia as a solution groove, both of them belonging to the karst morphology. Comparisons to terrestrial karst morphology strengthened this interpretation.
Author
Karst; Morphology; Mars Surface

20050166985 Eotvos Lorand Univ., Budapest, Hungary
How We Used NASA Lunar Set in Planetary Material Science Analog Studies on Lunar Basalts and Breccias with Industrial Materials of Steels and Ceramics
Berczi, S.; Cech, V.; Jozsa, S.; Szakmany, G.; Fabriczy, A.; Foldi, T.; Varga, T.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations
Contract(s)/Grant(s): MUI-TP-154/2004; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Analog studies play important role in space materials education. Various aspects of analogies are used in our courses. In

this year two main rock types of NASA Lunar Set were used in analog studies in respect of processes and textures with selected industrial material samples. For breccias and basalts on the lunar side, ceramics and steels were found as analogs on the industrial side. Their processing steps were identified on the basis of their textures both in lunar and in industrial groups of materials.
Author
Analogies; Basalt; Breccia; Lunar Crust

20050166986 Moscow Univ., Moscow, Russia
The Cold Traps Near the South Pole of the Moon
Berezhnoy, A. A.; Kozlova, E. A.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

According to the data from 'Lunar Prospector' the areas of high hydrogen content in the lunar south pole region coincide with the areas of such craters as Faustini (87.2 deg. S, 75.8 deg. E), Cabeus (85.2 deg. S, 323 deg. E) and other crates. We have allocated a number of craters which can be considered as 'cold traps ' in the south pole region of the Moon (Figure 1). Some from these craters has properties similar to those of the echo coming from icy satellites of Jupiter and from the southern polar cap of Mars.
Derived from text
Cold Traps; Craters; Polar Caps; Moon

20050166987 Planetary Science Inst., Tucson, AZ, USA
Arcuate Ridges and Gullies in Martian Craters: Dependence on Orientation and Latitude
Berman, D. C.; Hartmann, W. K.; Crown, D. A.; Baker, V. R.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

At the bases of many mid-latitude crater walls, arcuate ridges with sharp crests can be seen. These features are usually located at the bottom of gullied walls of craters, but gullies are not always present above them. Stratigraphically, the debris aprons of gullies overlie the crater wall-facing slopes of arcuate ridges, where the two features coexist, and the debris aprons may infill the region between the base of the crater wall and the arcuate ridge. Some ridges are only slightly sinuous and form one continuous ridge around a portion of the interior crater wall, but in most cases ridges appear as individual features that abut one another. They are often associated with lineations and pitted textures extending onto crater floors. The arcuate ridges resemble terrestrial protalus ramparts or terminal moraines, which suggests they may have a glacial origin. A general survey has shown these features to be common in certain midlatitude regions.
Author
Craters; Mars (Planet); Slopes; Textures

20050166990 NASA Johnson Space Center, Houston, TX, USA
Dynamic Dust Accumulation and Dust Removal Observed on the Mars Exploration Rover Magnets
Bertelsen, P.; Bell, J. F., III; Goetz, W.; Gunnlaugsson, H. P.; Herkenhoff, K. E.; Hviid, S. F.; Johnson, J. R.; Kinch, K. M.; Knudsen, J. M.; Madsen, M. B., et al.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Exploration Rovers each carry a set of Magnetic Properties Experiments designed to investigate the properties of the airborne dust in the Martian atmosphere. It is a preferred interpretation of previous experiments that the airborne dust in the Martian atmosphere is primarily composed by composite silicate particles containing one or more highly magnetic minerals as a minor constituent. The ultimate goal of the magnetic properties experiments on the Mars Exploration Rover mission is to provide some information/ constraints on whether the dust is formed by volcanic, meteoritic, aqueous, or other processes. The first problem is to identify the magnetic mineral(s) in the airborne dust on Mars. While the overall results of the magnetic properties experiments are presented in, this abstract will focus on dust deposition and dust removal on some of the magnets.
Author
Dust; Mars Atmosphere; Minerals; Trace Elements; Volcanoes

20050166991 Lockheed Martin Corp., USA

Variation in Size-Distributions Between Adjacent and Distant Secondary Craters

Bierhaus, E. B.; Merline, W. J.; Chapman, C. R.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

While both near- and distant-secondary crater diameters on Europa exhibit steep size-distributions (where steep typically is values b less than - 4 in the differential size distribution dN =kD(sub b) dD, with dN the number of craters in diameter range dD), a small data set of adjacent secondaries suggests they have steeper size-distributions than their distant cousins. Secondaries around Pwyll (a recent approx. 25 km crater) have b = -6.5 +/- 0.9, while secondaries around Tyre (a approx. 44 km crater) have b = -6.2 +/- 1.0. This is in contrast to the weighted average of clustered craters known to be distant secondary craters, seen in areas far from primary craters) that have b = -4.5 +/- 0.2. The difference in size-distributions is consistent with the two populations forming via different ejection mechanisms; e.g. the early-stage, very-high energy spallation process for distant secondaries vs. the late-stage, lower-energy bulk excavation flow for the adjacent secondaries. Any differences in late-stage ejecta between Tyre and Pwyll - resulting from their different penetration depths into the icy crust - are at sizes below the completeness limit of the available image data. Introduction: Although still under-abundant relative

Author

Size Distribution; Craters; Europa; Diameters; Excavation

20050166993 University of Southern Illinois, Carbondale, IL, USA

Why Meaningful Paleopoles Can't be Determined Without Special Assumptions from Mars Global Surveyor Data?

Biswas, Saurav; Ravat, D.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Magnetic anomalies on Mars as recorded by the magnetometers on-board Mars Global Surveyor (MGS) satellite have been modeled using several approaches. Some of these models have been subsequently used to compute paleopoles on Mars. In this paper, using forward models of alternative source geometries and diverse magnetization vectors, we show that the well-known ambiguity in potential fields can lead to significantly different paleopole locations. Furthermore, due to the coalescence effect of anomalies at satellite altitudes, the MGS observed anomalies inhibit inferences regarding precise geologic nature of the sources and their true directions of magnetizations. Thus, the paleopoles determined from magnetizations assuming large, uniformly magnetized source bodies could be erroneous.

Author

Magnetic Anomalies; Mars (Planet); Potential Fields; Magnetization; Mars

20050166994 Geological Museum, Copenhagen, Denmark

Timing of Crust Formation on Differentiated Asteroids Inferred from Al-Mg Chronometry

Bizzarro, M.; Baker, J. A.; Haack, H.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Determining the timing of assembly and differentiation of planetary bodies in the young Solar System is essential for a complete understanding of planet-forming processes. This is best achieved though the study of extinct radionuclides with short half-lives, as they provide unsurpassed time-resolution compared with long-lived chronometers. Furthermore, evidence for the former presence of some extinct radionuclides in early Solar System bodies has bearing on whether heating by short-lived radionuclides triggered planetesimal melting.

Derived from text

Asteroids; Chronometers; Protoplanets; Radioactive Isotopes; Aluminum; Magnesium

20050166995 Rutgers Univ., Piscataway, NJ, USA

Comparison of the Lithologies on the Surface of the Asteroid 4 Vesta Based on the Petrology of 91 and 92 Series Antarctic Achondrites

Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations

Contract(s)/Grant(s): NAG5-12148; NAG5-9528; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We studied meteorite sections PCA91179,9; EET92003,14; EET92025,5; EET92026,4; and EET92027,5 t determine lithological variations on the surface of the asteroid 4 Vesta. These are brecciated polymict eucrites. The clasts contained within these samples and the matrix which surrounds them in each sample provide a random sampling of the characteristic compositions found on the surface of asteroid 4 Vesta.
Author
Vesta Asteroid; Petrology; Meteoritic Composition; Lithology

20050166996 Rutgers Univ., Piscataway, NJ, USA
The Depositional Setting of the Earth's Earliest Sedimentary Rocks
Bjonnes, E.; Lindsay, J. F.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The c.3.5 Ga Coonterunah Group which is exposed on the Pilbara Craton of Western Australia includes one of Earth s oldest and best preserved stratigraphic successions. The succession consists largely of high magnesian ultramafic volcanics many of which are pillowed suggesting subaqueous deposition. One unit within this group, the Coucal Formation, includes a small number of thin but laterally continuous laminated cherts. Here we attempt to determine the origin of these ancient sediments and define their depositional environment.
Author
Deposition; Sedimentary Rocks; Volcanology; Earth (Planet)

20050167000 Imperial Coll. of Science, Technology and Medicine, London, UK
Trace Element Carrier Phases in Primitive Chondrite Matrix: Implications for Volatile Element Fractionation in the Inner Solar System
Bland, P. A.; Rost, D.; Vicenzi, E. P.; Stadermann, F. J.; Floss, C.; Fries, M.; Steele, A.; Benedix, G. K.; Lee, M. R.; Watt, L. E., et al.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Volatile element fractionation was one of the earliest and most fundamental processes affecting the inner solar nebula. Solids in the inner Solar System are depleted in volatile elements compared to solar abundances, with moderately volatile elements showing a monotonic depletion in abundance with decreasing condensation temperature. Models to explain volatile depletion in meteorites and the terrestrial planets fall into one of four categories: a) two-component models, with volatile depletion occurring during chondrule formation, and depleted chondrules being mixed with primordial, CI-like matrix; b) incomplete condensation during cooling of a hot inner disk, prior to chondrule formation; c) evaporative fractionation prior to chondrule formation; or d) inheritance of a volatile-depleted signature from the ISM.
Derived from text
Trace Elements; Chondrites; Solar System; Meteoritic Composition

20050167003 Arizona State Univ., Tempe, AZ, USA
Meteorites from the Franconia, Arizona Area: Observations and Summary of Petrographic Characteristics
Bleacher, L. V.; Huss, G. R.; Leshin, L. A.; Miller, M.; Garcia, R.; Clary, S.; Gwilliam, J.; Sloan, L.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Franconia meteorite was discovered in a dry wash in Mojave County, Arizona, USA, by John P. Wolfe on October 31, 2002. The original find, located without use of a metal detector, consisted of one specimen weighing approximately 4.75 kg. The specimen was classified by Alan Rubin at UCLA as an H ordinary chondrite (H5, S3, W2). Approximately one year after the original Franconia find, additional hunters began finding meteorites within a approx. 10 km radius of the first find, many not knowing that a meteorite had already been found in the area. To date, it is estimated that well over 100 specimens, comprising a total known weight of greater than 100 kg, have been found in the Franconia, AZ area. In early 2003, Mike Miller and Ruben Garcia contacted the ASU Center for Meteorite Studies (CMS) for help in sorting out a large group of meteorites, including a variety of stones and several small iron masses, from the same general area. Subsequently, additional stony specimens were brought in for classification by Sonny Clary and John Gwilliam. The relationship between the small irons and the stony majority is still under study and will not be discussed here. This abstract summarizes the similarities and differences

among the 19 stony finds from the Franconia, AZ area that have been examined and classified by the CMS to date.
Author
Meteorites; Petrography; Chondrites

20050167004 Hawaii Univ., Honolulu, HI, USA
Lava Flows on Olympus Mons, Mars: Estimates of Flow Speeds and Volume Fluxes from MOC, THEMIS and MOLA Data
Bruno, B. C.; Fagents, S. A.; Pilger, E.; Rowland, S.; Garbeil, H.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This research aims to characterize the eruptive behavior of lava flows on Olympus Mons, Mars. In particular, we are interested in: characterizing lava emplacement style (tubes vs. channels); estimating flow speeds and volume fluxes based on assumed input parameters; and identifying correlations, if any, among variables such as flow velocity, emplacement style, location on the edifice, topographic slope and flow dimensions.
Derived from text
Mars Volcanoes; Lava; Mars Global Surveyor; Flow Velocity; Laser Altimeters

20050167005 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Calculating the X-Ray Fluorescence from the Planet Mercury Due to High-Energy Electrons
Burbine, T. H.; Trombka, J. I.; Bergstrom, P. M., Jr.; Christon, S. P.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The least-studied terrestrial planet is Mercury due to its proximity to the Sun, which makes telescopic observations and spacecraft encounters difficult. Our lack of knowledge about Mercury should change in the near future due to the recent launching of MESSENGER, a Mercury orbiter. Another mission (BepiColombo) is currently being planned. The x-ray spectrometer on MESSENGER (and planned for BepiColombo) can characterize the elemental composition of a planetary surface by measuring emitted fluorescent x-rays. If electrons are ejected from an atom s inner shell by interaction with energetic particles such as photons, electrons, or ions, electrons from an outer shell can transfer to the inner shell. Characteristic x-rays are then emitted with energies that are the difference between the binding energy of the ion in its excited state and that of the ion in its ground state. Because each element has a unique set of energy levels, each element emits x-rays at a unique set of energies. Electrons and ions usually do not have the needed flux at high energies to cause significant x-ray fluorescence on most planetary bodies. This is not the case for Mercury where high-energy particles were detected during the Mariner 10 flybys. Mercury has an intrinsic magnetic field that deflects the solar wind, resulting in a bow shock in the solar wind and a magnetospheric cavity. Electrons and ions accelerated in the magnetosphere tend to follow its magnetic field lines and can impact the surface on Mercury s dark side Modeling has been done to determine if x-ray fluorescence resulting from the impact of high-energy electrons accelerated in Mercury's magnetosphere can be detected by MESSENGER. Our goal is to understand how much bulk chemical information can be obtained from x-ray fluorescence measurements on the dark side of Mercury.
Derived from text
Electrons; Mercury (Planet); X Ray Fluorescence; Messenger (Spacecraft)

20050167006 Indiana Univ., Bloomington, IN, USA
Experimental Production of Pure Iron Globules from Melts of Lunar Soil-Compositions
Buono, Antonio; Brophy, James; Schieber, Juergen; Basu, Abhijit; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Micrometeoritic impacts on lunar surface soils comminute, vaporize and melt parts of the targets. The impact vapor dissociates Fe0 and silicates, which condense on grain surfaces as an amorphous silicate patina charged with nanophase Fe(sup 0) particles. The melt scavenges dust and quenches to form agglutinates. Because solar wind hydrogen is implanted in lunar soils, the melt suffers reduction and produces immiscible Fe(sup 0) globules of various sizes that may coagulate to form larger globules. Taylor et al. however, dispute that Fe(sup 0) could form from micrometeoritic impact melts on lunar surface. To test this assertion, we have conducted one atmosphere melting experiments on lunar soil compositions in a hydrogen atmosphere. The quenched charge contains many submicron to millimeter sized Fe0 globules. This indicates that it Fe(sup 0) globule do

form through melt-exsolution in an environment with a f(sub O2) below the iron/wustite boundary, although we have not successfully formed globules much below 100nm in size.
Derived from text
Globules; Iron; Lunar Soil; Micrometeorites; Meteoritic Composition; Impact Melts

20050167007 University of Northern Arizona, Flagstaff, AZ, USA
'Primitive' and Igneous Achondrites Related to the Large and Differentiated CR Parent Body
Bunch, T. E.; Irving, A. J.; Larson, T. E.; Longstaffe, F. J.; Rumble, D., III; Wittke, J. H.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the more daunting tasks in meteoritics is to attempt the reconstruction of now disaggregated, potentially large planetary bodies that may have populated the early solar system. The remnants of these bodies, which may have been numerous, now consist of the present asteroids plus fragments that fall to Earth as meteorites. The increased bounty of research material, especially from Northwest Africa and Antarctica, has led to new hypotheses concerning the constitution, size and thermal regimes on these former objects. One recent proposal addresses the recognition of candidate core, mantle and regolith materials from the CV parent body. Here we apply the same forensic principles to the putative CR parent body, and suggest that it may have been even larger and experienced igneous activity in a similar manner to proto-Vesta.
Derived from text
Achondrites; Igneous Rocks; Petrology; Meteoritic Composition

20050167008 NovaSol, Honolulu, HI, USA
Two-Color Studies of the Mercurian and Lunar Surfaces
Blewett, D. T.; Hawke, B. R.; Lucey, P. G.; Robinson, M. S.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We are using Mariner 10 color image data (UV and orange) to examine spectral trends associated with surface features on Mercury. Spacecraft images of the Moon (Galileo and Clementine) and lunar sample laboratory spectra provide a framework for interpreting the mercurian data. The Mariner 10 spacecraft collected multispectral image data of the Moon and Mercury in the mid 1970s. Over the past decade, an effort has been underway to recover and reprocess the Mariner 10 images. The newly calibrated data has been corrected for camera artifacts that greatly hindered prior studies of ratio images. For the lunar encounter, data through the blue (480 nm) and orange (575 nm) filters has been recalibrated, while for Mercury, new mosaics of the incoming hemisphere have been created for ultraviolet (UV, 355 nm) and orange. The lack of exact wavelength correspondence precludes direct comparisons of ratio images. In order to help in the interpretation of the data for Mercury, we have conducted analog studies with lunar sample spectra and with imaging data for the Moon obtained by other spacecraft.
Author
Mercury (Planet); Lunar Geology; Lunar Rocks; Imaging Techniques

20050167009 Florida Atlantic Univ., Boca Raton, FL, USA
Secondary Cratering Rates on the Basaltic Plains of Mars and the Moon
Block, K. M.; Barlow, N. G.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: The current method of determining absolute ages of Martian terrain units relies on an extrapolation of the lunar crater chronology curve to Mars. This method utilizes the crater size-frequency distribution of the area in question. Until recently, images used for this type of analysis were relatively low resolution and small craters were difficult to identify. However advances in instrumentation now allow for smaller craters to be classified and thus smaller areas of the Martian surface to be examined in greater detail. Frequently, the small craters revealed in these higher resolution images are secondary craters created by ejected material from primary impacts. When these craters are used in the size-frequency distribution analysis a new source of possible error is introduced: variation in the secondary cratering rates between the two bodies. If the rates of secondary crater production on the Moon and Mars are statistically similar, the extrapolated crater chronology curve will provide accurate estimates of the ages of Martian surfaces.
Derived from text
Basalt; Cratering; Mars Surface; Planetary Geology; Size Distribution; Lunar Craters

20050167010 Carnegie Institution of Washington, Washington, DC, USA

SIMS Analysis of Volatiles and H Isotope Studies of the Nakhlites Yamato 000593 (Y000593) and North West Africa 998 (NWA998)

Boctor, N. Z.; Wang, J.; DAlexander, C. M. O.; Hauri, E.; Irving, A. J.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Water and other volatiles play an important role in partial melting of mantle sources of primary magmas, and their eruption and crystallization history. Melt inclusions trapped in early crystallized minerals, e.g., olivine, preserve a range of compositional and isotopic variability, providing valuable information on their parent melt composition, pre-eruptive volatile abundances of magmas, and their degassing history. The nakhlites are the least affected by shock metamorphism among the Martian meteorites. Their lack of pervasive alteration or shock melting suggest that their magmatic melt inclusions and nominally anhydrous minerals may provide clues to the volatiles abundances and H isotope signatures of their parental melts. Our initial study of H isotope signatures of clinopyroxene, melt inclusions, and some olivine in the nakhlites Governador Valadares and Nakhla showed that they contain an extraterrestrial H component. In this investigation, we report the first SIMS analyses of the volatiles CO2, F, S, and Cl in melt inclusions and nominally anhydrous minerals in the nakhlites Y000593 and NWA998. We also report the water abundances and H isotope signatures of these phases. Hydrogen isotope data determined for Lafayette, Nakhla, and Governador Valadares are also included.

Author

Mass Spectroscopy; Volatility; Crystallization; Hydrogen Isotopes; Magma; Melting; Nakhlites

20050167011 European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands

Diurnal Variability in Martian Atmospheric Water Vapour: Near Surface Ice Out of Equilibrium as a Source

Boettger, H. M.; Foing, B. H.; Read, P. L.; Lewis, S. R.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this study we attempt to test the hypothesis that the observed diurnal variability in column water vapour abundances is driven by the supply of water vapour from subsurface water sources which are out of equilibrium with the current Martian climate. We will attempt to validate our results against the available Gamma Ray Spectrometer (GRS) observations. However, we would like to examine an alternative approach. It may be possible that this diurnal signature is caused by a near surface water source which is supplying the atmosphere with water vapour on a daily basis. In equatorial regions this water source would of course be out of equilibrium with the current climatic conditions on Mars and would hence need to be a remnant

Derived from text

Mars Atmosphere; Diurnal Variations; Water Vapor; Surface Water; Ice; Atmospheric Moisture

20050167012 NASA Johnson Space Center, Houston, TX, USA

Characterizing the Early Impact Bombardment

Bogard, Donald D.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The early bombardment revealed in the larger impact craters and basins on the moon was a major planetary process that affected all bodies in the inner solar system, including the Earth and Mars. Understanding the nature and timing of this bombardment is a fundamental planetary problem. The surface density of lunar impact craters within a given size range on a given lunar surface is a measure of the age of that surface relative to other lunar surfaces. When crater densities are combined with absolute radiometric ages determined on lunar rocks returned to Earth, the flux of large lunar impactors through time can be estimated. These studies suggest that the flux of impactors producing craters greater than 1 km in diameter has been approximately constant over the past approx. 3 Gyr. However, prior to 3.0 - 3.5 Gyr the impactor flux was much larger and defines an early bombardment period. Unfortunately, no lunar surface feature older than approx. 4 Gyr is accurately dated, and the surface density of craters are saturated in most of the lunar highlands. This means that such data cannot define the impactor flux between lunar formation and approx. 4 Gyr ago.

Derived from text

Impactors; Structural Basins; Lunar Surface; Lunar Rocks; Lunar Craters

20050167013 NASA Johnson Space Center, Houston, TX, USA

Ar-Ar and I-Xe Ages of Caddo County and Thermal History of IAB Iron Meteorites

Bogard, Donald D.; Garrison, Daniel H.; Takeda, Hiroshi; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Inclusions in IAB iron meteorites include non-chondritic silicate and those with more primitive chondritic silicate composition. Coarse-grained gabbroic material rich in plagioclase and diopside occurs in the Caddo County IAB iron meteorite and represents a new type of chemically differentiated, extra-terrestrial, andesitic silicate. Other parts of Caddo contain mostly andesitic material. Caddo thus exhibits petrologic characteristics of parent body metamorphism of a chondrite-like parent and inhomogeneous segregation of melts. Proposed IAB formation models include parent body partial melting and fractional crystallization or incomplete differentiation due to internal heat sources, and impact/induced melting and mixing. Benedix et al. prefer a hybrid model whereby the IAB parent body largely melted, then underwent collisional breakup, partial mixing of phases, and reassembly. Most reported 129I- Xe-129 ages of IABs are greater than 4.56 Gyr and a few are greater than or = 4.567 Gyr. These oldest ages exceed the 4.567 Gyr Pb-Pb age of Ca, Al-rich inclusions in primitive meteorites,

Derived from text

Argon; Iodine; Xenon 129; Iron Meteorites; Meteoritic Composition; Crystallization; Chondrites

20050167014 Grenoble Univ., France

CO3 Chondrites: Metamorphic Sequence and Interclassification with Ordinary Chondrites

Bonal, L.; Bourot-Denise, M.; Boronkay, A.; Montagnac, G.; Quirico, E.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Based on silicate and metal compositions and on contents of rare gases, McSween (1977) revealed a metamorphic sequence among the CO carbonaceous chondrites [1]. The 3 determined metamorphic subgroups were refined by the definition of a petrologic type (PT) by [2,3] (Table 1), who considered Induced Thermo-Luminescence (ITL) properties. This technique was also applied to type 3 ordinary chondrites (UOC). But, a same subtype number does not necessarily indicate equivalent conditions of metamorphism for the ordinary and CO chondrites [4]. On the contrary, a new technique, based on structural order of the Organic Matter (OM), has been applied on UOC [5] and CV3 [6] and appears as an interclassification tool.

Derived from text

Carbonaceous Chondrites; Metamorphism (Geology); Rare Gases; Luminescence

20050167015 Grenoble Univ., France

Laser-induced Fluorescence: Potential Interests for Immature Organic Matter Characterization

Bonal, L.; Quirico, E.; Montagnac, G.; Reynard, B.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Studying immature extraterrestrial Organic Matter (OM) is blemished of experimental constraints: the small quantity of matter necessitates to work, as far as possible, with non-destructive microscopic techniques. Raman spectroscopy has been successfully used for characterizing OM in slightly metamorphosed chondrites. However, Raman spectra of immature OM are more difficult to interpret, partly because of a photoluminescence background induced by the laser excitation which perturbs the Raman features. This drawback of Raman spectroscopy is however interesting. The use of the fluorescence to characterize sedimentary OM has been proposed by several authors. In all of these studies, the main goal was to assess the maturity of the samples. In the actual state of knowledge, a consequent work is still needed for providing an analytical approach linking the fluorescence signal (spectral shape and absolute intensity) to compositional and structural information. Exploiting the information of the fluorescence signal and applying it to the study of immature extraterrestrial OM, such as Interplanetary Dust Particles (IDPs) and Carbonaceous Chondrites (CCs) is the goal of the present work.

Derived from text

Lasers; Fluorescence; Organic Materials; Carbonaceous Chondrites; Interplanetary Dust

20050167017 Consiglio Nazionale delle Ricerche, Rome, Italy

Identification of Magnesium Sulfate Hydration State Derived from NIR Reflectance Spectroscopy

Bonello, G.; Berthet, P.; dHendecourt, L.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

OMEGA, for the first time, has identified sulfates associated to layered deposits in Terra Meridiani and Valles Marineris using imaging-spectroscopy in the visible and near infrared wavelength ranges. Magnesium sulfate has been identified in monohydrated state and is one candidate that fit the OMEGA spectra in polyhydrated state. These observations are consistent with in-situ analyses that have demonstrated an important occurrence of the sulfur element correlated to magnesium leading many authors to the concept of magnesium sulfate salt as a widespread cementing agent in Martian soils. Thus, it could be considerate as a potential water storage constituent of the regolith that would account for equatorial H2O amount observed by the Odyssey spacecraft. A recent study has studied the crystalline structure and H2O content variations of hydrated magnesium sulfates (MgSO4.nH2O) with pression, temperature and relative humidity conditions. It has shown the possible stable phases of hydrated magnesium sulfates under Martian surface conditions for short term (diurnal) or long term evolutions. The present work is a first step in making a comprehensive analysis of spectral features related to hydration state (water content) of magnesium sulfates.
Author
Magnesium Sulfates; Hydration; Near Infrared Radiation; Spectroscopy; Mars Surface; Moisture Content

20050167018 Toledo Univ., OH, USA
Effects of Atmospheric Dust on Residual South Polar Cap Stability
Bonrv, B. P.; Bjorkman, J. E.; Hansen, G. B.; James, P. B.; Wolff, M. J.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Martian polar caps have been studied from the time of Herschel. Neither polar cap normally disappears in summer. The Residual North Polar Cap (portion that remains through summer) is composed of a mixture of water ice and dust, and its interannual stability is due to its low sublimation rate at the summer temperatures in the North Polar Region. The Residual South Polar Cap (RSPC) is more enigmatic, surviving the relatively hot perihelic summer season despite being composed of much more volatile CO2. It is able to do so because of its unusually high albedo, which is larger than that of other bright regions in the seasonal cap (e.g. Mountains of Mitchel). The proximity of the albedo of the RSPC to the critical albedo for stability raises the question of whether the RSPC exists in every Martian year. The ground based record is somewhat ambivalent. Douglass and Lowell reported that RSPC suddenly vanished at Ls=297deg in 1894 and did not reappear until Ls=0deg [1], and Kuiper reported that it disappeared in 1956 [2]; but both observations were questioned by contemporaries, who tended to attribute them to obscuring dust. Barker [3] reported a large amount of water vapor over the south polar cap in 1969 that could be attributed to exposure of near surface water ice during partial removal of the CO2 in the RSPC in 1969.
Derived from text
Dust; Polar Caps; Stability; Water Vapor; Mars Surface

20050167019 New Mexico Univ., Albuquerque, NM, USA
Geochemical and Isotopic Systematics of the Youngest Dated Lunar Igneous Rock, Northwest Africa 773
Borg, L. E.; Shearer, C. K.; Asmerom, Y.; Papike, J. J.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Many lunar samples are strongly enriched in potassium (K), rare earth elements (REE), and phosphorous (P). This KREEP geochemical signature is interpreted to indicate the involvement of late-stage liquids derived from the crystallization of a magma ocean in the petrogenesis of KREEP-rich samples. Most KREEP-rich samples, including Mg-suite, alkali suite rocks, as well as KREEP-basalts, have ages greater than 3.8 Ga. This has led to the hypothesis that KREEP magmatism was confined to the earliest periods of lunar history. Below we present Rb-Sr and Sm- Nd isotopic evidence that an olivine-rich clast in the lunar meteorite Northwest Africa 773 (NWA773) is not only the youngest lunar sample yet dated, but has the largest KREEP geochemical signature.
Author
Geochemistry; Isotopes; Isotope Ratios; Lunar Rocks; Potassium

20050167020 Southwest Research Inst., Boulder, CO, USA
Are Most Small Craters Primaries or Secondaries: Insights from Asteroid Collisional/Dynamical Evolution Models
Bottke, W. F.; Nesvorny, D.; Durda, D. D.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An important goal of steroid studies is to determine the size frequency distributions (SFDs) of both the main belt and planet-crossing asteroid populations and how they evolved over Solar System history. This information can be used in many ways. For example, by estimating the rate at which different sizes asteroids have struck the Moon and Mars over time, we can use crater populations to determine the chronology of geologic events on each surface. Obtaining accurate values for interpreting small crater populations, which may be dominated by secondary craters. we focus on this controversial issue here. Derived from text

Mathematical Models; Evolution (Development); Asteroids; Craters; Frequency Distribution; Chronology

20050167021 Planetary Science Inst., Tucson, AZ, USA

Alluvial Fans on Dunes in Kaiser Crater Suggest Niveo-Aeolian and Denivation Processes on Mars

Bourke, M. C.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations

Contract(s)/Grant(s): NNG04GJ92G; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

On Earth, cold region sand dunes often contain inter-bedded sand, snow, and ice. These mixed deposits of wind-driven snow, sand, silt, vegetal debris, or other detritus have been termed Niveo-aeolian deposits. These deposits are often coupled with features that are due to melting or sublimation of snow, called denivation features. Snow and ice may be incorporated into dunes on Mars in three ways. Diffusion of water vapour into pore spaces is the widely accepted mechanism for the accretion of premafrost ice. Additional mechanisms may include the burial by sand of snow that has fallen on the dune surface or the synchronous transportation and deposition of snow, sand and ice. Both of these mechanisms have been reported for polar dunes on Earth. Niveo-aeolian deposits in polar deserts on Earth have unique morphologies and sedimentary structures that are generally not found in warm desert dunes. Recent analysis of MOC-scale data have found evidence for potential niveo-aeolian and denivation deposits in sand dunes on Mars.

Author

Alluvium; Craters; Deposition; Mars Surface; Ice

20050167022 Aberdeen Univ., UK

The Extraction of Organic Compounds from Sulphate Minerals for Astrobiological Exploration

Bowden, S. A.; Parnell, J.; Cooper, J.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Sulphates on Mars: Sulphates were estimated to constitute 10 % of the Pathfinder and Viking Lander sites and up to 30 % at the MER-B landing site. This is significant in the context of astrobiological exploration as aqueous environments rich in sulphates could have been a habitat suitable for phototrophic life on Early (3.45 Ga) Earth and sulphates are known to provide a habitat for phototrophic life in a cold, desiccating environment in the Canadian Arctic. The former represent conditions similar to those that may have existed on Mars in the past and the latter conditions similar to those existing on the surface of Mars today.

Author

Organic Compounds; Extraction; Sulfates; Minerals

20050167024 Hawaii Univ., Honolulu, HI, USA

History of Major Degradational Events in the Highlands of Mars: Preliminary Results from Crater Depth/Diameter Measurements

Boyce, Joseph M.; Mouginis-Mark, Peter J.; Garbeil, Harold; Soderblom, Laurence A.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In an effort to gain insight into the degradational history of the highlands of Mars, we have measured the depth (d) and diameter (D) of 1,692 craters (D ranging from 6 km to greater than 100 km) using the technique developed by Mouginis-Mark et al. applied to the 1/128th degree MOLA digital elevation model. We have selected 19 test areas (12 areas in Noachian-age regions: Terra Meridiani, Margaritifer Terra, Memnonia Fosse, Ma'adim Valles, N.W. Arabia Terra, N.E Arabia Terra, N. Promethei Terra, S. Central Promethei, S.E. Cimmeria Terra, S. Argyre, Sirenum Terra, and Dueteronilus Regions; and 5 test

areas in Hesperian-age regions: Sinai, Hesperia, Lunae Planum, Amphitrites regions and Tempe Terra). It shows the location of craters in each of these areas.
Author
Degradation; Mars Surface; Craters; Depth Measurement

20050167025 Arizona Univ., Tucson, AZ, USA
Determination of Both Depth and Ice Content of Sub-Surface Ice in the Polar Regions
Boynton, W.; Kim, K.; Drake, D.; Reedy, R.; Janes, D.; Kerry, K.; Williams, R.; Crombie, K., et al.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: Our preliminary estimate of the ice content in the south polar region of Mars [1] showed that at -72 deg latitude the combined neutron and gamma data from the Gamma-Ray Spectrometer [2] implied an ice content of about 35% by mass, buried beneath a dry layer about 40 g/cm2 thick. At that time, which was shortly after arrival at Mars, we had to normalize our data to 'ground truth' and chose 1% H2O for a water content at the Viking-1 landing site (for neutrons) and 1% H2O for the entire band between +/- 30 deg. latitude (for the H gamma rays). We now know that the regions to which we normalized the data have substantially greater H2O content, which implies a greater sub-surface ice content in the polar region.
Derived from text
Depth; Ice; Mars Surface; Polar Regions

20050167026 Idaho State Univ., Pocatello, ID, USA
Exploring the Link Between Geochemistry and Volcano Morphology on the Eastern Snake River Plain: A Planetary Analog to Mars Volcanism
Brady, S. M.; Hughes, S. S.; Sakimoto, S. E. H.; Gregg, T. K. P.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The eastern Snake River Plain (ESRP) is known as a region of plains-style volcanism. Consisting of extensive rift systems, overlapping shield volcanoes, evidence of hydromagmatic activity, and intrusive rhyolitic domes; the ESRP is considered a bimodal volcanic provenance. Imagery from MOC, MOLA, and THEMIS reveal that the Tempe Terra and Syria regions of Mars exhibit many of the same volcanic features found on the ESRP. Therefore studies of the morphology of the ESRP shields are insightful based on the topographic manifestations of volcanic processes. Volcano morphology is typically a function of eruptive rate/magma supply, gas content, and composition. This study aims to explore the possible connection between the composition, i.e. the geochemistry and texture, of ESRP basalts and the resultant shield morphology. Ongoing research continues to quantify links between volcanic processes and topography on Mars.
Derived from text
Geochemistry; Morphology; Mars Volcanoes; Magma

20050167027 Florida Space Inst., Cape Canaveral, FL, USA
On the Possibility of a Persistent Greenhouse Regime on Mars
Brandenburg, J. E.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It has long been recognized that warmer wetter conditions existed on early Mars than at present. This has been evidenced by the presence of many extinct water channels on ancient terrians in the South of Mars and even what appear to be dendritic networks suggesting precipitation. However, evidence for an extinct paleocean has been found in the Northern younger terrains indicating the possibility that conditions allowing liquid water may have been present until the early Amazonian. Recent imagery has suggested that precipitation existed in the Late Hesperian. The simplest explanation for such such warmer wetter climate in Mars Past is that a Carbon dioxide greenhouse existed. However, such CO2 greenhouse models are subject to short term pressure and temperature instability in the presence of insolation and large impacts. In the long term such a CO2 greenhouse is chemically unstable because CO2 in the presence of liquid water and warm temperatures yields carbonic acid solution which attacks Ferro Magnesian silicates to form siderites, such as are found the primordial mars meteorite ALH84001, and thus rapidly depletes the CO2 until the greenhouse fails. Given the lack of Plate Tectonics on Mars, no mechanism is known to exist for recycling the CO2 into the atmosphere.
Derived from text
Greenhouse Effect; Planetary Geology; Mars Environment; Water Temperature; Carbon Dioxide

20050167030 New Mexico Univ., Albuquerque, NM, USA

On the Behavior of Phosphorus During the Aqueous Alteration of CM2 Carbonaceous Chondrites

Brearley, Adrian J.; Chizmadia, Lysa J.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923

Contract(s)/Grant(s): NAG5-13046; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

During the earliest period of solar system formation, water played an important role in the evolution of primitive dust, both after accretion of planetesimals and possible before accretion within the protoplanetary disk. Many chondrites show evidence of variable degrees of aqueous alteration, the CM2 chondrites being among the most studied [1]. This group of chondrites is characterized by mineral assemblages of both primary and secondary alteration phases. Hence, these meteorites retain a particularly important record of the reactions that occurred between primary high temperature nebular phases and water. Studies of these chondrites can provide information on the conditions and environments of aqueous alteration and the mobility of elements during alteration. This latter question is at the core of a debate concerning the location of aqueous alteration, i.e. whether alteration occurred predominantly within a closed system after accretion (parent body alteration) or whether some degree of alteration occurred within the solar nebula or on ephemeral protoplanetary bodies prior to accretion. At the core of the parent body alteration model is the hypothesis that elemental exchange between different components, principally chondrules and matrix, must have occurred. chondrules and matrix, must have occurred. In this study, we focus on the behavior of the minor element, phosphorus. This study was stimulated by observations of the behavior of P during the earliest stages of alteration in glassy mesostasis in type II chondrules in CR chondrites and extends the preliminary observations of on Y791198 to other CM chondrites.

Derived from text

Phosphorus; Planetary Evolution; Water; Solar System; Meteoritic Composition

20050167031 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Age-Orientation Relationships of Northern Hemisphere Martian Gullies and 'Pasted-on' Mantling Unit: Implications for Near-Surface Water Migration in Mars' Recent History

Bridges, N. T.; Lackner, C. N.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The finding of abundant, apparently young, Martian gullies with morphologies indicative of formation by flowing fluid was surprising in that volumes of near-surface liquid water in sufficient quantities to modify the surface geology were not thought possible under current conditions. Original hypotheses on origin of gullies were mostly centered on groundwater seepage and surface runoff and melting of near-surface ground ice. More recently, melting of snow deposited in periods of higher obliquity has been proposed as a possible origin of the gullies. Tied to this hypothesis is the supposition that the 'pasted-on' mantling unit observed in association with many gullies is composed of remnant snowpack. The mantling unit has distinct rounded edge on its upper boundary and exhibits features suggestive of flow noted that the uppermost part of the mantle marks where gullies begin, suggesting that the source of water for the gullies was within the mantle. The mantle is found preferentially on cold, pole-facing slopes and, where mantled and non-mantled slopes are found together, gullies are observed incised into the latter. In other cases, the mantling material lacks gullies.

Derived from text

Mars (Planet); Water; Migration; Seepage

20050167032 MacQuarie Univ., Australia

Hydrothermal Mars 'Through the CRISM': Which Hydroxyl Band and Why

Brown, A. J.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Compact Reconnaissance Infrared Spectrometer for Mars (CRISM) is scheduled to launch on Mars Reconnaissance Orbiter in August 2005. CRISM will view radiation from Mars in the ultraviolet to mid wavelength infrared (0.383- 3.960 m). A commandable subset of wavelengths covering key mineralogic absorption bands will be examined during the preliminary mapping phase of the mission. In order to search for Al-OH bearing hydrothermal minerals such as muscovite, kaolins and pyrophyllite, absorptions due to vibrations of the hydroxyl (OH) molecule will be targeted. The spectral region covered by

CRISM contains several OH absorption bands. The subject of this report is: Which of the available OH absorption bands should be targeted during CRISM preliminary mapping?
Author
Hydrothermal Systems; Infrared Radiation; Mars (Planet); Reconnaissance; Infrared Spectrometers; Hydroxyl Emission

20050167034 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Cassini VIMS at Saturn: The First 6 Months
Brown, R. H.; Baines, K.; Bellucci, G.; Buratti, B.; Capaccioni, F.; Cerroni, P.; Clark, R. N.; Coradini, A.; Cruikshank, D.; Drossart, P., et al.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 1 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Cassini Visual and Infrared Mapping Spectrometer (VIMS) is an imaging spectrometer on the Cassini spacecraft that covers the spectral range of 0.35 - 5.2 m in 352 spectral channels, a nominal instantaneous field of view of 0.5 mrad and an image format of 64 x 64 pixels. It has completed it s first 6 months in orbit around Saturn. During that time it has made extensive observations of Saturn s rings, it s icy satellites, in particular Phoeba and Iapetus, and had 1 distant and 2 close flybys of Titan.
Author
Cassini Mission; Saturn Rings; Imaging Spectrometers; Spectra; Titan

20050167036 NASA Johnson Space Center, Houston, TX, USA
Hematite on the Surface of Meridiani Planum and Gusev Crater
Brueckner, J.; Dreibus, G.; Jagoutz, E.; Gellert, R.; Lugmair, G.; Rieder, R.; Waenke, H.; Zipfel, J.; Klingelhoefer, G.; Clark, B. C., et al.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Meridiani Planum was selected as a landing side for the Rover Opportunity because of an indication of hematite observed from orbit. Meridiani Planum consists of sorted sands with aeolian features like ripples and desert pavements. In impact craters, a high-albedo layered bedrock is exposed. The soil is a mixture of: (i) fine sand material in the size ranges of 50 to 150 m, (ii) sub-angular, irregular particles of 0.5 to 5 mm size with submillimeter circular voids that are most likely vesicular basaltic fragments, and (iii) spherules with a restricted grain size between 4 and 6 mm. The Mini-TES on board the rover Opportunity identified a hematite signature at distance resulting from mm-sized spherules as determined by the Moussbauer Spectrometer. Small quantities of similar spherules (2 vol. %) were found in rock exposures in Eagle crater and were interpreted as concretions that formed by precipitation from aqueous fluids inside sedimentary rocks. At Gusev crater no hematite was observed until sol 90 except for layering on a rock. Our investigations of hematite bearing materials, measured by the Alpha Particle X-ray Spectrometer (APXS), Moussbauer Spectrometer (MB), and Microscopic Imager (MI), provide a more integrated view of different occurrences of hematite on the martian surface. Chemistry of soils and rocks: Chemical compositions
Author
Hematite; Basalt; Chemical Composition; Craters; Mars Surface

20050167038 Arkansas Univ., Fayetteville, AR, USA
Simulation of Extraterrestrial Sample Acquisition
Buffington, J. A.; Franzen, M. A.; Azouggagh-McBride, S.; Roe, L. A.; Sears, D. W. G.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Hera Mission is a Discovery class proposal to return several 100 g samples from a near-Earth asteroid. The mission will meet objectives of the NASA Roadmap, Decadel Survey, as well as seven of the eleven goals of the Space Science Enterprise Strategic Plan. Ultimately, Hera also aligns with the President's New Vision for NASA by providing an intermediate step for exploration between the Moon and Mars. The actual mechanics of the mission are presented.
Derived from text
Simulation; NASA Space Programs; Sample Return Missions; Extraterrestrial Environments

20050167039 NASA Ames Research Center, Moffett Field, CA, USA

Aqueous Alteration of Basaltic Glass Under a Simulated Mars Atmosphere

Bullock, M. A.; Moore, J. M.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

For the past several years we have been performing experiments designed to produce brines under Mars-simulated conditions. Previously, we had generated and analyzed Mars-analog brines by allowing a mixture of minerals derived from SNC mineralogy to soak in pure water under a synthetic current-Mars atmosphere and under a gas similar to the present Mars atmosphere but with added acidic gases. The latest version of these experiments incubates basaltic glass, obtained from recent Kilauea flows (Mother's Day flow in December 2002), in pure water under a present-day Mars analog atmosphere at 25 C. This abstract and our presentation will discuss the composition of these Mars-analog brines and implications for Mars surface chemistry.

Derived from text

Basalt; Glass; Mars Atmosphere; Simulation; Aqueous Solutions

20050167040 Maryland Univ. Baltimore County, Catonsville, MD, USA

Distinguishing Between Primary and Secondary Emplacement Events of Blocky Volcanic Deposits Using Rock Size Distributions

Bulmer, M. H.; Glaze, L. S.; Anderson, S.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A primary key to understanding past history of a volcano, and potentially future behavior, is interpretation of surface deposits. However, interpreting the origin of a blocky geologic surface is difficult, especially in instances where ground observations are not possible or where additional evidence that could provide spatial and temporal context for the deposit is ambiguous. This difficulty is compounded in volcanic terrains where lava flows and rock avalanches can occur in the same material and locality. Furthermore, post-emplacement processes such as glaciation or fluvial activity may contribute additional complexity to interpreting the origin of a blocky surface. Although several previous studies have investigated morphologic characteristics of lava flows and rock avalanches, relatively few have addressed surface rock size distributions. Those that do address geologic rock size are often limited to qualitative discussions of angularity and sorting. Where more quantitative data have been acquired, size information has been reduced to cumulative size-frequency distributions. However, much of the detail contained in the raw measurement data is lost in this type of analysis.

Derived from text

Volcanoes; Mineral Deposits; Rocks; Size Distribution

20050167041 Scripps Institution of Oceanography, La Jolla, CA, USA

Detection of New Deep Moonquakes in the Apollo Lunar Seismic Data: Implications for Temporal and Spatial Distribution

Bulow, R. C.; Johnson, C. L.; Shearer, P. M.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Apollo Passive Seismic Experiment consisted of four seismometers deployed on the lunar surface between 1969 and 1972. Data were recorded continuously until 1977, and approximately 12,000 seismic events were detected. These events were classified into three main types: impacts, shallow moonquakes, and deep moonquakes. The latter comprise nearly half of the catalogued events. Early studies of these deep events revealed 77 separate source regions, each of which produces a characteristic waveform. Deep moonquakes were also discovered to occur with tidal periodicity. The repeatability of waveforms from a single source region can be used to search for new events in the continuous data via cross-correlation. Because the original events were selected from the continuous data by eye, automating the process allows us not only to detect signals close to the noise level, but also to classify some of the catalogued events not previously associated with any group. This search fills out the event catalog, providing a complete description of deep moonquake occurrence times for identified clusters, from which improved estimates of tidal periodicities can be made. Waveform repeatability can also be used for stacking events from a single source region. This improves signal-to-noise (SNR) and the visibility of seismic phases. Our event search improves stack quality by increasing the total number of events in a given stack. Optimized stacks are produced using a weighted iterative approach. This reduces erroneous trace selection and creates the cleanest possible stacks from which

travel times estimates can be made. We use these travel times to estimate source region locations and compare to those of previous studies.
Derived from text
Moonquakes; Seismology; Spatial Distribution; Temporal Distribution; Detection

20050167042 New Mexico Univ., Albuquerque, NM, USA
Localized Chemical Redistribution During Aqueous Alteration in CR2 Carbonaceous Chondrites EET 87770 and EET 92105
Burger, Paul V.; Brearley, Adrian J.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations
Contract(s)/Grant(s): NAG5-11862; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Carbonaceous chondrites are primitive meteorites that are valuable because they preserve evidence of processes that occurred in the solar nebula and on asteroidal parent bodies. Among the carbonaceous chondrite groups, the CR group appears to contain a particularly pristine record of early solar system processes. Distinguishing characteristics of CR2 chondrites include a high abundance of chondrules (50-60 vol.%) and Fe, Ni metal (5-8 vol. %). These meteorites preserve evidence for varying degrees of aqueous alteration, manifested by progressive replacement of chondrule mesostasis by phyllosilicates. Recent studies have suggested that even in weakly altered chondrites, mass transfer occurred between chondrules and fine-grained matrices, implying that aqueous alteration must have followed lithification of the final meteorite parent body. Although petrographic characteristics of alteration in CR chondrites have been documented, mechanisms of alteration are still only poorly understood. For example, the relative rates and scales of elemental mobility as well as the sources and sinks for key elements are currently not constrained. An improved knowledge of these issues will contribute to an increased understanding of aqueous alteration reactions on meteorite parent bodies. This study expands on research conducted on Type IIA chondrules and chondrule fragments from two CR2 chondrites, EET 87770 and EET 92105. These chondrites have been weakly altered; chondrule mesostases show incipient alteration primarily where they are in direct contact with fine-grained matrices.
Derived from text
Carbonaceous Chondrites; Metamorphism (Geology); Petrography; Position (Location); Chemical Composition

20050167043 NASA Johnson Space Center, Houston, TX, USA
Molecular Contamination on Anodized Aluminum Components of the Genesis Science Canister
Burnett, D. S.; McNamara, K. M.; Jurewicz, A.; Woolum, D.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Inspection of the interior of the Genesis science canister after recovery in Utah, and subsequently at JSC, revealed a darkening on the aluminum canister shield and other canister components. There has been no such observation of film contamination on the collector surfaces, and preliminary spectroscopic ellipsometry measurements support the theory that the films observed on the anodized aluminum components do not appear on the collectors to any significant extent. The Genesis Science Team has made an effort to characterize the thickness and composition of the brown stain and to determine if it is associated with molecular outgassing.Detailed examination of the surfaces within the Genesis science canister reveals that the brown contamination is observed to varying degrees, but only on surfaces exposed in space to the Sun and solar wind hydrogen. In addition, the materials affected are primarily composed of anodized aluminum. A sharp line separating the sun and shaded portion of the thermal closeout panel is shown. This piece was removed from a location near the gold foil collector within the canister. Future plans include a reassembly of the canister components to look for large-scale patterns of contamination within the canister to aid in revealing the root cause.
Derived from text
Aluminum; Anodizing; Contamination; Genesis Mission; Molecular Biology; Cans

20050167044 Centre National de la Recherche Scientifique, Gif-sur-Yvette, France
In Situ Determination of the Partitioning of Lead, Strontium and Rubidium Between Hydrous Melts and Aqueous Fluids at High Pressure and Temperature
Bureau, H.; Menez, B.; Malavergne, V.; Somogyi, A.; Munoz, M; Simionovici, A.; Massacre, D.; Lunar and Planetary Science

XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Subduction zones are the locations where the oceanic crust, which experienced intense interaction with seawater, is buried back into the Earth's mantle. These environments play a critical role in the global geochemical cycle of Earth, being the location at which chemical components are both recycled into the mantle and returned to the atmosphere through volcanism. It is now generally admitted that magma genesis at subduction zones is mainly induced by the presence and movement of fluids (aqueous fluids and/or silicate melts) released continously in large amounts due to dehydration reactions in the subducted slab. It is also believed that these fluids may be responsible of the atypical trace-element signature of the Island Arc Basalts (IAB), which are enriched in Large Ion Lithophile Element (LILE= Sr, Rb, Ba, Pb) and depleted in High-Field Strength Element (HFSE= Zr, Ti, Hf, Nb, Ta) compared to Mid-Ocean Ridge Basalts (MORB). The present study combined diamond anvil cells experiments with the high-brillance third-generation synchrotron light source of the European Synchrotron Radiation Facility (ESRF Grenoble, France), to study in situ the partitioning of key elements (Pb, Rb, Sr) between aqueous fluids and silicate melts, under subduction zones pressure and temperature conditions. We performed experiments with and without chlorine to evaluate the effect of chlorine on partition coefficents of key elements as function of pressure and temperature.

Derived from text

High Pressure; Rubidium; Strontium; Lead (Metal); High Temperature; Basalt; Melts (Crystal Growth); In Situ Measurement

20050167045 Arizona State Univ., Tempe, AZ, USA

Using an Inexpensive Digital Camera to Photograph Mars-Analog Materials at the Scale of the MER Microscopic Imager, and at Other Scales

Burt, D. M.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The high-resolution Microscopic Imagers (MI) on the Mars Exploration Rovers Spirit and Opportunity have taken thousands of amazing close-up photos of Mars minerals and rocks with a field of view (FOV) of about 30 mm (1.2 in) square in a 1024 pixel-square image (i.e., a 1 megapixel image). This magnification is commonly quoted as 30 m per pixel. Two frustrating limitations of the MI are first, that the photos are monochrome (gray-scale), and second, that the zoom and sample distance cannot be varied (i.e., each photo always shows the same-sized FOV). As might be expected, the depth of field (DOF) is also rather limited, and consequently all or part of any given image may be out of focus. Other than the gray-scale limitation, this makes the MI quite analogous to the traditional 10X hand lens of the field geologist, as intended. For imaging Mars analog materials, the MI is also analogous to a consumer-level digital camera, except that digital imaging technology has advanced so far in the past few years that the consumer camera probably has far more capability than the MI (e.g., zoom lens, color capability, far greater pixel resolution, and, with a few simple add-ons, far more magnification capability). This fact allows many consumer-level cameras to be used to image possible Mars-analog materials (when images are deliberately cropped or downsampled and gray-scaled) in a manner analogous to the MI.

Derived from text

Digital Cameras; Mars Exploration; Photographs; Imaging Techniques; Mars Roving Vehicles; Analogs

20050167046 Moscow Univ., Moscow, Russia

Possibility of Separating Silicates and Organics in Large Kuiper Belt Objects

Busarev, V. V.; Dorofeeva, V. A.; Makalkin, A. B.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923

Contract(s)/Grant(s): RFBR-04-05-64867; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have made estimations applicable to the structure of large (R greater than or equal to 100 km) Kuiper belt objects (KBOs) and similar silicate-icy bodies existed in the formation zones of neighbouring giant planets in the early Solar system. According to the estimations, initial decay of the short-lived Al-26 in the bodies and/or thermal consequences of their mutual collisions (at relative velocities greater than or equal to 1.5 kilometers per second) during the subsequent period were probably the main sources of heating sufficient for water ice melting and formation of a water ocean in their interiors. We consider principal processes and results of them in the water ocean of large KBOs. One of the important consequences of the early heating could be a layered structure of present KBOs, manifesting itself in a large range of their colours.

Derived from text

Kuiper Belt; Planetary Evolution; Silicates; Gas Giant Planets; Organic Materials

20050167048 Johns Hopkins Univ., Laurel, MD, USA
Galileo's View of the Lunar North Pole
Bussey, D. B. J.; Schenk, P. M.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have used Galileo SSI data to learn more about the topography and illumination conditions surrounding the Moon's north pole. During the 1992 flyby of the Earth-Moon system Galileo obtained 7 full imaging mosaics of the lunar northern hemisphere, from approximately 45 S to 90 N latitude and from approximately 110 E to approximately 70 W longitude at resolutions ranging from approximately 1.9 to 1.1 kilometers per pixel. These data are conducive to the production of Digital Elevation Models with nominal effective vertical resolutions of several hundred meters. Additionally the Galileo data were acquired during a different season than previous imaging data of the lunar poles and therefore provides a unique snapshot of the illumination conditions.
Derived from text
Galileo Spacecraft; Northern Hemisphere; Lunar Topography

20050167050 Image Again, Middletown, NJ, USA
Size Distribution of Lunar Basins
Byrne, Charles J.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Even a cursory examination of the near side and far side of the Moon reveals an obvious difference; dark mare material has flooded the large basins on the near side, particularly north of 35 degrees South latitude. This has been found to be due to the crust being thinner there. However, a more careful examination of multi-ringed basins reveals a difference in the relative sizes of near side and far side basins (measured by their main rings). This paper looks beyond the flooding by mare material to examine the distribution of basins by size and position. A list of 45 multi-ringed basins, with estimates of the location of their centers and the diameter of their rings, was given by Spudis. The list is similar to that of Wilhelms. Although these data could be reviewed in the light of the altimetry and remote sensing measurements of the Clementine and Lunar Prospector spacecraft missions, this list, published before those missions, is used as the source data for this paper. The estimate of the diameter of the main ring of each basin is taken as the measure of its size. The mean main ring diameter of the basins is 581 km, with a standard deviation of 371 km.
Derived from text
Size Distribution; Structural Basins; Moon; Lunar Surface

20050167051 Pittsburgh Univ., Pittsburgh, PA, USA
Synthesis and Analysis of Silicate Glasses: Applications to Remote Sensing of Volcanic Surface Units on Earth and Mars
Byrnes, Jeffrey M.; King, Penelope L.; Ramsey, Michael S.; Lee, Rachel J.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Volcanism is the primary process in the solar system that creates the surfaces of the terrestrial planetary bodies. Volcanoes and volcanic surface units provide information about the geologic history of these bodies, which reflects the unique thermal and chemical evolution of each. Remote sensing provides an effective means to study these volcanic surface units in a quantitative way. Thermal infrared (TIR) is one such type of remotely sensed data set that has been collected for Earth and Mars. TIR data has been used to determine the temperature and emissivity (a material property) of volcanic surfaces to derive energy output of active volcanoes on Earth, and various emissivity-derived characteristics of volcanic deposits, including material composition and physical state and surface texture. However, a knowledge gap remains in our understanding of the fundamental ways silicate structures (especially in glasses) affect TIR emissivity and how to accurately map emissivity of volcanic surfaces.
Derived from text
Mars Surface; Planetary Geology; Remote Sensing; Earth Surface; Silica Glass; Synthesis (Chemistry); Volcanoes

20050167069 Florida Univ., Gainesville, FL, USA
Origins and Dynamics of Interplanetary Dust Particles
Dermott, Stanley F.; April 30, 2005; 9 pp.; In English
Contract(s)/Grant(s): NAG5-11643; No Copyright; Avail: CASI; A02, Hardcopy

This is a final report for research supported by the National Aeronautics and Space Administration issued through the Office of Space Science Planetary Geology and Geophysics Program, covering all relevant activities during its 3-year period of funding from 02/01/2002 through to 01/31/2005. The ongoing aim of the research supported through this grant, and now through a successor award, is to investigate the origin of interplanetary dust particles (IDPs) and their dynamical and collisional evolution, in order to: (1) understand the provenance of zodiacal cloud particles and their transport from their source regions to the inner solar system; (2) produce detailed models of the zodiacal cloud and its constituent components; (3) determine the origin of the dust particles accreted by the Earth; (4) ascertain the level of temporal variations in the dust environment of the inner solar system and the accretion rate of IDPs by the Earth, and evaluate potential effects on global climate; and to (5) exploit this research as a basis for interpreting the structure observed in exozodiacal clouds that may result from the collisional evolution of planetesimals and the presence of unseen planets.
Derived from text
Interplanetary Dust; Planetary Geology; Particles; NASA Programs

20050167084 General Accounting Office, Washington, DC, USA
Major Management Challenges and Program Risks
January 2001; 40 pp.; In English; Original contains black and white illustrations
Report No.(s): GAO-01-258; No Copyright; Avail: CASI; A03, Hardcopy

The National Aeronautics and Space Administration's (NASA) mission encompasses human exploration and development of space, the advancement and communication of scientific knowledge, and research and development of aeronautics and space technologies. Its activities span a broad range of complex and technical endeavors from investigating the composition, evaluation, and resources of Mars; to working with its international partners to complete and operate the International Space Station; to providing satellite and aircraft observations of Earth for scientific and weather forecasting purposes; to developing new technologies designed to improve air flight safety. Overall, NASA spends more than $12 billion annually for goods and services supporting these and other activities, mostly on contracts with businesses and other organizations. Since 1990, we have identified a number of major management challenges at NASA. Currently, four challenges warrant increased NASA attention, including one area contract management that we are continuing to categorize as high risk. As highlighted in this overview, NASA has made substantial progress in addressing these challenges. Nevertheless, key steps remain.
Derived from text
International Space Station; NASA Space Programs; Risk; Project Management

20050167087 Arizona State Univ., Tempe, AZ, USA
Microbeam Investigations of Presolar and Early Solar System Materials
Huss, Gary R.; [2005]; 7 pp.; In English
Contract(s)/Grant(s): NAG5-11543; No Copyright; Avail: CASI; A02, Hardcopy

This grant provided three years of funding for my Cosmochemistry research program at Arizona State University. This research resulted in 11 peer-reviewed papers in six Journals and 35 abstracts to 11 Conferences and Workshops (see list below). My original proposal listed three main areas of research: 1) Studies of presolar grains; 2) Studies of short-lived radionuclides and; 3) Investigations of nebular processes and the origin of chondritic components.
Author (revised)
Cosmochemistry; Meteoritic Composition; Solar System Evolution

20050167124 Lunar and Planetary Inst., Houston, TX, USA
Lunar and Planetary Science XXXVI, Part 3
[2005]; ISSN 1540-7845; In English; Lunar and Planetary Science XXXVI, 14-18 Mar. 2005, Houston, TX, USA; See also 20050167125 - 20050167203
Contract(s)/Grant(s): NCC5-679
Report No.(s): LPI-Contrib-1234-Pt-3; Copyright; Avail: CASI; C01, CD-ROM

Topics discussed include: Characterization of Non-Organized Soils at Gusev Crater with the Spirit Rover Data; Searching for Life with Rovers: Exploration Methods & Science Results from the 2004 Field Campaign of the 'Life in the Atacama' Project and Applications to Future Mars Missions; Analysis of the Lunar Surface with Global Mineral and Mg-Number Maps ALH77005: The Magmatic History from Rehomogenized Melt Inclusions; New 70-cm Radar Mapping of the Moon; Cryptomare Deposits Revealed by 70-cm Radar; Construction of a PZT Sensor Network for Low and Hypervelocity Impact Detection; Palmer Quest: A Feasible Nuclear Fission 'Vision Mission' to the Mars Polar Caps; Physical Properties of Volcanic

Deposits on Venus from Radar Polarimetry; Science Alert Demonstration with a Rover Traverse Science Data Analysis System; Earth and Mars, Similar Features and Parallel Lives? Didactic Activities; Expected Constraints on Rhea s Interior from Cassini; Microbially Induced Precipitates: Examples from CO3, Si-, Mn- and Fe-rich Deposits; Li, B - Behavior in Lunar Basalts During Shock and Thermal Metamorphism: Implications for H2O in Martian Magmas; Evaluation of CO Self-Shielding as a Possible Mechanism for Anomalous Oxygen Isotopic Composition of Early Solar System Materials; Effect of Ground Ice on Apparent Thermal Inertia on Mars; Utah Marbles and Mars Blueberries: Comparative Terrestrial Analogs for Hematite Concretions on Mars; Newly Discovered Meteor Crater Metallic Impact Spherules: Report and Implications; and Evidence of Very Young Glacial Processes in Central Candor Chasma, Mars.
Derived from text
Basalt; Hypervelocity Impact; Craters; Hematite; Lunar Surface; Mars Surface; Meteorite Craters; Nuclear Fission

20050167125 NASA Ames Research Center, Moffett Field, CA, USA
Characterization of Non-Organized Soils at Gusev Crater with the Spirit Rover Data
Cabrol, N. A.; Greeley, R., et al.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We surveyed the characteristic of non-organized soils at Gusev crater at microscale and macroscale in four main traverse regions: (1) Landing site to Bonneville crater; (2) Bonneville to West Spur; (3) the West Spur region; and (4) the Columbia Hills up to sol 363. Non-organized soils are defined as soils traversed by Spirit that do not include drifts, ripples, or dunes.
Derived from text
Craters; Soils; Landing Sites; Dunes

20050167126 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Palmer Quest: A Feasible Nuclear Fission 'Vision Mission' to the Mars Polar Caps
Carsey, F. D.; Beegle, L. W.; Nakagawa, R.; Elliott, J. O.; Matthews, J. B.; Coleman, M. L.; Hecht, M. H.; Ivaniov, A. B.; Head, J. W.; Milkovich, S., et al.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We are engaged in a NASA Vision Mission study, called Palmer Quest after the American Antarctic explorer Nathaniel Palmer, to assess the presence of life and evaluate the habitability of the basal domain of the Mars polar caps. We address this goal through four objectives: 1. Determine the presence of amino acids, nutrients, and geochemical heterogeneity in the ice sheet. 2. Quantify and characterize the provenance of the amino acids in Mars ice. 3. Assess the stratification of outcropped units for indications of habitable zones. 4. Determine the accumulation of ice, mineralogic material, and amino acids in Mars ice caps over the present epoch. Because of the defined scientific goal for the vision mission, the Palmer Quest focus is astrobiological; however, the results of the study make us optimistic that aggressive multi-platform in-situ missions that address a wide range of objectives, such as climate change, can be supported by variations of the approach used on this mission. Mission Overview: The Palmer Quest baseline
Author
Amino Acids; Geochemistry; Habitability; Ice; Mars Surface; Vision

20050167128 Geological Survey, Flagstaff, AZ, USA
Evidence of Very Young Glacial Processes in Central Candor Chasma, Mars
Chapman, M. G.; Soderblom, L. A.; Cushing, G.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A newly released Mars Express Mission anaglyph (36 m/pixel) from Orbit 334 of central Ophir and Candor Chasmata [1] shows convincing evidence of youthful glacial erosion in central Candor Chasma [2]. These features are also observable in MOLA, THEMIS, and Viking datasets, but were not interpreted as glacially related until viewed in the high resolution topographic and group image context of the HRSC anaglyph. Correlative high-resolution MOC and THEMIS images have been used to examine the features in greater detail.
Derived from text
Glaciers; Mars Surface; Erosion; Topography

20050167129 Northrop Grumman Corp., Redondo Beach, CA, USA

Unique Science Features of the JIMO Vehicle

Christensen, Andrew; Leavitt, Keith; Johnson, Tamra; Reuter, Justin M.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 1 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The JIMO vehicle will revolutionize space science with unprecedented mass and power available for science. The mission is designed to obit the three icy moons of Jupiter: Callisto, Ganymede, and Europa for a minimum of 30- 60 days. The vehicle will have approximately 1500 kg of science payload available and at least 10 kW of electrical power. This enables high power payloads such as Ice Penetrating Radars, SARs, High Power Laser Experiments and Imaging Lidars. Additionally, the extensive power allows and unprecedented data rate up to 30 Mbps from Jupiter. This paper will focus on the design of the JIMO vehicle and how it maximizes the science potential of these missions. A conceptional design of the JIMO vehicle will be presented describing the entire system from the power source to the mission module, highlighting science features of the design

Author

Jupiter Probes; Callisto; Europa; Ganymede

20050167131 Colorado Univ., Boulder, CO, USA

Wavy Lineaments on Europa: Fracture Propagation into Combined Nonsynchronous and Diurnal Stress Fields

Crawford, Zane; Pappalardo, Robert T.; Barr, Amy C.; Gleeson, Damhnait; Mullen, McCall; Nimmo, Francis; Stempel, Michelle M.; Wahr, John; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Understanding the processes that have operated on Europa and the manner in which they may have changed through time is fundamental to understanding the satellite's geology and present-day habitability. Previous studies have shown that lineament patterns on Europa can be explained by accumulation of tensile stress from slow nonsynchronous rotation (NSR), while the cycloidal planforms of other Europan lineaments can be explained if fractures propagate through a diurnally changing tensile stress field. We find that fractures propagated into combined diurnal and NSR stress fields can be 'wavy' in planform for NSR stress accumulated over ~2 to 8 of ice shell rotation and average propagation speeds of approx. 1 to 3 m/s. The variety of Europa's observed lineament planforms from cycloidal, to wavy, to arcuate can be produced by accumulation of NSR stress relative to the diurnal stress field. Varying proportions of these stress mechanisms plausibly may be related to a time-variable (slowing) NSR rate.

Author

Europa; Crack Propagation; Diurnal Variations; Planforms; Rotation; Structural Properties (Geology)

20050167132 NASA Johnson Space Center, Houston, TX, USA

Li, B - Behavior in Lunar Basalts During Shock and Thermal Metamorphism: Implications for H2O in Martian Magmas

Chaklader, Johny; Shearer, C. K.; Horz, F.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: The water-content of Martian magmas is a topic of debate among researchers. Some Martian basalts are characterized with melt inclusions of biotite, apatite and amphibole; phases typically associated with hydration reactions on Earth [1-3]. However, the H-content of melt inclusions from these basalts is low, and bulk-rock H2O-contents range from a meager 0.013 to 0.035 wt. % in Shergotty [4]. Nonetheless, researchers note that low present-day water contents do not preclude a once hydrous past [5]. Since light lithophile elements (LLE), such as Li and B, partition into aqueous fluids at T \g 350 C, workers proposed that Li-B depletions in pyroxene rims of Nakhlite and Shergottite basalts reflect the loss of several weight percent water from Martian magmas during crystallization [6]. Since similar depletions were observed in pyroxene rims from completely dry lunar basalts, it is likely that alternative mechanisms also contribute to the distribution of elements such as Li and B [7]. Given that many Martian basalts have experienced considerable shock pressures (15-45 GPa), it is possible that shock and subsequent thermal metamorphism may have influenced the volatile element records of these basalts [8]. In order to better understand the distribution of Li and B, we are studying the effects of crystal chemistry, shock pressure, and thermal metamorphism in pyroxenes from lunar basalts. Below, we discuss results from experimentally shocked and

thermally metamorphosed Apollo 11, 10017 (A-11) and Apollo 17, 75035 (A-17) basalts.
Derived from text
Basalt; Moisture Content; Magma; Mars (Planet)

20050167135 NASA Ames Research Center, Moffett Field, CA, USA
The Distribution of Water in a Viscous Protoplanetary Disk
Ciesla, F. J.; Cuzzi, J. N.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The distribution of water in the solar nebula is important to understand for a number of reasons. Firstly, in the inner regions of the solar nebula, the concentration of water vapor is expected to have played a major role in determining its oxidation state, and therefore would control which minerals would form there. Secondly, in the outer nebula, water would be a major condensable, making up nearly 50% of the mass of the solids and thus possibly playing a role in determining where giant planets formed. Lastly, liquid water is important for forming and sustaining life, and therefore understanding where and how water was transported to the habitable zone of a a star is critical to understanding how common life may be in the galaxy. Because of its importance, the distribution of water in the solar nebula has been studied by a number of authors. The main transport mechanisms which would determine the distribution of water would be diffusion and gas drag migration. Water vapor and small solids would diffuse in the nebula, moving away from areas of high concentrations. Larger bodies, while also subject to diffusion, though to a lesser extent, would experience gas drag migration, causing them to move inwards with time. The bodies most affected by this transport mechanism would be on the order of 1 meter in size. As objects continued to grow larger, their inertia would also grow, making them nearly immobile to gas drag. While efforts have been made to understand how water would be distributed in a protoplanetary disk, none of the published models simultaneously consider the effects of nebular evolution, transport of material throughout the nebula, and the existence of solids of various sizes at a given location of the nebula. We are currently developing a model which allows for these effects and is consistent with models for the accretion of bodies in the solar nebula.
Derived from text
Gas Giant Planets; Protoplanetary Disks; Water Vapor; Planetary Evolution; Water

20050167136 NASA Johnson Space Center, Houston, TX, USA
Overview of Biomineralization and Nanobacteria
Ciftcioglu, N.; McKay, D. S.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Biomineralization is a frequently used term in nanotechnology, astrobiology, geology, and medicine. In the process of biomineralization, a living organism provides a chemical environment that controls the nucleation and growth of unique mineral phases. Often these materials exhibit hierarchical structural order, leading to superior physical properties, not found either in their inorganic counterparts or in synthetic materials. Biomineralization is widespread in the biosphere and hundreds of different minerals are produced or assisted by a variety of organisms from bacteria to humans. Teeth, bones, kidney stones, and skeletons of algae, mussels, and magnetotactic bacteria are all examples of biomineralization. We do not fully understand the control mechanism of biomineralization either in primitive or in developed organisms. The presence of organic molecules, among other characteristics, can influence the coherence length for X-ray scattering in biogenic crystals. Control over biomineral properties can be accomplished at a myriad of levels, including the regulation of particle size, shape, crystal orientation, polymorphic structure, defect texture, and particle assembly. In the latter case, cellular processes enable control in both the spatial and temporal domain in such a way that hierarchical composite structures can be built which increase the toughness and durability of the material, which is invaluable for load-bearing materials such as bones, teeth, mollusk shells, etc. Durability of biominerals produces remarkably preserved bacterial and cyanobacterial microfossils from billions of years-old samples. The differentiation between microfossils and nonbiogenic artifacts has been a lively discussion subject in astrobiology especially in the last decade. Clearly, more detailed information on the mechanism of biomineralization, and the effect of organic matter on crystal formation/fossilization would help focus such discussions.
Derived from text
Bacteria; Mineralogy; Nanotechnology; General Overviews; Biogeny; Biosphere

20050167137 L-3 Communication Government Services, Inc., Chantilly, VA, USA

Constant Scale Natural Boundary Mapping as Tool for Characterizing Asteroids

Clark, P. E.; Clark, Chuck S.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We are exploring the Constant Scale Natural Boundary (CSNB) approach to mapping and modeling asteroids in terms of morphological insight that can be gained in the context of traditional flat (2D) map projections and regular plate (3D) models. Author

Mapping; Asteroids; Boundaries; Models

20050167139 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Processes of Formation of Spheroidal Concretions and Inferences for 'Blueberries' in Meridiani Planum Sediments

Coleman, Max; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The MER Opportunity Athena Science team has described spheroidal hematite nodules in sediments at Meridiani Planum on Mars [1]. They were informally referred to as 'Blueberries' in the initial press releases and for brevity that is the name to be used in this abstract. Not all spheroidal objects in sediments are nodular concretions, but this paper will discuss the diagenetic processes possibly relevant to understanding the origin of the Blueberries. There are many occurrences of spheroidal diagenetic concretions in terrestrial sediments and detailed work has been done to understand the processes of their formation. In particular, it is possible to reconstruct the controls on their shapes and compositions, both mineral and chemical. Although there may not be good analogs for the Meridiani Planum hematite spherules on Earth, it may be possible to deduce the former environmental conditions that led to their formation and whether they might retain (or even be) biosignatures. Derived from text

Mars Surface; Spherules; Sediments; Minerals; Hematite; Geochemistry

20050167141 Open Univ., Milton Keynes, UK

The Combustion Characteristics and Stable Carbon Isotopic Compositions of Irradiated Organic Matter: Implications for Terrestrial and Extraterrestrial Sample Analysis

Court, R. W.; Sephton, M. A.; Parnell, J.; Gilmour, I.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ionizing radiation is the dominant creator and modifier of organic matter in space. It is capable of inducing free-radical chemistry in interstellar ice grains and the interiors of comets and asteroids, in planetary atmospheres and on the surfaces below. Therefore, all analyses of extraterrestrial organic matter need to be aware of the nature and extent of radiolytic alteration. This is especially true for the technique of stepped combustion-isotope ratio-mass spectrometry (stepped combustion-IRMS). Incremental heating allows the separation of carbon-bearing phases, such as kerogen, graphite, carbonate and diamond, by virtue of their different combustion temperatures. The gas evolved at each temperature step is then analyzed isotopically. This technique, used extensively on terrestrial samples, was to have been employed by the Gas Analysis Package on the ill-fated Beagle 2 Mars Lander, and will be performed by the Ptolemy evolved gas analyzer on board the Rosetta spacecraft, upon arrival at Comet 67P/Churyumov-Gerasimenko.
Derived from text

Combustion; Carbon; Isotope Ratios; Irradiation; Organic Materials; Extraterrestrial Matter

20050167142 Williams Coll., Williamstown, MA, USA

Is Chaos on Europa Caused by Crust-penetrating Impacts?

Cox, R.; Ong, L. C. F.; Arakawa, M.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Impact breaching of Europa's solid ice surface is not only possible, but probable. Estimates of crustal thickness range from a few 10s of km) down to a few km or even a few hundred m in places, and numerical simulations demonstrate that an ice shell 4-7 km thick or less is likely to be breached by 1 km diameter comets impacting at average speed. In addition, the larger impact structures Tyre, Callanish, and Manan n (produced by bolides of about 1-2 km diameter, based on equations in

Zahnle et al. have all been interpreted to represent partial breaching of the ice crust and leakage of fluid material from below. If 1-2 km diameter bolides split the crust, and 2 km is only the median diameter for impactors at Jupiter, larger bolides must produce full crustal penetration. Many chaos areas (equidimensional and sharply-bounded) may be a hitherto unrecognised record of full-crustal penetration by bolides.
Author
Chaos; Comets; Europa; Impactors; Crusts

20050167143 University of Southern Illinois, Carbondale, IL, USA
Albedo Study of the Depositional Fans Associated with Martian Gullies
Craig, Jonathan; Sears, Derek; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The discovery of geologic features resembling terrestrial water-carved gullies reported by Malin and Edgett in Science has sparked considerable debate among the scientific community. Numerous proposals have been submitted to explain what appears to be evidence of flowing liquid erosional features (gullies) on the surface of Mars in its recent past. Mellon and Phillips reported on two possible mechanisms for the origin of liquid water on the surface of Mars in relation to these gully landforms. Using orbital climate changes for both mechanisms they investigated melting of near surface ground ice and melting of subsurface ice by geothermal energy. In both mechanisms reference to dissolved salts in the ice table are included as a possible factor in freezing point depression to a value low enough for liquid water to occur on or just below the surface of Mars. It is reported by Mellon and Phillips that a 15-40% by weight of dissolved salts in a frozen aquifer is required to accomplish this effect. Using Mars Orbital Camera images provided by Malin Space Science Systems, Mellon and Phillips have ruled out this possibility, citing lack of albedo evidence.
Author
Albedo; Water; Structural Properties (Geology); Liquid Surfaces; Mars Surface

20050167144 Hampshire Coll., Amherst, MA, USA
Evidence for Extensive Fluvial Erosion Around Olympus Mons: A Multi-Resolution Survey
Cull, S. C.; McGovern, Patrick J.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Olympus Mons on Mars has been well studied in terms of tectonic and volcanic evolution; however, few studies have focused on fluvial features around Olympus Mons and their relationship to the tectonic evolution of the volcano. Previous studies have examined the small-scale relationship between tectonic and fluvial features around Olympus Mons, small-scale fluvial features in and around the aureoles, the relationship between volcanics and the cryosphere, and the proposed rock glacier deposits on the western flank of the volcano. This study surveys the aureole lobes and regions surrounding Olympus Mons for signs of large- and small-scale fluvial activity.
Derived from text
Mars Volcanoes; Ice Environments; Tectonics

20050167145 Geological Survey, Flagstaff, AZ, USA
Thermal Inertia of the Arsia Mons Caldera: A Site for Nightly CO2 Condensation
Cushing, G.; Titus, T.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Arsia Mons, the southernmost of three massive shield volcanoes in the Tharsis region, is a type of shield volcano distinct from most others with steep inner-margins, a broad flat caldera, and concentric ring-like graben and fractures. By either morphological or topographical comparison, Arsia Mons has no direct counterpart on Earth. The caldera of Arsia Mons has one of the most extreme environments on Mars. At an elevation of 16.5 kilometers, the temperature varies by a factor of nearly two every day, and CO2 frost is observed to form on the floor every night while not forming on the walls or rim. This suggests that the material on the floor has a lower thermal inertia, which, in turn, suggests that there are processes in the caldera that effectively sort aeolian material such as sand and dust. This theory is supported by the presence of dust devil tracks, whose formation is crucially dependent on grain-size distribution and sorting of surface material.
Derived from text
Calderas; Carbon Dioxide; Geological Faults; Mars Surface; Mars Volcanoes; Thermal Emission; Volcanoes

20050167146 Brown Univ., Providence, RI, USA

ALH77005: The Magmatic History from Rehomogenized Melt Inclusions

Calvin, C.; Rutherford, M.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Melt inclusions in rocks such as the SNC meteorites contain a record of the rock s magmatic history because they preserve melt that was present during phenocryst growth. After entrapment, a melt inclusion can be modified by processes such as reaction with the host crystal and diffusion through the host [1]. We have studied two thin sections of, and rehomogenized melt inclusions from 7 chips of ALH77005 to better understand the magmatic history of the meteorite. We have attempted to address the following questions: 1) What was the composition of the early magmas that formed ALH77005? 2) How does these magmas compare to other SNC meteorites? 3) What is the origin of the differences in composition between melt inclusions in ALH77005? Experiments: Experiments were performed in argon- pressurized, TZM pressure vessels. Samples were surrounded with graphite, which reacts with ferric iron to fix the oxidation state of the experiment. The graphite also prevents sample tube reaction (Fe-loss to Pt tubing). The tubes were brought to either 0.8 or 1.0 kbar. The temperature of the samples was then raised to 1150, 1160, 1165, and 1185 C. Samples were run for durations ranging from 3 to 72 hours. After a rapid quench, polished sections were made for analysis by electron microprobe.

Derived from text

Inclusions; Magma; Meteorites; Pressure Vessels; Entrapment; Diffusion

20050167147 NASA Ames Research Center, Moffett Field, CA, USA

Vassili Ivanovich Moroz: An Appreciation

Cruikshank, D. P.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The 2005 LPSC special session, OMEGA At Mars, is dedicated to the work and memory of V. I. Moroz, in recognition of his pioneering studies in the characterization of planetary bodies with remotely sensed data, and his special interest in, and contributions to, the study of Mars.

Author

Planets; Remote Sensing; Mars Atmosphere; Mars

20050167148 NASA Ames Research Center, Moffett Field, CA, USA

Searching for Life with Rovers: Exploration Methods & Science Results from the 2004 Field Campaign of the 'Life in the Atacama' Project and Applications to Future Mars Missions

Cabrol, N. A.a; Wettergreen, D. S.; Whittaker, R.; Grin, E. A.; Moersch, J.; Diaz, G. Chong; Cockell, C.; Coppin, P.; Dohm, J. M.; Fisher, G., et al.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124

Contract(s)/Grant(s): NAG5-12890; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Life In The Atacama (LITA) project develops and field tests a long-range, solarpowered, automated rover platform (Zo) and a science payload assembled to search for microbial life in the Atacama desert. Life is barely detectable over most of the driest desert on Earth. Its unique geological, climatic, and biological evolution have created a unique training site for designing and testing exploration strategies and life detection methods for the robotic search for life on Mars.

Derived from text

Mars Missions; Extraterrestrial Life; Biological Evolution; Geology; Fossils; Field Tests

20050167149 Hawaii Univ., Honolulu, HI, USA

Analysis of the Lunar Surface with Global Mineral and Mg-Number Maps

Cahill, J. T.; Lucey, P. G.; Steutel, D.; Gillis, J. J.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mg-number (Mg#=atomic Mg/(Mg+Fe)) serves as an important petrologic discriminator when analyzing and understanding lunar rocks and crustal evolutionary models. Here we present a new data set of Mg# for the lunar surface that can be used to evaluate crustal materials and modeling in greater spatial and geochemical detail. The general paradigm for lunar evolution involves formation of a compositionally homogeneous global magma ocean (MO), followed by flotation of

cumulate plagioclase crystals that accumulated to form the ferroan anorthositic (FAN) crust between 4.5 to 4.3 Ga [1-3]. After crustal formation, a second stage of magma intrusion and crystallization by Mg-suite rocks occurred during the period of 4.4 to 3.9 Ga [4-6]. However, recent studies of lunar rocks and meteorites suggest that the evolution of the lunar crust may have been more complex than the model briefly described above [7-9]. Studies by [10] and [11] now suggest the possibility of an MO that did not create FAN rocks first. Instead, these authors purpose a MO that crystallized before FAN formation. This was then followed by instability in an early mafic cumulate crust, which led to the overturn and eventual rise of FAN rocks via diapirism.
Derived from text
Magma; Lunar Surface; Lunar Crust; Mineralogy; Geochemistry; Lunar Rocks

20050167150 Smithsonian Institution, Washington, DC, USA
New 70-cm Radar Mapping of the Moon
Campbell, B. A.; Campbell, D. B.; Chandler, J.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We are using the Arecibo and Greenbank radio telescopes to collect a new 70-cm wavelength radar map of the entire lunar nearside. These data have a spatial resolution as fine as 450 x 320 m near the limbs, and approx.900 m for areas at 30deg incidence. A patch-focusing method is used to preserve the best possible resolution across the illuminated area. Each region is mapped in both senses of reflected circular polarization, and the complex-valued data permit determination of the linear-polarized component of the echo. These data represent the highest-resolution synoptic radar coverage of the Moon, and have applications to a variety of geologic and cartographic problems. ephemeris data are updated for each minute, so we create a polynomial fit for the variation of the Moon s spin state as a function of time.
Derived from text
Radar Maps; Moon; Spatial Resolution; Circular Polarization; Illuminating; Radio Telescopes

20050167151 Smithsonian Institution, Washington, DC, USA
Cryptomare Deposits Revealed by 70-cm Radar
Campbell, B. A.; Hawke, B. R.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Cryptomare deposits represent ancient basalts that have been subsequently buried by and (to some degree) incorporated into highlanddominated basin or crater ejecta. Past work has identified cryptomaria on the basis of iron and titanium signatures within highland terrain, and by the presence of craters with optically dark haloes formed by mafic material excavated from depth. We present new 70-cm wavelength radar data that penetrate to depths of 10 s of m to reveal a large expanse of cryptomaria between Orientale and Oceanus Procellarum.
Derived from text
Craters; Deposits; Highlands; Signatures; Ejecta

20050167153 Smithsonian Institution, Washington, DC, USA
Physical Properties of Volcanic Deposits on Venus from Radar Polarimetry
Carter, Lynn M.; Campbell, Donald B.; Campbell, Bruce A.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Studies of the morphology and radar properties of volcanic deposits can aid in understanding their differences and formation. On Venus, volcanoes range in size from large highland edifices, such as Theia Mons, to small shields and domes which are often found in groups of tens to hundreds. In plains regions, windstreaks are sometimes found near shield fields, suggesting that there may be fine grained deposits associated with the volcanoes. Previous studies of Bell Regio suggest the presence of fine-grained material in a low dielectric constant triangular shaped region on the flank of Tepev Mons, which may be crater ejecta or a pyroclastic deposit spread westward by wind. The eastern caldera on Tepev Mons shows a steep trend in backscattered power with incidence angle and has high RMS-slopes, implying a finegrained covering such as ash. Radar waves can easily penetrate smooth mantling layers such as ash and aeolian deposits. If a radar system can measure two orthogonal polarizations, it is possible to detect subsurface scattering and infer the presence of surficial deposits. The Magellan spacecraft could only measure one polarization and was therefore not able to fully characterize the polarization state of the

radar echoes. We compare Arecibo dual-polarization data for Venus to Magellan images and emissivity data to investigate the physical properties of volcanic deposits.
Author
Physical Properties; Volcanoes; Deposits; Venus (Planet); Radar Echoes; Polarimetry

20050167155 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Expected Constraints on Rhea's Interior from Cassini
Castillo, J. C.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We model the interior of Rhea based on observational constraints and the results from geodynamical models available in the literature. Ten main types of models are defined, depending on the presence or absence of a high-pressure ice layer (ice II), and the extent of separation of the rock component from the volatiles. We present degree-two gravity components computed for each of these models in order to assess which properties of the interior are likely to be inferred from Cassini radio science measurements scheduled on November 26, 2005.
Author
Satellite Tracking; Icy Satellites; Geodynamics

20050167157 Universidad Complutense, Madrid, Spain
Earth and Mars, Similar Features and Parallel Lives? Didactic Activities
Castilla, G.; dePablo, M. A.; Lopez, C.; Martin, L.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Here we present three didactic activities that allow a general view of the planet Mars compared with Earth. Each of these didactic activities are focused on one of these goals: geological history, geological processes and geomorphologic features, and finally the size of the reliefs. That three activities that we carry out with students of secondary education and public of different ages are easy to develop and allow, through an easy way, to have a general view of the geology, history, geography and geomorphology of Mars compared with Earth. How similar or different were the histories of theses planets? The actual different between Mars and Earth could have their origin into their different geological histories?... These and other questions could be anwered with the next didactic activities.
Author
Geography; Geology; Geomorphology

20050167158 Arizona Univ., Tucson, AZ, USA
Effect of Ground Ice on Apparent Thermal Inertia on Mars
Chamberlain, M. A.; Boynton, W. V.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The most recent thermal inertia maps of Mars have been produced with data from the Thermal Emission Spectrometer (TES) onboard the Mars Global Surveyor (MGS) [1]. Thermal models developed by [2-4] are used to convert surface temperatures observed by spacecraft to the thermal inertia of the ground. These models assume uniform thermal properties with depth. A multi-dimensional look-up table generated by the thermal model is used to match observed nighttime temperatures to thermal inertia. Latitude, season, time of day, dust opacity, surface pressure and albedo are other dimensions of the lookup table. Thermal inertia values in recent TES maps in northern polar regions are variable between adjacent orbit tracks; this has been attributed to variable atmospheric conditions and observations taken near local dawn [1]. Also, thermal inertia values in the north from [1] are substantially higher than values by [5] particularly around 75deg N.
Derived from text
Ice; Thermal Emission; Surface Temperature; Mars Surface; Thermodynamic Properties; Temperature Distribution

20050167160 Utah Univ., Salt Lake City, UT, USA
Utah Marbles and Mars Blueberries: Comparative Terrestrial Analogs for Hematite Concretions on Mars
Chan, Marjorie A.; Beitler, Brenda; Parry, W. T.; Ormoe, Jens; Komatsu, Goro; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Images of in situ and loose accumulations of abundant, hematite-rich spherical 'blueberries' from the Mars Exploration Rover Opportunity landing site at Meridiani Planum [1] bear a striking resemblance to diagenetic iron oxidecemented 'marbles' that are common in southern Utah [2]. The Jurassic Navajo Sandstone in Utah contains a great variety of well-exposed iron oxide concretionary forms that are the result of geochemical redox fronts from groundwater mixing [2-6]. This terrestrial model of diagenetic groundwater flow for the production of iron oxide concretions has important implications for understanding analogous hematite concretions on Mars [2,3]. Although host rock compositions, iron sources, and mobilization mechanisms may differ between Utah and Mars, the process for concretion formation is analogous. The morphology, character and distribution of Navajo hematite concretions (Fig. 1) allow us to infer host-rock properties, and subsurface fluid processes necessary for similar features to develop on Mars. Fe2O3 comprises ~30% in wholerock analysis in both the Utah and the Mars concretions [2,7].
Derived from text
Hematite; Sandstones; Mars Surface; Iron Oxides; Sediments

20050167161 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Palladium Isotopic Composition in Iron Meteorites
Chen, J. H.; Papanastassiou, D. A.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations
Contract(s)/Grant(s): RTOP 344-31-55-01; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ru, Mo and Pd are very useful indicators for the identification of nucleosynthetic components. We have developed techniques for Pd isotopes, in an effort to check the extent of isotopic effects in this mass region and for a Pt-group element which is less refractory than Ru. Stable Pd isotopes are produced by the process only (102Pd), the s-process only (104Pd), the process only (Pd-110) and by both the r- and s-processes (Pd-105, Pd-106, Pd-108). Kelly and Wasserburg reported a hint of a shift in 102Pd (approx. 25(epsilon)u; 1(epsilon)u (triple bonds) 0.01%) in Santa Clara. Earlier searches for Mo and Ru isotopic anomalies were either positive or negative.
Derived from text
Palladium Isotopes; Iron Meteorites; Molybdenum; Ruthenium

20050167163 Aix-Marseilles Univ., France
Experimental Evidence of Martian Weathering
Chevier, V.; Mathe, P.-E.; Rochette, P.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The origin of iron bearing phases in the Martian regolith is classically interpreted as the heritage of titanomagnetite present in the primary magmatic rocks as well as neoformed Fe3+ phases (maghemite and hematite). However, on one hand, recent mass balance studies estimate that up to 10-30% in mass of the regolith matter could be of meteoritic origin, as meteorite and IDP usually contains 10- 20% of iron rich phases (sulfides and metal) compared to 1-2% in Martian rocks. Sulfides may also be more common in primary Martian rocks than on Earth. On the other hand, weathering may play a key role in the neoformed oxide production. Nevertheless, the fundamentally different nature of Earth and Mars atmospheres (replacement of O2 by CO2 and presence of peroxides) may induce strong variations in terms of oxidation processes. Therefore several possible primary iron minerals have been experimentally weathered, including pure metallic iron, magnetite, as well as hexagonal and monoclinic pyrrhotites, in various atmospheres.
Author
Mars Atmosphere; Iron; Regolith; Mass Distribution; Meteorites

20050167164 European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands
The Mars Express Mission: Summary of Scientific Results from Orbit
Chicarro, A. F.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The ESA Mars Express mission was successfully launched on 02 June 2003 from Baikonur, Kazakhstan, onboard a Russian Soyuz rocket with a Fregat upper stage. The mission comprises an orbiter spacecraft, which has been placed in a polar martian orbit, and the small Beagle-2 lander, due to land in Isidis Planitia but whose fate remains unknown. In addition to global studies of the surface, subsurface and atmosphere of Mars, with an unprecedented spatial and spectral resolution, the

unifying theme of the mission is the search for water in its various states everywhere on the planet. Following the Mars Express spacecraft commissioning in January 2004, most experiments onboard began their own calibration and testing phase already acquiring scientific data. This phase will last until June when all the instruments will start their routine operations. The MARSIS radar antennas, however, will only be deployed in early May in order to maximize daylight operations of the other instruments before the pericentre natural drift to the Southern latitudes, which coincides with nightime conditions required for subsurface sounding. Initial science results are summarized below.
Derived from text
Mars Express; Mars Surface; Spatial Resolution; Spectral Resolution

20050167165 Centre National de la Recherche Scientifique, Aix-en-Provence, France
Sulfide Mineralogy, Redox Conditions and Alteration Effects in Some SNC Meteorites
Chevrier, V.; Lorand, J. P.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Cu-Fe-Ni sulfides are minor although important minerals of igneous rocks. Since non-stoechiometry in pyrrhotites is caused by incorporation of trivalent iron that generate vacancies, pyrrhotite is a reliable indicator of redox conditions. Pyrrhotite is also able to carry rock magnetic susceptibility. Magmatic sulfides control the whole-rock budget of a large panel of chalcophile and siderophile elements, while carrying clues to understand sulfur cycling, thanks to sulfur isotope systematics. Upon hydrothermal alteration and weathering, magmatic sulfides can liberate oxidized sulfur as sulfuric acid that may trigger alteration of surrounding silicates. Despite their bearing on magnetic susceptibility of Martian SNC meteorites and the various attempts to ascribe the sulfur enrichment of the Martian regolith (up to 8% SO3) to weathering of primary sulfur-rich basaltic rocks, there are comparatively little information on magmatic sulfide mineralogy. Therefore the purpose of this study is to determine sulfide assemblages, compositions and origin in various SNC meteorites, including shergottites, the most represented group among the SNC's, nakhlites and Chassigny.
Author
Sulfuric Acid; Mineralogy; Iron; Copper; Nickel; Mars Surface; SNC Meteorites

20050167166 Sternberg Astronomical Inst., Moscow, USSR
General Structure of the Lunar South Pole: Aitken Basin and Possible Genesis of It
Chikmachev, V. I.; Pugacheva, S. G.; Shevchenko, V. V.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The nature and origin of the enormous pre-Nectarian South Pole - Aitken (SPA) basin remain the most important problems in the current lunar studies. The basin represents a geophysically, compositionally, and topographically unique lunar formation. The studying SPA is significant for principal reasons concerning earliest epoch of the bombardment rate of the Moon and possible investigations of the very deep lunar interior. Recently the SPA basin has been proposed as a high-priority target for future robotic sample return mission.
Author
Moon; Sample Return Missions; Poles

20050167167 Hawaii Univ., Honolulu, HI, USA
Fine-grained Rims of Y-791198 are Texturally, Mineralogically and Compositionally Similar to GEMS-type IDPs
Chizmadia, L. J.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Carbonaceous chondrites are complex mixtures of components which have lead to decades of puzzlement and fascination. These components reveal numerous processes including condensation, melting and evaporation, parent-body and nebular alteration, fluid-mediated and thermal metamorphism. The fine-grained materials are especially sensitive to many of these processes because of their high surface area to volume ratios and disequilibrium assemblage of phases. Fine-grained materials (interchondrule matrix and fine-grained rims) comprise 20 to 50 vol% of carbonaceous chondrites this is where the organic molecules and pre-solar grains are found. Silicate dust is a major component of interstellar dust and the extent to which this

materials survived processing in the solar nebula is unknown. Until recently, many researchers have assumed
Derived from text
Rims; Fine Structure; Grain Size; Carbonaceous Chondrites

20050167169 Colorado Univ., Boulder, CO, USA
Surficial Properties of Landslide Units in Ophir Chasma, Mars, from Remote-sensing Data
Chojnacki, M.; Jakosky, B. M.; Hynek, B. M.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We mapped the surface layers of the Ophir Chasma region of Valles Marineris using observations made by the Mars Global Surveyor s Thermal Emission Spectrometer (TES) and the Mars Odyssey s Thermal Emission Imaging System (THEMIS). Our goal is to understand the surface physical characteristics and how they relate to the geology. TES and THEMIS measure the thermal inertia or the thermophysical character as derived from its thermal signature (decimeter scale), allowing us to infer surface physical processes. TES observations indicate that Ophir Chasma possesses some of the most diverse thermal properties on Mars. The extreme high and low values in thermal inertia occur within 100 km of each other in Ophir. The thermal maps in conjunction with elevation data, meteorological modeling and high resolution images of Ophir have led to new insights on how thermal inertia relates to the local morphology. We found the landslide units of Ophir s north wall to have a diverse range of characteristics; these are described, and reasons for this are explored herein.
Derived from text
Elevation; Geology; Landslides; Mars Surface; Morphology; Surface Layers; Thermodynamic Properties

20050167170 Arizona State Univ., Tempe, AZ, USA
The Igneous Diversity of Mars: Evidence for Magmatic Evolution Analogous to Earth
Christensen, P. R.; McSween, H. Y., Jr.; Bandfield, J. L.; Ruff, S. W.; Rogers, A. D.; Hamilton, V. E.; Gorelick, N.; Wyatt, M. B.; Jakosky, B. M.; Kieffer, H. H., et al.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Compositional mapping of Mars at 100-m scale from THEMIS has revealed a wide diversity of igneous materials. Volcanic evolution produced compositions from low-silica basalts to high-silica dacite in the Syrtis Major caldera. The existence of dacite demonstrates that highly evolved lavas have been produced, at least locally, by magma evolution through fractional crystallization. Olivine basalts are observed on crater floors and in layers exposed in canyon walls up to 4.5 km beneath the surface. This vertical distribution suggests that olivine-rich lavas were emplaced at various times throughout the formation of the upper crust; their growing inventory suggests that picritic basalts may be relatively common. Quartz-bearing granitoid rocks have been discovered, demonstrating that extreme differentiation has occurred. These observations show that the martian crust, while dominated by basalt, contains a diversity of igneous materials whose range in composition from picritic basalts to granitoids rivals that found on the Earth.
Author
Mars Surface; Planetary Geology; Planetary Mapping; Magma

20050167171 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mineral Composition and Abundance of the Rocks and Soils at Gusev and Meridiani from the Mars Exploration Rover Mini-TES Instruments
Christensen, P. R.; Wyatt, M. B.; Glotch, T. D.; Rogers, A. D.; Anwar, S.; Arvidson, R. E.; Bandfield, J. L.; Blaney, D. L.; Budney, C.; Calvin, W. M.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Miniature Thermal Emission Spectrometer (Mini-TES) has provided remote measurements of mineralogy, thermophysical properties, and atmospheric temperature profile and composition of the outcrops, rocks, spherules, and soils surrounding the Spirit and Opportunity Rovers. The mineralogy of volcanic rocks provides insights into the composition of the source regions and the nature of martian igneous processes. Carbonates, sulfates, evaporites, and oxides provide information on the role of water in the surface evolution. Oxides, such as crystalline hematite, provide insight into aqueous weathering processes, as would the occurrence of clay minerals and other weathering products. Diurnal temperature measurements can be used to determine particle size and search for the effects of sub-surface layering, which in turn provide clues to the origin of surficial materials through rock disintegration, aeolian transport, atmospheric fallout, or induration. In

addition to studying the surface properties, Mini-TES spectra have also been used to determine the temperature profile in the lower boundary layer, providing evidence for convective activity, and have determined the seasonal trends in atmospheric temperature and dust and cloud opacity.
Derived from text
Minerals; Rocks; Soils; Temperature Measurement; Weathering; Wind (Meteorology); Mars Exploration

20050167172 Planetary Science Inst., Tucson, AZ, USA
Martian Debris Aprons: Morphometric Comparisons of the Eastern Hellas and Tempe/Mareotis Populations
Chuang, F. C.; Crown, D. A.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Martian debris aprons are lobate deposits commonly found at the bases of knobs, mesas, escarpments, and crater interior walls in the mid-to-high latitude regions of Mars. These features were first observed in areas of fretted terrain in Mariner 9 and Viking Orbiter images. Debris aprons are part of a suite of features that are considered to be geomorphic indicators of ground ice, and their locations are generally consistent with model predictions of stable near-surface ground ice. Numerous terrestrial analogs have been proposed, including frost creep or gelifluction, piedmont glaciers, rock glaciers, debris covered glaciers, and rock avalanches of icy debris. Currently there is no single formation model that accounts for the size, shape, and surface features of Martian debris aprons. These features are generally interpreted to be young due to the paucity of superposed impact craters, and their potential as large reservoirs of ice in the subsurface makes them attractive sites for future robotic and human exploration on Mars.
Derived from text
Mars Surface; Debris; Mars Volcanoes; Geomorphology; Populations

20050167173 Planetary Science Inst., Tucson, AZ, USA
The Explorer's Guide to Impact Craters
Chuang, F.; Pierazzo, E.; Osinski, G.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations
Contract(s)/Grant(s): NAG5-13429; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Impact cratering is a fundamental geologic process of our solar system. It competes with other processes, such as plate tectonics, volcanism, fluvial, glacial and eolian activity, in shaping the surfaces of planetary bodies. In some cases, like the Moon and Mercury, impact craters are the dominant landform. On other planetary bodies impact craters are being continuously erased by the action of other geological processes, like volcanism on Io, erosion and plate tectonics on the Earth, tectonic and volcanic resurfacing on Venus, or ancient erosion periods on Mars. The study of crater populations is one of the principal tools for understanding the geologic history of a planetary surface. Among the general public, impact cratering has drawn wide attention through its portrayal in several Hollywood movies. Questions that are raised after watching these movies include: How do scientists learn about impact cratering? , and What information do impact craters provide in understanding the evolution of a planetary surface? Fundamental approaches used by scientists to learn about impact cratering include field work at known terrestrial craters, remote sensing studies of craters on various solid surfaces of solar system bodies, and theoretical and laboratory studies using the known physics of impact cratering.
Derived from text
Planetary Craters; Plates (Tectonics); Remote Sensing; Volcanology; Solar System

20050167174 NASA Johnson Space Center, Houston, TX, USA
Large-Scale Experimental Planetary Science Meets Planetary Defense: Deorbiting an Asteroidal Satellite
Cintala, M. J.; Durda, D. D.; Housen, K. R.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Other than remote-sensing and spacecraft-derived data, the only information that exists regarding the physical and chemical properties of asteroids is that inferred through calculations, numerical simulations, extrapolation of experiments, and meteorite studies. Our understanding of the dynamics of accretion of planetesimals, collisional disruption of asteroids, and the macroscopic, shock-induced modification of the surfaces of such small objects is also, for the most part, founded on similar inferences. While considerable strides have been made in improving the state of asteroid science, too many unknowns remain to assert that we understand the parameters necessary for the more practical problem of deflecting an asteroid or asteroid pair

on an Earth-intersecting trajectory. Many of these deficiencies could be reduced or eliminated by intentionally deorbiting an asteroidal satellite and monitoring the resulting collision between it and the primary asteroid, a capability that is well within the limitations of current technology.
Derived from text
Asteroids; Protoplanets; Remote Sensing; Planetary Orbits; Satellite Design

20050167175 Los Alamos National Lab., NM, USA
Experimental Stability and Transformation Kinetics of Magnesium Sulfate Hydrates that may be Present on Mars
Chipera, S. J.; Vaniman, D. T.; Bish, D. L.; Carey, J. W.; Feldman, W. C.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The dominant naturally-occurring members of the MgSO4 (central dot) nH2O series on Earth are epsomite (MgSO4 (central dot) 7H2O), hexahydrite (MgSO4 (central dot) 6H2O), and kieserite (MgSO4 (central dot) H2O). In addition, other magnesium sulfate hydrates (sanderite - 2H2O, starkeyite - 4H2O, pentahydrite - 5H2O) have been identified as efflorescent salts in limited localities in the USA, Chile, and Germany. Significant attention has been given to Mg-sulfate salts on Mars as they are believed to be a widespread cementing agent in martian soils and a possible contributor to near-equatorial H detected by the Odyssey spacecraft. Most studies examine only the possible occurrences of epsomite, hexahydrite, and kieserite at the martian surface, on the assumption that the other MgSO4 hydrates are unstable or metastable. However, other Mg-sulfates do have distinct stability fields. In particular, starkeyite shows a pronounced stability field between hexahydrite and kieserite.
Author
Magnesium Sulfates; Hydrates; Mars Surface; Kinetics

20050167176 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Results and Implications of Mineralogical Models for Chemical Sediments at Meridiani Planum
Clark, B. C.; McLennan, S. M.; Morris, R. V.; Gellert, R.; Jolliff, B.; Knoll, A.; Lowenstein, T. K.; Ming, D. W.; Tosca, N. J.; Christensen, P. R., et al.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Exploration Rover (MER) 'Opportunity' has explored chemically-enriched sedimentary outcrops at Meridiani Planum, Mars. In its first year, three different crater sites - Eagle, Fram and Endurance - have been explored. Nineteen high-interest outcrop rocks were investigated by first grinding a hole to reach the interior (using the Rock Abrasion Tool, RAT), and then conducting APXS (alpha particle x-ray spectrometry) analysis, MB (M ssbauer) analysis, and close up imaging (MI, microscopic imager). Sixteen elements and four Fe-bearing minerals were assayed to good accuracy in each sample, producing 380 compositional data points. The Miniature Thermal Emission Spectrometer (Mini- TES) obtained spectra on outcrop materials which provide direct indication of several mineral classes. Preliminary reports on Eagle crater and three RAT samples have been published. Chemical trends and a derived mineralogical model for all RAT d outcrop samples to date has been developed.
Author
Imaging Techniques; Mars Exploration; Mars Surface; Mineralogy; Thermal Emission; X Ray Spectroscopy

20050167177 Clark (Chuck S.), Atlanta, GA, USA
The Martian Watershed, Geology, Dichotomy and Paleohydrology on Two World Maps with Constant Scale Natural Boundaries
Clark, Chuck S.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

All investigators of Mars global affairs know the difficulty of representing its spherical surface in two dimensions, i. e. on a map. One might say of the Martian research community, busy probing an abundance of data and puzzles, that it is in a state not unlike that in the proverb of the blind wise men, attempting a description of an old elephant, but shy a consensus vision.
Author
Mars Surface; Watersheds

20050167178 NASA Goddard Space Flight Center, Greenbelt, MD, USA

ALI (Autonomous Lunar Investigator): Revolutionary Approach to Exploring the Moon with Addressable Reconfigurable Technology

Clark, P. E.; Curtis, S. A.; Rilee, M. L.; Floyd, S. R.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Addressable Reconfigurable Technology (ART) based structures: Mission Concepts based on Addressable Reconfigurable Technology (ART), originally studied for future ANTS (Autonomous Nanotechnology Swarm) Space Architectures, are now being developed as rovers for nearer term use in lunar and planetary surface exploration. The architecture is based on the reconfigurable tetrahedron as a building block. Tetrahedra are combined to form space-filling networks, shaped for the required function. Basic structural components are highly modular, addressable arrays of robust nodes (tetrahedral apices) from which highly reconfigurable struts (tetrahedral edges), acting as supports or tethers, are efficiently reversibly deployed/stowed, transforming and reshaping the structures as required.

Derived from text

Lunar Surface; Roving Vehicles; Nanotechnology; Autonomy

20050167179 Chicago Univ., Chicago, IL, USA

Disequilibrium Oxygen Chemistry in the Solar Nebula

Clayton, Robert N.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It has been proposed that the anomalous isotopic fractionation of oxygen in chondrules and CAIs is the result of isotopic self-shielding in the photodissociation of carbon monoxide in the solar nebula. Photolysis of CO proceeds by a predissociation mechanism, in which each isotopomer absorbs in narrow energy bands, separated in wavelength due to the mass-dependent differences in vibrational energies. The young Sun was the source of ultraviolet radiation, and the self-shielding effect results from the much smaller depth of penetration of radiation of the wavelength absorbed by the abundant species, C-12(O-16), compared to the depth leading to dissociation of the rare species, C-12(O-17), C-12(O-18), and C-13(O-16). Thus, at depths into the nebula on the order of one magnitude of visual extinction, the production rates of atomic O-17 and O-18 exceed that of O-16 by a factor of about ten, and are approximately equal to one another. Incorporation of the rare-isotope-enriched reactive atoms into condensed phases leads to heavy-isotope enrichment in the products, with constant O-17/O-18 ratio, as seen in chondrules and exchanged phases of CAIs.

Derived from text

Oxygen Isotopes; Chondrule; Carbon Monoxide; Solar Nebula; Photolysis

20050167180 NASA Johnson Space Center, Houston, TX, USA

Ultra-Fast Laser Desorption/Laser Ionization Mass Spectrometry for the Organic Analysis of Stardust Sample Return

Clemett, Simon J.; McKay, David S.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The STARDUST sample return capsule is anticipated to provide 500-1000 cometary particles 15 m in size. These were collected during the 340 km flyby of Comet P/Wild-2 and impacted the aerogel collection medium at a relative velocity of approx. 6.1 /kms. Hypervelocity impact studies suggest that some fraction of the original organic inventory of collected particles ought to remain intact, although there is likely to be a significant amount of devolatilization and disassociation of the lower mass organic fraction.

Derived from text

Comets; Ionization; Lasers; Mass Spectroscopy; Stardust Mission

20050167181 Idaho Univ., Moscow, ID, USA

Possible Fault Control of Hydrogen Ion Concentrations Near Schiaparelli Crater, Mars

Clevy, J. R.; Kattenhorn, S. A.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Epithermal neutron flux maps of the equatorial region near Schiaparelli Crater in Mars eastern hemisphere indicate hydrogen ion concentrations in the shallow subsurface. Published maps of these hydrogen concentrations reveal anomalous

linear concentrations of hydrogen with a northeast to southwest trend. The width and trend of these linear anomalies matches the width and trend of the graben between Scylla Scopulus and Charybdis Scopulus further to the south, west of Hellas Basin. These concentrations are believed to indicate locations of subsurface water ice. As such, the flux maps pinpoint locations where quantities of water may intermittently exist today or where liquid water may have pooled in the past. The possibility of life existing on Mars, either in the distant past or at present, depends on the availability of liquid water.
Author
Hydrogen Ions; Ion Concentration; Mars Surface; Structural Basins

20050167182 Winnipeg Univ., Manitoba, Canada
Diagnostic Absorption Features in Sulfate Reflectance Spectra Across OMEGA Wavelength Range
Cloutis, E. A.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Express Omega instrument has detected sulfate minerals across large parts of the Martian surface [1]. In order to enhance the interpretation of the observational spectra for Omega and CRISM, we have undertaken a systematic spectral-compositional-structural study of a wide range of sulfate minerals. Discrimination of specific sulfates is important for constraining the geological and climatic evolution of Mars because many sulfates form, or are stable, only under restricted conditions.
Derived from text
Sulfates; Mars Surface; Minerals; Climate; Geology

20050167183 NASA Ames Research Center, Moffett Field, CA, USA
Nature of the South Pole on Mars Determined by Topographic Forcing of Atmosphere Dynamics
Colaprete, A.; Barnes, Jeffrey R.; Haberle, Robert M.; Hollingsworth, Jeffery L.; Kieffer, Hugh H.; Titus, Timothy N.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: The observed Springtime (Ls approx. 200) surface albedo in the Martian southern polar region is shown in Figure 1. In general, the hemisphere west of Hellas is marked by relatively high values of surface albedo. In contrast, the hemisphere east of Hellas contains extensive regions of very low surface albedo. One of the brightest features within the western hemisphere is the South Pole Residual Cap (SPRC). The dark region, which dominates the eastern hemisphere, is the 'Cryptic' region[1]. The nature of the SPRC has been the source of considerable debate since its identification as CO2 ice by the Viking spacecraft. Two fundamental questions still exist regarding the SPRC s formation, location and stability. First, why is the SPRC offset from the geographic pole? There are no local topographic features or surface properties that can account for the offset in the SPRC. Second, does the SPRC represent a large or a small reservoir of CO2? If the former, then it could possibly buffer the surface pressure. If the latter, then the SPRC may not survive every year.
Derived from text
Topography; Surface Properties; Polar Regions; Albedo; Mars Surface

20050167187 NASA Johnson Space Center, Houston, TX, USA
Mineralogy, Petrology and Oxygen Fugacity of the LaPaz Icefield Lunar Basaltic Meteorites and the Origin of Evolved Lunar Basalts
Collins, S. J.; Righter, K.; Brandon, A. D.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

LAP 02205 is a 1.2 kg lunar mare basalt meteorite found in the Lap Paz ice field of Antarctica in 2002 [1]. Four similar meteorites were also found within the same region [1] and all five have a combined mass of 1.9 kg (LAP 02224, LAP 02226, LAP 02436 and LAP 03632, hereafter called the LAP meteorites). The LAP meteorites all contain a similar texture, mineral assemblage, and composition. A lunar origin for these samples comes from O isotopic data for LAP 02205 [1], Fe/Mn ratios of pyroxenes [1-5], and the presence of distinct lunar mineralogy such as Fe metal and baddeleyite. The LAP meteorites may represent an area of the Moon, which has never been sampled by Apollo missions, or by other lunar meteorites. The data from this study will be used to compare the LAP meteorites to Apollo mare basalts and lunar basaltic meteorites, and will ultimately help to constrain their origin.
Derived from text
Petrology; Mineralogy; Basalt; Meteorites; Lunar Maria; Mineral Deposits

20050167190 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Tectonic Implications of Mars Crustal Magnetism

Connerney, J. E. P.; Acuna, M. H.; Kleteschka, G.; Ness, N. F.; Mitchell, D. L.; Lin, R. P.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 1 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: The Mars Global Surveyor spacecraft has completed three Mars years in nearly circular polar orbit at a nominal altitude of 400 km. The Mars crust is at least an order of magnitude more intensely magnetized than that of the Earth [1], and intriguing in both its global distribution and geometric properties [2,3,4,5]. We present here a new map of the magnetic field with an order of magnitude increased sensitivity to crustal magnetization. The map is assembled from \g 2 full years of MGS night-side observations. The increased sensitivity and spatial resolution afforded by this new map invites geologic interpretation akin to that here-to-for reserved for aeromagnetic and ship surveys on Earth.

Derived from text

Crusts; Magnetic Properties; Mars Surface; Planetary Geology; Magnetic Fields; Tectonics

20050167191 City Univ. of New York, Brooklyn, NY, USA

Understanding the Cooling Rates Experienced by Type II Porphyritic Chondrules

Connolly, Harold C., Jr.; Jones, Rhian H.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Determining the cooling rates experienced by chondrules is crucial in constraining potential transient heating mechanisms within our solar nebula. The main technique used to define cooling rates is experimental petrology. For over a decade, typical cooling rates of porphyritic chondrules, the most abundant textural type, have been assumed to be in the range 5-1000o/hour [1-5]. Recently, Wasson and co-workers have argued for cooling rates approximately 3000 times faster [6-8]. Here we discuss the petrologic-chemical interpretation of cooling rates experienced by porphyritic chondrules.

Derived from text

Chondrule; Cooling; Meteoritic Composition; Solar Nebula

20050167193 NASA Ames Research Center, Moffett Field, CA, USA

Keto-Acids in Carbonaceous Meteorites

Cooper, G.; Chang, P. M.; Dugas, A.; Byrd, A.; Chang, P. M.; Washington, N.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Murchison and Murray meteorites are the best-characterized carbonaceous meteorites with respect to organic chemistry and are generally used as references for organic compounds in extraterrestrial material. Among the classes of organic compounds found in these meteorites are amino acids, carboxylic acids, hydroxy acids, purines, and pyrimidines. Such compounds, important in contemporary biochemistry, are thought to have been delivered to the early Earth in asteroids and comets and may have played a role in early life and/or the origin of life. Absent among (today's) critically important biological compounds reported in carbonaceous meteorites are keto acids, i.e., pyruvic acid, acetoacetic acid, and higher homologs. These compounds are key intermediates in such critical processes as glycolysis and the citric acid cycle. In this study several individual meteoritic keto acids were identified by gas chromatography-mass spectrometry (GC-MS) (see figure below). All compounds were identified as their trimethylsilyl (TMS), isopropyl ester (ISP), and tert-butyldimethylsilyl (tBDMS) derivatives. In general, the compounds follow the abiotic synthesis pattern of other known meteorite classes of organic compounds [1,2]: a general decrease in abundance with increasing carbon number within a class of compounds and many, if not all, possible isomers present at a given carbon number. The majority of the shown compounds was positively identified by comparison of their mass spectra to commercially available standards or synthesized standards.

Derived from text

Carbonaceous Meteorites; Organic Chemistry; Organic Compounds; Acids

20050167194 European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands

Macroscopic Texture of the Martian Surface: Application of a Filtering Method Using Mars Express HRSC Data

Cord, A.; Martin, P.; Foing, B. H.; Jaumann, R.; Hauber, E.; Hoffman, H.; Neukum, G.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present here a method based on a filtering process to quantify the 'macroscopic texture' of a planetary surface at the scale of a few pixels. We apply it to an impact crater on the Martian surface, using images from the High Resolution Stereo Camera onboard Mars Express.
Author
Mars Surface; Textures; Craters

20050167195 Smithsonian Institution, Washington, DC, USA
The Tishomingo Iron: Relationship to IVB Irons, CR Clan Chondrites, and Angrites and Implications for the Origin of Volatile-depleted Iron Meteorites
Corrigan, C. M.; Rumble, D., III; McCoy, T. J.; Ash, R. D.; McDonough, W. F.; Honesto, J.; Walker, R. J.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Of the approx. 1,000 known iron meteorites, approx. 85% fall into clusters thought to represent individual parent bodies. These are the well-known groups of irons (e.g., IIIAB, IVB). The remaining approx. 15% fall outside these clusters and have been termed 'ungrouped'. The origin of these ungrouped irons is unclear, with possibilities including their formation as impact melts from chondritic bodies, products of extreme fractional crystallization or liquid immiscibility within the main groups, or that they are the only samples of their parent bodies. The last of these is particularly intriguing, since perhaps 40 distinct parent bodies are needed to account for the diversity of ungrouped irons - more than all other meteorites combined. Thus, they may serve as a tremendous resource of untapped information in understanding the diversity of meteorite parent bodies. We have begun a study of ungrouped irons spurred not only by this fact, but by the availability of a population of Antarctic irons with an anomalously high percentage of ungrouped irons and emergence of a suite of techniques for study of irons in the last decade. In this study, we report on our work on the Tishomingo iron and discuss its relationship to group IVB and CR clan chondrites.
Author
Iron Meteorites; Chondrites; Crystallization; Impact Melts

20050167196 California Univ., Los Angeles, CA, USA
Magnesium and Oxygen Isotopic Study of the Wark-Lovering Rim Around a Fluffy Type-A Inclusion from Allende
Cosarinsky, M.; McKeegan, K. D.; Hutcheon, I. D.; Weber, P.; Fallon, S.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The abundance of Al-26 in chondritic materials in principle permits a determination of the relative timing of events that occurred during the early stages of solar system formation. In particular, Ca-Al-rich inclusions (CAIs) from CV chondrites experienced complex histories and many suffered flash thermal events that resulted in the formation of Wark-Lovering rims (WLRs) or sequences of thin layers, each composed of a single mineral phase. The timing of these high temperature processes is important for understanding CAI formation and thermal structures in the nebula, but is relatively poorly constrained by data. High-precision results obtained by ion microprobe on an Efremovka inclusion suggest a time difference of approx. 0.5 My between the formation of the CAI and the WLR. However, the difficulty to obtain high-precision analyses on single phases represents a major challenge because of the relatively large beam size compared to the target phases. A promising approach to obtain both high-precision and high-spatial resolution results is to perform multiple collector analyses on low Al/Mg minerals with the ims 1270 ion microprobe combined with NanoSIMS analyses on high Al/Mg phases in the same objects. The goals of this study are to determine the primary Al-26/Al-27 at the time of CAI formation, and the timing and nature of WLR formation. Additionally, Mg and O isotope mass fractionations among WLR layers and CAI phases will provide further constraints on the processes involved in the evolution of refractory materials in the early solar system and the gaseous reservoirs with which they interacted. Here we report preliminary data on a type-A CAI from Allende.
Derived from text
Magnesium Isotopes; Oxygen; Chondrites; Meteoritic Composition; Planetary Evolution; Time Response

20050167198 Planetary Science Inst., Tucson, AZ, USA
Martian Highland Paterae: Studies of Volcanic and Degradation Histories from High-Resolution Images and Impact Crater Populations
Berman, Daniel C.; Bleamaster, Leslie F., III; Chuang, Frank C.; Hartmann, William K.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A detailed understanding of the chronology of volcanism on Mars is a fundamental goal of planetary exploration that provides critical constraints on surface evolution, magmatic histories of eruptive centers, and the thermal evolution of the lithosphere. New analyses of Martian volcanoes characterize the earliest preserved phase of central-vent volcanism on Mars and contribute to assessments of changes in volcanic style as a function of time, as well as to resurfacing and degradation events that may be related to regional or global geologic evolution. Using MOC and THEMIS images, we are compiling size-frequency distributions of small craters on the Martian highland paterae. As part of this effort, we are examining the variability of small crater populations across geologic units of interest in order to develop a methodology for integrating small crater populations with Viking crater statistics to generate 'full' crater size distributions for craters greater than approx. 10 m in diameter. We use analyses of small-scale surface morphology and comparisons between crater populations on the highland paterae and surrounding units of different ages, types, and settings to determine the nature of crater obliteration and modification processes for the patera surfaces and the Hellas region in general. These studies provide new constraints on the age, duration, internal structure/composition, and erosional history of highland paterae.
Author
Planetary Geology; Mars Surface; Mars Volcanoes; Size Distribution

20050167199 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Styles and Timing of Volatile-driven Activity in the Eastern Hellas Region of Mars
Crown, David A.; Bleamaster, Leslie F., III; Mest, Scott C.; Teneva, Lida T.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Hellas basin, the largest well-preserved impact structure on the Martian surface, is Mars deepest depositional sink and has long been recognized as a source for global dust storms. The basin and surrounding highlands span a wide range in latitude and elevation, exhibit landforms shaped by a diversity of geologic processes, and preserve exposures of Noachian, Hesperian, and Amazonian units. Geologically contemporaneous volcanism and volatile-driven activity in the circum-Hellas highlands provide resources for potential Martian life. Hellas is a geologically significant region for evaluating volatile abundance, distribution and cycling and changes in surface conditions on Mars. Current work integrates geologic studies of the basin floor and east rim using Viking Orbiter, Mars Global Surveyor, and Mars Odyssey datasets to provide a synthesis of the history of volatiles in the region.
Author
Mars Surface; Structural Basins; Surface Properties; Landforms

20050167201 New Mexico Museum of Natural History and Science, Albuquerque, NM, USA
MER Field Observations and Analysis of Vesicles in the Gusev Plains: Significance as Records of Emplacement Environment
Crumpler, L. S.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Estimates of past climate and atmospheric conditions are an important part of Mars Explorer Rover (MER) mission goals. Vesicles and lava structures provide information from which the emplacement mechanism and environment of emplacement of lava flows may be inferred. A variety of primary basaltic lava structures and textures, including variations in vesicularity, were observed in individual clasts and blocks during the extended traverse of Spirit within the basaltic plains of Gusev crater. Analysis of the occurrences, size, and shape distribution of vesicles and lava epistructure provide some preliminary estimates of the volatile content, lava emplacement style, and atmospheric conditions (pressure) at the time that the Gusev basalts were erupted.
Author
Mars Exploration; Meteorology; Climate; Craters; Roving Vehicles

20050167202 Hampshire Coll., Amherst, MA, USA
A Dynamic Digital Map of Mars
Cull, S. C.; Condit, C. D.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A Dynamic Digital Map (DDM) is a fully interactive software program that incorporates maps, images, movies, data,

articles, interviews, animations, and class activities. DDMs are designed to serve many purposes, including teaching tools and data presentation. For more detailed discussion on using DDMs interactively in large geology classes, see [4]. DDMs are designed to run on most computer platforms, including Macintosh OS 9 and OS X, Windows, Linux, and Unix variations. The software can be downloaded for free off the internet at http://ddm.geo.umass.edu. DDMs currently available include DDM New England, DDM Springerville Volcanic Field, DDM Tatara-San Pedro Volcanic Complex in Chile, DDM Moon, DDM Holtwood PA, DDM Davis Mine, and DDM Mars.
Derived from text
Digital Data; Maps; Mars Surface; Volcanoes; Geology

20050167203 NASA Ames Research Center, Moffett Field, CA, USA
Nebula Models of Non-Equilibrium Mineralogy: Wark-Lovering Rims
Cuzzi, J. N.; Petaev, M.; Krot, A. N.; Lunar and Planetary Science XXXVI, Part 3; [2005]; 2 pp.; In English; See also 20050167124; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: The meteorite record contains several examples of minerals that would not persist if allowed to come to equilibrium with a cooling gas of solar composition. This includes all minerals in CAIs and AOAs. Their survival is generally ascribed to physical removal of the object from the gas (isolation into a large parent object, or ejection by a stellar wind), but could also result from outward radial diffusion into cooler regions, which we discuss here. Accretion of CAIs into planetesimals has also been relied on to preserve them against loss into the sun. However, this suggestion faces several objections. Simple outward diffusion in turbulence has recently been modeled in some detail, and can preserve CAIs against loss into the sun [2]. Naturally, outward radial diffusion in turbulence is slower than immediate ejection by a stellar wind, which occurs on an orbital timescale. Here we ask whether these different transport mechanisms can be distinguished by nonequilibrium mineralogy, which provides a sort of clock. Our application here is to one aspect of CAI mineralogy - the Wark-Lovering rims (WLR); even more specifically, to alteration of one layer in the WLR sequence from melilite (Mel) to anorthite (An).
Derived from text
Nebulae; Models; Mineralogy; Meteorites; Equilibrium

20050167736 Lunar and Planetary Inst., Houston, TX, USA
Lunar and Planetary Science XXXVI, Part 6
[2005]; ISSN 1540-7845; In English; Lunar and Planetary Science XXXVI, 14-18 Mar. 2005, Houston, TX, USA; See also 20050167737 - 20050167787
Contract(s)/Grant(s): NCC5-679
Report No.(s): LPI-Contrib-1234-Pt-6; Copyright; Avail: CASI; C01, CD-ROM

Contents include the following: A Model for Multiple Populations of Presolar Diamonds. Characterization of Martian North Polar Geologic Units Using Mars Odyssey THEMIS Data. Effect of Flow on the Internal Structure of the Martian North Polar Layered Deposits. Elemental Abundance Distributions in Basalt Clays and Meteorites: Is It a Biosignature? Early Results on the Saturn System from the Composite Infrared Spectrometer. NanoSIMS D/H Imaging of Isotopically Primitive Interplanetary Dust Particles. Presolar (Circumstellar and Interstellar) Phases in Renazzo: The Effects of Parent Body Processing. Catastrophic Disruption of Hydrated Targets: Implications for the Hydrated Asteroids and for the Production of Interplanetary Dust Particles. Chemical and Mineralogical Analyses of Particles from the Stratospheric Collections Coinciding with the 2002 Leonid Storm and the 2003 Comet Grigg-Skjellerup Trail Passage. An Analysis of the Solvus in the CaS-MnS System. ESA s SMART-1 Mission at the Moon: First Results, Status and Next Steps. Europa Analog Ice-splitting Measurements and Experiments with Ice-Hunveyor on the Frozen Balaton-Lake, Hungary. Chromium on Eros: Further Evidence of Ordinary Chondrite Composition. Dust Devil Tracks on Mars: Observation and Analysis from Orbit and the Surface. Spatial Variation of Methane and Other Trace Gases Detected on Mars: Interpretation with a General Circulation Model. Mars Water Ice and Carbon Dioxide Seasonal Polar Caps: GCM Modeling and Comparison with Mars Express Omega Observations. Component Separation of OMEGA Spectra with ICA. Clathrate Formation in the Near-Surface Environment of Titan. Space Weathering: A Proposed Laboratory Approach to Explaining the Sulfur Depletion on Eros. Sample Collection from Small Airless Bodies: Examination of Temperature Constraints for the TGIP. Sample Collector for the Hera Near-Earth Asteroid Sample Return Mission. A Rugged Miniature Mass-Spectrometer for Measuring Aqueous Geochemistry on Mars. Martian and Lunar Pyroxene Microstructures Studied by Single-Crystal X-Ray Diffraction.
CASI
Asteroid Missions; Atmospheric General Circulation Models; Carbon Dioxide; Chemical Analysis; Mars Surface

20050167737 Smithsonian Institution, Washington, DC, USA

Al-Mg Isotopic Evidence for Separate Nebular and Parent-Body Alteration Events in Two Allende CAIs

Fagan, T. J.; Guan, Y.; MacPherson, G. J.; Huss, G. R.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Calcium-aluminum-rich inclusions (CAIs) from Allende (CV3) are characterized by abundant secondary minerals (grossular, monticellite, wollastonite, plagioclase feldspar, nepheline and sodalite) that formed by partial replacement of mostly melilite. Whether this diverse alteration occurred in one episode, or in multiple events that were separated in time and/or location, has important implications both for early solar system chronology and for whether some or all of the secondary minerals formed during metamorphism on asteroidal parent bodies or during gas-solid reactions in the solar nebula. Here we present preliminary results of a study using the Al-26-Mg-26 decay system to evaluate possible isotopic (age) differences between different secondary minerals in two CAIs from Allende.

Author

Asteroids; Isotopes; Mineralogy; Minerals; Meteorite Parent Bodies; Meteoritic Composition; Petrogenesis; Aluminum 26; Magnesium Alloys

20050167738 Hawaii Univ., Honolulu, HI, USA

Boundary Conditions on the Formation of Ramparts on Fluidized Ejecta Deposits Around Martian Impact Craters

Fagents, S. A.; Baloga, S. M.; Mouginis-Mark, P. J.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Images from the MOC and THEMIS instruments are revealing in unprecedented detail the structure of fluidized ejecta deposits associated with certain martian impact craters. The two most common types have been formally classified by Barlow et al. as single layered ejecta (SLE) and double layered ejecta (DLE) craters, although numerous examples of additional, highly complex, types of fluidized ejecta have now been documented. The formation of the lobate deposits has been attributed to the presence of volatiles (water or ice) within the target material at the time of crater formation, or to atmospheric effects. As such, fluidized ejecta provide a unique diagnostic of target properties and the ambient conditions at the time of impact. The spatial and temporal variations in ejecta characteristics can then be ascribed to target variations (e.g., volatile content), the latitude and elevation of the parent crater, and possible temporal changes in the climate.

Derived from text

Boundary Conditions; Ejecta; Deposits; Mars Craters; Water

20050167742 NASA Ames Research Center, Moffett Field, CA, USA

Spatial Variation of Methane and Other Trace Gases Detected on Mars: Interpretation with a General Circulation Model

Forget, F.; Haberle, B.; Montmessin, F.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Several teams have recently reported the detection of methane in the Martian atmosphere [1-3]. Although the detection is at the limit of the instrument capacities, one of the most surprising findings by some of these teams is the apparent strong spatial variations observed in spite of the fact that a gas like methane was expected to have a relatively long lifetime in the Martian atmosphere and thus be well mixed. To better quantitatively understand how such spatial variations can form on Mars, we have performed multiple realistic 3D general circulation model simulations in which gases with different sources, lifetime or sinks are released and transported in the Martian atmosphere.

Derived from text

Methane; Spatial Distribution; Trace Elements; Atmospheric General Circulation Models; Mars Atmosphere; Atmospheric Composition

20050167743 Carnegie Institution of Washington, Washington, DC, USA

Inclusions Within Chondrule Mineral Grains as Characterized Using Confocal Raman Imaging

Fries, M.; Steele, A.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Rounded, randomly emplaced inclusions within chondrule mineral grains have been characterized by confocal Raman imaging and found to contain mixtures of carbon, metal sulfides, mineral grains, and other components depending on meteorite type. Inclusions were sampled from porphyritic olivine pyroxene and barred olivine chondrules in both the CV3 Allende and from the L3.2 EET 96188. These inclusions tend to be roughly spherical and approximately six to ten micrometers in diameter, and contain widely varying components even in inclusions separated by tens of micrometers or less.
Derived from text
Chondrule; Imaging Techniques; Inclusions; Minerals; Olivine; Pyroxenes

20050167744 Consejo Superior de Investigaciones Cientificas, Madrid, Spain
Evidence for Variable Thickness in Europa's Icy Shell: Implications for Astrobiology Mission Design
Fairen, A. G.; Amils, R.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The exploration of Europa s subsurface ocean is hardly constrained by the presence of an outer ice shell of unknown thickness: a somewhat thin crust would allow easier access to the ocean below. Current estimates for the thickness of Europa s icy surface range from a few km to a few tens of km, the shell overlying a liquid water ocean up to 150 km thick. The surface is believed to be young (mean age of 30-80 Myr) and geologically active, as it is sparsely cratered. Here we report geological evidence indicating that the thickness of Europa s ice crust is actually a complex combination of thicker and thinner areas, highlighting the implications of such structure in the future exploration of the inner ocean.
Author
Europa; Ice; Thickness; Extraterrestrial Oceans; Geology

20050167745 Brown Univ., Providence, RI, USA
New Evidence for Fluvial Sedimentary Deposits on Mars: Deltas Formed in a Crater Lake in the Nili Fossae Region
Fassett, C. I.; Head, J. W., III; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Despite substantial evidence for ancient fluvial erosion on the Martian surface, primarily manifested in the form of valley networks, there have been relatively few observations of unambiguous fluvial sedimentary deposits on Mars. The lack of sediments anticipated at the MER Spirit landing site on the floor of Gusev Crater, and recent work questioning the interpretations of features as lacustrine sediments in a crater in western Memnonia, provides motivation for studying the presence (or lack thereof) of candidate fluvial sedimentary deposits on the Martian surface. Clear evidence for sedimentation associated with at least some valley networks would help to demonstrate that fluvial processes are indeed important on Mars.
Derived from text
Deposits; Sediments; Mars Surface; Craters

20050167749 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Early Results on the Saturn System from the Composite Infrared Spectrometer
Flasar, F. M.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 1 pp.; In English; See also 20050167736; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Composite Infrared Spectrometer (CIRS) is a remote-sensing Fourier Transform Spectrometer on the Cassini orbiter that measures thermal radiation over two decades in wavenumber, from 10 to 1400 /cm (1 mm to 7 microns), with a spectral resolution that can be set from 0.5 to 15.5 /cm. The far infrared portion of the spectrum (10-600 /cm) is measured with a polarizing interferometer having thermopile detectors with a common 4-mrad field of view. The middle infrared portion is measured with a traditional Michelson interferometer having two focal planes (600-1100 /cm, 1100-1400 cm). Each focal plane is composed of a 1x10 array of HgCdTe detectors, each detector having a 0.3-mrad field of view. More complete descriptions of the instrument and investigation are given in and. A brief description of the first results from observations through the Saturn orbital insertion period can be found in.
Author
Saturn; Infrared Spectrometers; Thermal Radiation; Remote Sensing

20050167750 University Coll., London, UK
Clathrate Formation in the Near-Surface Environment of Titan
Fortes, A. Dominic; Stofan, Ellen R.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In terrestrial near-surface environments, alteration of rocks and sediments is mediated by water, producing hydrous minerals: we need not be concerned about water being consumed in this fashion since the Earth has plenty more in the oceans. On Titan, the liquid mediating alteration of the bedrock and regolith may be a mixture of light hydrocarbons - ethane and methane - the alteration product being the well-known inclusion compound known as a clathrate hydrate. Formation of hydrocarbon clathrates may be a concern for understanding the source of Titan's atmospheric methane, since recent Cassini data of Titan appear to indicate that there is not a vast abundance of liquid hydrocarbons (i.e., oceans) at the surface. Here, we briefly consider the formation not only of hydrocarbon clathrates but of air clathrates in the near surface environment of Titan.
Author
Titan; Environmental Chemistry; Bedrock; Regolith

20050167751 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Regional Studies of Highland-Lowland Age Differences Across the Mars Crustal Dichotomy Boundary
Frey, H. V.; DeSoto, G. E.; Lazrus, R. M.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Regional differences in crater retention ages (CRAs) across the Mars dichotomy boundary are compared to the global highland-lowland age difference previously determined from visible and buried impact basins based on MOLA-derived Quasi-Circular Depressions (QCDs). Here Western Arabia (WA) is compared with Ismenius Lacus (IL). We find the buried lowlands in the two regions have total CRAs essentially identical to the global average. Even more intriguing, the WA cratered terrain appears to have a CRA like that of the adjacent buried lowlands,
Derived from text
Mars Surface; Crusts; Dichotomies; Structural Basins; Craters; Highlands; Age Factor

20050167753 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA, Arizona Univ., Tucson, AZ, USA
Dependence of Surface Contrast on Emission Angle in Cassini ISS 938-nm Images of Titan
Fussner, S.; McEwen, A.; Perry, J.; Turtle, E.; Dawson, D.; Porco, C.; West, R.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Titan, the largest of Saturn s moons, is one of the most difficult solid surfaces in the Solar System to study. It is shrouded in a thick atmosphere with fine haze particles extending up to 500 km. [1] The atmosphere itself is rich in methane, which allows clear viewing of the surface only through narrow 'windows' in the methane spectrum. Even in these methane windows, the haze absorbs and scatters light, blurring surface features and reducing the contrast of images. The haze optical depth is high at visible wavelengths, and decreases at longer (infrared) wavelengths. [2]
Derived from text
Image Contrast; Solid Surfaces; Optical Thickness; Infrared Spectra; Haze; Blurring; Methane

20050167755 Maryland Univ., College Park, MD, USA
Sulfur Multiple Isotopes of the Moon: S-33 and S-36 Abundances Relative to Canon Diablo Troilite
Farquhar, J.; Wing, B. A.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 1 pp.; In English; See also 20050167736; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We are measuring sulfur multiple isotope abundances in 10 lunar basalts, a suite of terrestrial igneous rocks, and samples of Canon Diablo Troilite (CDT). Ongoing measurements suggest that the acid volatile sulfur (AVS) in lunar basalts is only slightly enriched in S-34 relative to CDT, confirming earlier results. High-precision sulfur multiple isotope measurements also indicate that lunar AVS falls on a fractionation line defined by the bulk composition of CDT and a slope of 0.515.
Author
Sulfur Isotopes; Troilite; Igneous Rocks; Lunar Composition

20050167757 Space Science Inst., Boulder, CO, USA
Visible/Near Infrared Spectral Characterization of In Situ Rock Outcrops at Meridiani Planum as Observed by the Mars Exploration Rover Opportunity
Farrand, W. H.; Bell, J. F.; Johnson, J. R.; Clark, B. C.; Joliff, B. L.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Over the course of its primary and extended mission, the Mars Exploration Rover Opportunity has examined a serious of light toned outcrop materials exposed in the walls of craters and intermittently on the Meridiani plains. These in situ rock layers record a past epoch of Martian history in which liquid water played a large role on the surface of Mars. Pancam images have been used to help establish an initial stratigraphy and to help in selecting targets for in situ examinations. Multispectral images acquired by Pancam have demonstrated that the layers of Meridiani outcrop are not uniform in their Visible and Near Infrared (VNIR) spectral properties. Indeed, they display color differences that in some instances were used to define marker beds for stratigraphic analysis.
Author
Near Infrared Radiation; Stratigraphy; Mars Surface; Rocks

20050167758 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Mars Atmospheric Chemistry in Electrified Dust Devils and Storms
Farrell, W. M.; Delory, G. T.; Atreya, S. K.; Wong, A.-S.; Renno, N. O.; Sentmann, D. D.; Marshall, J. G.; Cummer, S. A.; Rafkin, S.; Catling, D.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 1 pp.; In English; See also 20050167736; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Laboratory studies, simulations and desert field tests all indicate that aeolian mixing dust can generate electricity via contact electrification or 'triboelectricity'. In convective structures like dust devils or storms, grain stratification (or charge separation) occurs giving rise to an overall electric dipole moment to the aeolian feature, similar in nature to the dipolar electric field generated in terrestrial thunderstorms. Previous simulation studies [1] indicate that this storm electric field on Mars can approach atmospheric breakdown field strength of 20 kV/m. In terrestrial dust devils, coherent dipolar electric fields exceeding 20 kV/m have been measured directly via electric field instrumentation. Given the expected electrostatic fields in Martian dust devils and storms, electrons in the low pressure CO2 gas can be energized via the electric field to values exceeding the electron dissociative attachment energy of both CO2 and H2O, resulting in the formation of new chemical products CO and O- and OH and H- within the storm. Using a collisional plasma physics model we present a calculation of the CO/O- and OH/H- reaction and production rates. We demonstrate that these rates vary geometrically with ambient electric field, with substantial production of dissociative products when fields approach breakdown levels of 20-30 kV/m.
Derived from text
Storms; Mars Atmosphere; Electric Fields; Atmospheric Chemistry; Carbon Dioxide; Polarization (Charge Separation); Dipole Moments

20050167759 Space Science Inst., Boulder, CO, USA
Spectral Class Distinctions Observed in the MPF IMP SuperPan Using a Self Organizing Map
Farrand, W. H.; Merenyi, E.; Murchie, S.; Barnouin-Jha, O.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The recent success of the Mars Exploration Rover (MER) mission prompts a reexamination of data from previous landed missions in order to see if insights gained from MER can be applied to unresolved questions from these earlier missions. The predecessor to MER was the Mars Pathfinder (MPF) mission which landed on the Ares Valles floodplain. The landscapes examined by MPF and by Spirit have intriguing similarities and significant differences. In the investigation described in this paper we have reanalyzed a set of multispectral data, the socalled 'SuperPan' from the MPF Imager for Mars Pathfinder (IMP). We have performed this analysis using state-of-the-art Self-Organizing Map (SOM) Artificial Neural Network (ANN) software. In addition to gaining additional insights into the nature of the MPF landing site from this analysis, we are also using insights gained into the nature of the bright regions at Gusev crater explored by Spirit.
Author
Craters; Flood Plains; Spectra; Topography; Data Processing

20050167763 Arizona State Univ., Tempe, AZ, USA
Seasonal Movement of Material on Dunes in Proctor Crater, Mars: Possible Present-Day Sand Saltation
Fenton, L. K.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Much of the martian surface is covered with dune fields, ventifacts, yardangs, and other aeolian features that require sand saltation to form [e.g., 1]. However, there is little evidence for present day sand saltation. Images of dunes since the Viking

mission and during the Mars Global Surveyor (MGS) mission show no visible dune migration [1,2]. Lander experiments rarely, if ever, measure winds strong enough to saltate sand [3,4]. Yet, MOC NA (Mars Orbiter Camera Narrow Angle) images of sand dunes show sharp, uneroded crests [e.g., 1], suggesting that these dunes may still be active. Investigation of MOC NA images of an intercrater dune field has led to the discovery of possible evidence for dune activity and sand saltation during the MGS mission.
Derived from text
Mars Surface; Planetary Craters; Dunes; Sediment Transport; Wind (Meteorology)

20050167764 Los Alamos National Lab., NM, USA
Topographic Control of Hydrogen Deposits at Mid- to Low Latitudes of Mars
Feldman, W. C.; Prettyman, T. H.; Maurice, S.; Elphic, R.; Funsten, H. O.; Gasnault, O.; Lawrence, D. J.; Murphy, J. R.; Nelli, S.; Tokar, R. L.; Vaniman, D. T.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Global surveys of hydrogen deposits on Mars have revealed three major reservoirs. The two most abundant reservoirs reside at high latitudes, poleward of about +/- 60 deg. Significant reservoirs with minimum abundances between 2% and 10% water-equivalent hydrogen (WEH) reside at mid-to low latitudes. Initial analyses of the lower latitude deposits indicate they are most likely in the form of hydrated minerals although deposits of water ice cannot be ruled out if they are covered by dry layers having sufficiently low permeability to effectively isolate them from the atmosphere. Most low latitude reservoirs are hydrogeologically isolated from those at high latitudes because of their relatively high altitudes and/or deep boundary canyons. Their recharge can therefore not occur by connection to the polar caps through a possible global water table. On the other hand, the actual WEH emplacement mechanism is not known because the locations of low- to mid latitude reservoirs correlate poorly with most commonly known measures of WEH stability in the current Martian environment [e.g., local maxima in WEH occur in regions of both high and low albedo (and hence low and high subsurface temperatures, respectively), and high and low relative humidity]. We present evidence here that the topographic control of weather patterns (orographic effects) could account for the observed WEH distribution at low to middle latitudes.
Author
Hydrogen; Deposits; Mars Surface; Mars Environment; Latitude

20050167765 Arizona State Univ., Tempe, AZ, USA
Thermophysics at the MER Spirit and Opportunity Landing Sites: Perspectives from the Surface and from Orbit
Fergason, R. L.; Christensen, P. R.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The primary science goal for this mission is to search for evidence of standing water, and to assess past environments and their suitability for supporting life [1]. While understanding past environments in Gusev and Meridiani is a priority, an additional science goal of this mission is to identify and understand current processes acting on Mars and how they have shaped the morphology of the surface in its recent history. To help reach this goal, an extensive campaign was developed to systematically measure the thermophysical properties of the landing sites. This involves acquiring Mini-TES emissivity spectra, supporting Pancam imagery, and MI images (when possible) to assess the variability of soils and surface properties during the rover traverses. This work presents an analysis of Mini-TES emissivity measurements acquired at multiple times during the day of a single surface or bedform (allowing to accurately determine the thermal inertia), and information gathered from the associated Pancam and MI imagery. This combined data set allows for 1) characterization of the surface which contributes to understanding the recent processes that have influenced these surfaces, and 2) a comparison of the recent eolian history of two regions on opposite sides of the planet. In addition, the roving capabilities provide a unique opportunity to ground truth orbital data, because the rovers have traversed the distance of multiple THEMIS pixels.
Derived from text
Thermophysical Properties; Surface Properties; Landing Sites; Mars Surface; Planetary Geology; Thermodynamics

20050167766 State Univ. of New York, Stony Brook, NY, USA
An Experimental Crystallization Study of a Proposed High-Fe, Low-Al Martian Parental Liquid at Elevated Pressure
Filiberto, J.; Nekvasil, H.; Lindsley, D. H.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent discoveries have led workers to start to question the assumption that high-Fe, low-Al compositions characterize all Martian magmas. The MER rover Spirit data suggest a much more terrestrial Al/Si ratio and lower Fe contents than previously observed (in the SNC meteorites). MER rover Spirit basaltic rocks, after correction for 25% olivine phenocrysts (Fo70-Fo30) as possible cumulate material, have residual bulk compositions similar to terrestrial tholeiites. Recent work has suggested that liquid parental to the Chassigny meteorite could be similar to terrestrial hawaiite. The experiments upon which this was based showed that at pressures above 4.3 kbar and water contents greater than 0.4 wt% the assemblage olivine, augite, orthopyroxene, kaersutite, (Ti-biotite), apatite, ilmenite, and plagioclase crystallized. This assemblage is consistent with the cumulate and melt inclusion assemblages of Chassigny.
Derived from text
Crystallization; Iron; Aluminum; Magma; Mars (Planet); Basalt

20050167773 Washington Univ., Saint Louis, MO, USA
Presolar (Circumstellar and Interstellar) Phases in Renazzo: The Effects of Parent Body Processing
Floss, C.; Stadermann, F. J.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Like interplanetary dust particles (IDPs), the CR chondrite Renazzo contains abundant isotopic anomalies in both hydrogen and nitrogen, attesting to the primitive nature of this meteorite. Renazzo has been suggested as a promising analog for IDPs because it is the only meteorite known to have D-rich hotspots and, like IDPs, it shows evidence for several distinct D carriers. We have been using the NanoSIMS to carry out isotopic (C, N, O) imaging studies of IDPs and Renazzo matrix in order to compare the nature and distribution of the primitive matter present in these two types of extraterrestrial material. Several unresolved issues remain, including whether the isotopic characteristics of IDPs and primitive meteorites are similar, whether the phases carrying isotopic anomalies are the same in both materials, and what role parent body processing has played. We have reported results for IDPs elsewhere; here we focus on data obtained to date for Renazzo matrix material.
Author
Anomalies; Chondrites; Extraterrestrial Matter; Interplanetary Dust; Isotopes

20050167775 American Museum of Natural History, New York, NY, USA
An Analysis of the Solvus in the CaS-MnS System
Fogel, R. A.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The cubic sulfides oldhamite CaS), niningerite (MgS) and alabandite (MnS) are essential components of the enstatite (E) chondrite and aubrite meteorites. The CaS-MgS-MnS-FeS-Fe system describes the thermodynamic behavior of these minerals in the enstatite meteorites.. The work of describes the behavior of the sulfides in this system between the temperatures (T) of 500oC and 1000oC. For the past 30 years, the interpretation of enstatite meteorite CaS and MnS sulfides has largely been confined to this ground-braking study. Unfortunately, the work of is restricted to the subsolidus region; thus, studies attempting to interpret or model the igneous origin of aubrites and E chondrite components (i.e., chondrules) have had few tools available for interpreting the chemistry of supersolidus cubic sulfides. In an attempt to address this absence of data and to open up new insights on the formation of the E meteorites, a systematic study of low and high temperature regions of the CaS-MgS-MnS-FeS-Fe system has been initiated.
Derived from text
Sulfides; Achondrites; Thermodynamics; Meteoritic Composition; Chondrule

20050167776 European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands
ESA's SMART-1 Mission at the Moon: First Results, Status and Next Steps
Foing, B. H.; Racca, G. D.; Grande, M.; Huovelin, J.; Josset, J.-L.; Keller, H. U.; Nathues, A.; Malkki, A.; Heather, D.; Koschny, D., et al.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

SMART-1 is the first in the programme of ESA s Small Missions for Advanced Research and Technology [1,2,3]. Its first objective has been achieved to demonstrate Solar Electric Primary Propulsion (SEP) for future Cornerstones (such as Bepi-Colombo) and to test new technologies for spacecraft and instruments. The spacecraft has been launched on 27 Sept. 2003, as an Ariane-5 auxiliary passenger and injected in GTO Geostationary Tranfer Orbit. Thanks to the successful electric

propulsion navigation, the spacecraft has left the inner radiation belts in early 2004, and reached lunar capture on 17 November 2004. We shall report at LPSC2005 on the first commissioning and results from the spacecraft and the instruments. The SMART-1 mission has spiraled down to reach a lunar orbit 300-3000 km for a nominal science period of six months, with possible extension. The spacecraft is carrying out a complete programme of scientific observations. Some first data and results obtained during the cruise, and during the lunar approach and commissioning will be presented at LPSC.
Derived from text
Space Missions; Solar Electric Propulsion; Spacecraft Instruments; Geosynchronous Orbits; Lunar Surface

20050167777 Arizona State Univ., Tempe, AZ, USA
Dust Devil Tracks on Mars: Observation and Analysis from Orbit and the Surface
Foley, D. J.; Whelley, P. L.; Greeley, R.; Neakrase, L. D. V.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Dust devils result from active processes on Mars that redistribute particles, changing the surface and atmosphere. Dust devils commonly develop where strong heating of the surface forms a layer of super heated air just above the ground. Long narrow dark streaks seen on Viking Orbiter images of Mars were suggested to be the tracks from vortical atmospheric activity. This was confirmed by orbital observations of active vortices leaving the tracks, and these albedo features are now generally recognized to be tracks from the passage of dust devils. The Mars Exploration Rover Spirit landed in Gusev Crater on January 3, 2004, in an area where dust devil tracks are common. Spirit traversed a recently formed dust devil track. The objective of this study was to observe a dust devil track seen from orbit and analyze the track on the ground with Spirit data.
Author
Dust; Mars Exploration; Planetary Geology; Craters; Mars Surface

20050167778 Centre National de la Recherche Scientifique, Orsay, France
Component Separation of OMEGA Spectra with ICA
Forni, O.; Pulet, F.; Bibring, J.-P.; Erard, S.; Gomez, C.; Langevin, Y.; Gondet, B.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Reflectance hyperspectral observations in the visible and near-infrared domain are very powerful to infer the composition of the surface and/or atmosphere of planetary bodies. The OMEGA spectra on board Mars Express consist of 352 spectral channel ranging form 0.3 to 5.1 micron with a spatial resolution ranging from 300 m to 4.8 km. One goal in the analysis of such data is to identify zones that are spectrally different from each other and to determine their composition. Statistical method like Minimum Noise Fraction (MNF) combined with Pixel Purity Index (PPI) have proved to be very efficient to identify mineralogical endmembers in spectra. The OMEGA dataset is very large (several tens millions of spectra acquired so far) so that the use of classical methods (spectral ratio, MNF combined with PPI) of identification is limited and not efficient in some cases. Here we will present the results obtained by another purely statistical method based on the determination of independent sources mixed linearly, namely the Independent Component Analysis (ICA) method. In this work, we have restricted our analysis to the SWIR-C detector that ranges from 0.96 to 2.55 micron.
Author
Mars Express; Mineralogy; Spectra; Statistical Analysis

20050167779 NASA Ames Research Center, Moffett Field, CA, USA
Mars Water Ice and Carbon Dioxide Seasonal Polar Caps: GCM Modeling and Comparison with Mars Express Omega Observations
Forget, F.; Levrard, B.; Montmessin, F.; Schmitt, B.; Doute, S.; Langevin, Y.; Bibring, J. P.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

To better understand the behavior of the Mars CO2 ice seasonal polar caps, and in particular interpret the the Mars Express Omega observations of the recession of the northern seasonal cap, we present some simulations of the Martian Climate/CO2 cycle/ water cycle as modeled by the Laboratoire de Meteorologie Dynamique (LMD) global climate model.
Author
Mars Atmosphere; Water; Ice; Carbon Dioxide; Climate Models

20050167780 Arkansas Univ., Fayetteville, AR, USA

Sample Collection from Small Airless Bodies: Examination of Temperature Constraints for the TGIP Sample Collector for the Hera Near-Earth Asteroid Sample Return Mission

Franzen, M. A.; Roe, L. A.; Buffington, J. A.; Sears, D. W. G.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There have been a number of missions that have explored the solar system with cameras and other instruments but profound questions remain that can only be addressed through the analysis of returned samples. However, due to lack of appropriate technology, high cost, and high risk, sample return has only recently become a feasible part of robotic solar system exploration. One specific objective of the President s new vision is that robotic exploration of the solar system should enhance human exploration as it discovers and understands the the solar system, and searches for life and resources [1]. Missions to small bodies, asteroids and comets, will partially fill the huge technological void between missions to the Moon and missions to Mars. However, such missions must be low cost and inherently simple, so they can be applied routinely to many missions. Sample return from asteroids, comets, Mars, and Jupiter s moons will be an important and natural part of the human exploration of space effort. Here we describe the collector designed for the Hera Near-Earth Asteroid Sample Return Mission. We have built a small prototype for preliminary evaluation, but expect the final collector to gather approx.100 g of sample of dust grains to centimeter sized clasts on each application to the surface of the asteroid.

Derived from text

Asteroid Missions; Asteroids; Robotics; Sample Return Missions

20050167781 Arkansas Univ., Fayetteville, AR, USA

Space Weathering: A Proposed Laboratory Approach to Explaining the Sulfur Depletion on Eros

Franzen, M. A.; Kracher, A.; Sears, D. W. G.; Cassidy, W.; Hapke, B.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Space weathering is the cumulative effect of physical and chemical changes that occur to substances exposed on the exterior of body void of an atmosphere [1], in this case the regolith on asteroid Eros. It is only recently that the scientific community has accepted the theory first developed in the mid- 1970s by Hapke and his colleagues of how space weathering occurs. The theory [1] asserts that optical and magnetic effects, first studied on moon rocks and lunar regolith, are caused by submicroscopic metallic iron (SMFe), smaller than the wavelength of light in vapor deposit coatings, on regolith grains, and in agglutinates. This vapor is generated by solar wind and micrometeorite impacts and does not require additional heating, melting, or a reducing environment to produce space weathering. One of the major finds of the first detailed reconnaissance of an asteroid by the NEAR Shoemaker mission was that the surface of Eros was essentially chondritic yet showed major depletions in sulfur [2, 3]. Here we propose space weathering sputtering experiments that may contribute to the explanation of sulfur depletion on asteroid Eros.

Derived from text

Space Weathering; Regolith; Asteroids; Magnetic Effects; Optical Properties; Agglutination; Vapor Deposition

20050167782 Hawaii Univ., Honolulu, HI, USA

A Rugged Miniature Mass-Spectrometer for Measuring Aqueous Geochemistry on Mars

French, L. C.; Anderson, F. S.; McMurtry, G.; Pilger, E.; Stopar, J.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We are developing a miniature, shock-hardened rotating field mass spectrometer (RFMS) for high precision measurements of aqueous geochemistry on Mars under MIDP funding. The design is based on a mass spectrometer system currently being used in-situ in deep ocean applications [1] and in the defense industry. The strengths of this instrument include: the ability to sample liquids, small dimensions, low power requirements, low mass, no precision machining is required, and it is tolerant of moderate vacuum. The discovery of extensive near-surface deposits of ice in the northern lowlands of Mars [2,3] immediately raises the question of the nature and origin of these deposits. This new discovery of extant water raises the possibility of in situ studies of evaporite deposits in the process of formation, with water (almost certainly in the form of ice) within the reach of rover arms, shallow drills, or moles. An important question regarding the northern lowlands water ice deposits is their origin: are they the remains of a relic ocean, derived from discharge from the highlands into the lowlands? Or are they atmospheric condensates with only limited opportunity to leach ions from solids in contact? A potential means of distinguishing between these hypotheses is the nature and content of dissolved ions in the water. For example, the distribution

coefficients of many ions are surprisingly large, e.g. on the order of 0.1 to 0.3 for only modest salinities [4,5]. Thus a frozen ocean or groundwater deposit, with extensive opportunity to leach ions from susceptible silicates when in the liquid form, will certainly have a much higher content of dissolved ions than a condensate, as well as likely showing a distinctive isotopic signature having been at least partly shielded from extensive atmospheric isotopic processing.
Derived from text
Geochemistry; Mass Spectrometers; Mars Surface; Miniaturization; Mineral Deposits

20050167783 Ludwig-Maximilians-Univ., Munich, Germany
Martian and Lunar Pyroxene Microstructures Studied by Single-Crystal X-Ray Diffraction
Frey, F.; Weidner, E.; Burghammer, M.; Paulmann, C.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations
Contract(s)/Grant(s): DFG-WE-2912; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: Microstructures of extraterrestrial pyroxenes may bear information about prior thermal history, shock history, if any, and radiation damage. Related X-ray diffraction (XRD) studies are complementary to transmission electron microscopy (TEM) studies: (i) a quantitative evaluation of Bragg intensities allows for an atomic structure analysis in particular a determination of cation distributions; (ii) XRD reveals 'global' microstructures due to long-range coherency effects in contrast to local defect structures observable by TEM; (iii) simultaneously recorded Bragg- and diffuse data provide information of both the average structure and the microstructure in one and the same specimen. Pyroxene single crystals from mars meteorite NWA 856 were studied under both aspects. Here we concentrate on the microstructural features. For comparison lunar pyroxenes were also investigated. Main diffuse diffraction phenomena are expected to be due to exsolution and super-order phenomena of pigeonite and augite lamellae in NWA 856 as observed by TEM, polymorphic phase transitions (diffusive, spinodal, displacive) and domain formation (after pigeonite inversion) which all contribute to an understanding of thermal history, due to micro-twinning and stacking disorder indicating a prior deformation (impact) history, and/or due to to radiation damage giving rise to weakly modulated diffuse background or diffuse halos around Bragg peaks.
Author
Mars (Planet); Lunar Composition; Microstructure; Pyroxenes; Thermal Shock; Radiation Damage

20050167785 Brock Univ., Saint Catherines, Ontario, Canada
Attitude Determination of Geological Layers Using HRSC Data and Orion Software
Fueten, F.; Stesky, R.; MacKinnon, P.; Zegers, T.; Hauber, E.; Foing, B.; Pischel, R.; Gwinner, K.; Scholten, F.; Neukum, G.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Previous work has demonstrated that MOLA and wide angle MOC data can be combined in Orion software to determine attitudes of large scale layering within the chasmta walls of Valles Marineris. Individual layers, between 7.7 km and 83.8 km in lateral extent, were found to have statistically consistent orientations. Layer attitudes indicated largely shallow dips into the canyon and were interpreted to record the collapse that produced the early ancestral basins. Unfortunately the resolution of the MOLA 1/128 x 1/128 topographic grid file (463 m/pixel) limited the scale of layering that could be investigated. While many more detailed layers are visible in narrow angle images, most narrow angle MOC images only span about 10 DEM pixels, which makes it impossible to obtain quality attitudinal data from them.
Author
Mars Surface; Topography; Geological Surveys

20050167786 Lunar and Planetary Inst., Houston, TX, USA
Physical Characterization of Titan Atmosphere by the Huygens Atmospheric Structure Instrument (HASI)
Fulchignoni, M.; Angrilli, F.; BarNun, A.; Barucci, M. A.; Bianchini, G.; Borouki, W.; Coradini, M.; Coustenis, A.; Falkner, P.; Ferri, F., et al.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 1 pp.; In English; See also 20050167736; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Huygens Atmospheric Structure Instrument (HASI) measured the main physical characteristics of the Titan atmosphere in all the phases of the Huygens probe mission at Titan: entry, descent and impact. The accelerometers (ACC sensors) provided the data from the very beginning of the entry phase (1200 km) and down to the impact phase at the surface of Titan. Temperature and pressure profile were obtained by direct measurements of T (TEM sensors) and P (PPI package)

during the descent and the impact, providing us with hints on the physical structure of Titan s atmosphere. The electrical properties, as the permittivity at 45 Hz and the conductivity, of the atmosphere have been measured during the whole descent phase and at the surface of Titan by the Permittivity and Wave Analysis (PWA) sensors. The radar altimeter data collected in the range of elevation 30-0 km have been processed by the FFT device of the HASI data processing unit, providing us with both information on the elevation of the probe in the last part of the descent and on some physical properties of the Titan surface.
Author
Titan; Huygens Probe; Accelerometers; Pressure Distribution; Electrical Properties

20050167787 American Museum of Natural History, New York, NY, USA
The Crucible: An Unusual Matrix-enclosing Igneous CAI in NWA 2364 (CV3)
Friedrich, J. M.; Ebel, D. S.; Weisberg, M. K.; Birdsell, J.; Lunar and Planetary Science XXXVI, Part 6; [2005]; 2 pp.; In English; See also 20050167736; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Chondrites are records of the earliest stages of planetary accretion in the solar system. Structural features in chondrite components can be studied to decipher and constrain events and conditions during accretion. Here we describe the structure, mineralogy and petrology of a very large, deformed Ca-, Al-rich inclusion in a new CV3 chondrite, NWA 2364 (CV3) AMNH 5035. This remarkable CAI is 18mm in largest apparent diameter, appears cup-shaped (hence 'the crucible'), and envelops a portion of the host chondrite. The formation histories of many CAIs and chondrules in carbonaceous chondrites include deformation by events in space (e.g.-compound chondrules) or impacts during the accretion of parent bodies. Distinguishing between these two deformation environments is difficult. To assess the possible outcomes of such deformation, it is important to know the extremes of deformation illustrated by samples where the location of deformation (nebula or parent body) can reliably be established. The crucible perhaps represents an extreme of deformation experienced by a once-spherical object during parent body accretion.
Author
Chondrites; Solar System; Deformation; Mineralogy; Meteoritic Composition

20050167788 Lunar and Planetary Inst., Houston, TX, USA
Lunar and Planetary Science XXXVI, Part 4
[2005]; ISSN 1540-7845; In English; Lunar and Planetary Science XXXVI, 14-18 Mar. 2005, Houston, TX, USA; See also 20050167789 - 20050167844
Contract(s)/Grant(s): NCC5-679
Report No.(s): LPI-Contrib-1234-Pt-4; Copyright; Avail: CASI; C01, CD-ROM

Contents include the following: High-Resolution Electron Energy-Loss Spectroscopy (HREELS) Using a Monochromated TEM/STEM. Dynamical Evolution of Planets in Open Clusters. Experimental Petrology of the Basaltic Shergottite Yamato 980459: Implications for the Thermal Structure of the Martian Mantle. Cryogenic Reflectance Spectroscopy of Highly Hydrated Sulfur-bearing Salts. Implications for Core Formation of the Earth from High Pressure-Temperature Au Partitioning Experiments. Uranium-Thorium Cosmochronology. Protracted Core Differentiation in Asteroids from 182Hf-182W Systematics in the Eagle Station Pallasite. Maximizing Mission Science Return Through Use of Spacecraft Autonomy: Active Volcanism and the Autonomous Sciencecraft Experiment. Classification of Volcanic Eruptions on Io and Earth Using Low-Resolution Remote Sensing Data. Isotopic Mass Fractionation Laws and the Initial Solar System (sup26)Al/(sup27)Al Ratio. Catastrophic Disruption of Porous and Solid Ice Bodies (sup187)Re-(sup187)Os Isotope Disturbance in LaPaz Mare Basalt Meteorites. Comparative Petrology and Geochemistry of the LaPaz Mare Basalt Meteorites. A Comparison of the Structure and Bonding of Carbon in Apex Chert Kerogenous Material and Fischer-Tropsch-Type Carbons. Broad Spectrum Characterization of Returned Samples: Orientation Constraints of Small Samples on X-Ray and Other Spectroscopies. Apollo 14 High-Ti Picritic Glass: Oxidation/Reduction by Condensation of Alkali Metals. New Lunar Meteorites from Oman: Dhofar 925, 960 and 961. The First Six Months of Iapetus Observations by the Cassini ISS Camera. First Imaging Results from the Iapetus B/C Flyby of the Cassini Spacecraft. Radiative Transfer Calculations for the Atmosphere of Mars in the 200-900 nm Range. Geomorphologic Map of the Atlantis Basin, Terra Sirenum, Mars. The Meaning of Iron 60: A Nearby Supernova Injected Short-lived Radionuclides into Our Protoplanetary Disk.
CASI
Mars Atmosphere; Mars Surface; Meteorites; Geochemistry; Geomorphology; Radioactive Isotopes

20050167789 Rutgers Univ., Piscataway, NJ, USA

Broad Spectrum Characterization of Returned Samples: Orientation Constraints of Small Samples on X-Ray and Other Spectroscopies

Delaney, J. S.; Dyar, . D.; Gunter, M. E.; Sutton, S. R.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Microanalysis of minute (less than 1 m) returned samples, such as those from the Genesis, Stardust, and putative Mars and asteroid missions, will present significant analytical challenges. In most cases, micrometer and smaller grain sizes prevent use of the routine techniques that represent the 'gold standard' methods of today. These include studies of elemental and isotopic abundance, morphology, and chemical state. There is a need for microanalytical methods because of the importance of obtaining analyses in petrographic context.

Derived from text

X Rays; Spectra; Range (Extremes); Petrography; Microanalysis

20050167793 Imperial Coll. of Science and Technology, London, UK

Cassini Magnetometer Observations at Saturn

Dougherty, Michele K.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 1 pp.; In English; See also 20050167788; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

On overview of magnetometer data from the initial flybys of the Cassini orbital tour at Saturn will be described. This analysis includes a description of the observed internal magnetic field, clear field periodicities observed at the rotational period of the planet, observations of diamagnetic cavities observed at the edge of the E-ring, strong wave activity both upstream of Saturn as well as deep within the magnetosphere as well as observations from the first close Titan flybys.

Author

Saturn Rings; Magnetometers; Magnetic Fields; Diamagnetism; Periodic Variations

20050167795 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Maximizing Mission Science Return Through Use of Spacecraft Autonomy: Active Volcanism and the Autonomous Sciencecraft Experiment

Davies, A. G.; Chien, S.; Baker, V.; Castano, R.; Cichy, B.; Doggett, T.; Dohm, J. M.; Greeley, R.; Ip, F.; Rabideau, G., et al.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

ASE has successfully demonstrated that a spacecraft can be driven by science analysis and autonomously controlled. ASE is available for flight on other missions. Mission hardware design should consider ASE requirements for available onboard data storage, onboard memory size and processor speed.

Author

Autonomy; Volcanology; Spaceborne Experiments; Space Missions

20050167796 Arizona Univ., Tucson, AZ, USA

Olivine and Ca-Phosphate in the Diogenites Manegaon and Roda

Domanik, K. J.; Sideras, L. C.; Drake, M. J.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains black and white illustrations

Contract(s)/Grant(s): NAG5-12795; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The textural relationships between the different primary minerals in igneous rocks provide one of the most fundamental pieces of evidence available for inferring the crystallization history of their parent magmas. Unfortunately, the high degree of brecciation that characterizes most diogenites, along with the low modal abundance and small grain sizes of minerals other than orthopyroxene, combine to make identifying and interpreting such textural relationships extremely difficult in this class of meteorites. A few descriptions of primary igneous contacts between orthopyroxene and chromite, troilite, and to a lesser extent, olivine in diogenites have been provided in the literature. In addition to these, in previous work, our research group has characterized several types of igneous contacts between Ca-pyroxene, plagioclase and orthopyroxene in the Bilanga diogenite. We have also described primary igneous inclusions of troilite + kamacite + chromite + Ca-pyroxene +/- Ca-phosphate in orthopyroxene (i.e. Metal/Troilite- Ball inclusions) in the diogenites Bilanga, Manegaon, Johnstown, Roda, Shalka, and Tatahouine. However, for the most part, detailed data on igneous textural relations between minerals other than

orthopyroxene in diogenites are still sparse. Of the diogenite samples that we have examined,
Derived from text
Olivine; Phosphates; Meteoritic Composition; Chromites; Breccia

20050167797 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Classification of Ion Mobility Data Using the Neural Network Approach
Duong, T. A.; Kanik, I.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Determination of atmospheric and surface elemental and molecular composition of various solar system bodies is essential to the development of a firm understanding of the origin and evolution of the solar system. Furthermore, such data is needed to address the intriguing question of whether or not life exists or once existed elsewhere in the Solar System. As such, these measurements are among the primary scientific goals of NASA s current and future planetary missions. In recent years, significant progress toward both miniaturization and field portability of in situ analytical separation and detection devices have been made with future planetary explorations in mind. However, despite all these advances, accurate in situ identification of atmospheric and surface compounds remains a big challenge. In response to that we are developing various hardware and software tools which would enable us to uniquely identify species of interest in a complex chemical environment.
Derived from text
Neural Nets; Classifications; Chemical Composition; Mobility; Ions

20050167799 New Mexico Univ., Albuquerque, NM, USA
High Pressure Phase Relations and Trace Element Partitioning in Apollo 14 Black Glass
Dwarzski, R. E.; Draper, D. S.; Shearer, C. K.; Agee, C. B.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Picritic lunar glasses act as probes into the petrologic processes that occurred within the lunar interior, since they were delivered to the surface of the moon from depth as liquids with little to no modification or fractionation. Understanding the phase equilibria and trace element partitioning of phases stable in the picritic glass compositions at high pressure provides a unique insight into the structure of the moon and lunar differentiation processes.
Derived from text
High Pressure; Moon; Trace Elements; Glass

20050167800 Mount Holyoke Coll., South Hadley, MA, USA
Integrated Spectroscopic Studies of Hydrous Sulfate Minerals
Dyar, M. D.; Lane, M. D.; Bishop, J. L.; OConnor, V.; Cloutis, E.; Hiroi, T.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Sulfate minerals have been identified in Martian meteorites and on Mars using a suite of instruments aboard the MER rovers. These results have confirmed previous groundbased observations and orbital measurements that suggested their presence. The orbiting OMEGA instrument on Mars Express is also finding evidence for sulfate. In order to better interpret remote-sensing data, we present here the results of a coordinated visible/near infrared (VNIR) reflectance, Moussbauer (MB), and thermal emittance study of wellcharacterized hydrous sulfate minerals.
Author
Minerals; Sulfates; Thermal Emission; SNC Meteorites

20050167802 Lawrence Livermore National Lab., Livermore, CA, USA
High-Resolution Electron Energy-Loss Spectroscopy (HREELS) Using a Monochromated TEM/STEM
Sai, Z. R.; Bradley, J. P.; Erni, R.; Browning, N.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations
Contract(s)/Grant(s): W-7405-eng-48; NAG5-7450; NAG5-10632; NAG1-0696; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A 200 keV FEI TF20 XT monochromated (scanning) transmission electron microscope funded by NASA's SRLIDAP

program is undergoing installation at Lawrence Livermore National Laboratory. Instrument specifications in STEM mode are Cs =1.0 mm, Cc =1.2 mm, image resolution =0.18 nm, and in TEM mode Cs =1.3 mm, Cc =1.3 mm, information limit =0.14 nm. Key features of the instrument are a voltage-stabilized high tension (HT) supply, a monochromator, a high-resolution electron energy-loss spectrometer/energy filter, a high-resolution annular darkfield detector, and a solid-state x-ray energy-dispersive spectrometer. The high-tension tank contains additional sections for 60Hz and high frequency filtering, resulting in an operating voltage of 200 kV plus or minus 0.005V, a greater than 10-fold improvement over earlier systems. The monochromator is a single Wien filter design. The energy filter is a Gatan model 866 Tridiem-ERS high resolution GIF spec d for less than or equal to 0.15 eV energy resolution with 29 pA of current in a 2 nm diameter probe. 0.13 eV has already been achieved during early installation. The x-ray detector (EDAX/Genesis 4000) has a take-off angle of 20 degrees, an active area of 30 square millimeters, and a solid angle of 0.3 steradians. The higher solid angle is possible because the objective pole-piece allows the detector to be positioned as close as 9.47 mm from the specimen. The voltage-stabilized HT supply, monochromator and GIF enable high-resolution electron energy-loss spectroscopy (HREELS) with energy resolution comparable to synchrotron XANES, but with approximately 100X better spatial resolution. The region between 0 and 100 eV is called the low-loss or valence electron energy-loss spectroscopy (VEELS) region where features due to collective plasma oscillations and single electron transitions of valence electrons are observed. Most of the low-loss VEELS features we are detecting are being observed for the first time in IDPs. A major focus of our research is to understand the origin and significance of these features and how they might be exploited to gain insight about IDPs and other meteoritic materials.
Derived from text
High Resolution; Transmission Electron Microscopy; Monochromatization; Spectroscopy; Energy Dissipation

20050167803 Padua Univ., Italy
Dynamical Evolution of Planets in Open Clusters
DallaStella, A.; Marzari, F.; Barbieri, M.; Vanzani, V.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Open clusters are favorable environments for extrasolar planet detections with the transit method. It is expected that a consistent number of planetary systems were born from protoplanetary disks in the early stage of the cluster. However, the subsequent dynamical evolution of the planets and their survival can be significantly affected by encounters between their parent stars and other stars in the cluster. Binary star systems are particularly effective in altering the orbital configuration of planetary systems possibly leading in some cases to their disruption. About 27% of planets can be liberated from their stars in an open cluster generating a population of free floating planets. Numerical simulations with N body codes estimate a lower fraction of planetary ejections, about 3%. The variability of these percentages is possibly due to different choices of the initial orbital parameters of the planets and of the cluster density. An additional consequence of multiple stellar encounters is that planets can also develop high eccentricities and possibly migrate in inner (or outer) orbits. We are performing a statistical study of the planet orbital evolution around stars in open clusters. We sample at a regular step the initial orbital elements of the planets (semimajor axis and eccentricity) and the cluster density. The trajectories of stars and planets are numerically integrated with the code NBODY6 appropriately modified for handling planetary orbits. We report the results of a first set of simulations where we model open clusters with a population of 3000 stars with a primordial binary fraction of 30%. We consider three different models for the cluster with values for the virial radius (r) of 1.0, 1.5, and 2.0 pc, respectively. The density of the the cluster ranges from about 700 stars/pc(sup 3) to about 200 stars/pc(sup 3). In our simulations we concentrate on the fate of planets with semi major axis comparable to that of Jupiter, Saturn, and Uranus and we derive the dependency of the ejection (and migration) rate on the initial orbital configuration of the planetary system and on the cluster virial radius. We place a planet around 50% of single stars with mass in the range 0.4-1.6 solar mass.
Derived from text
Extrasolar Planets; Open Clusters; Planetary Evolution; Planetary Systems

20050167804 Arizona State Univ., Tempe, AZ, USA
Experimental Petrology of the Basaltic Shergottite Yamato 980459: Implications for the Thermal Structure of the Martian Mantle
Dalton, H. A.; Musselwhite, D. S.; Kiefer, W.; Treiman, A. H.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788
Contract(s)/Grant(s): NAG5-13279; NAG5-122771; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Yamato 980459 (Y98) is an olivine-phyric basaltic shergottite composed of 48% pyroxene, 26% olivine, 25% mesostasis,

and 1% other minerals. Unlike the other Martian basalts, it contains no plagioclase. Olivine in Y98 is the most magnesian of all Martian meteorites. Thus Y98 is believed to be the most primitive and its composition may be the closest to a primary or direct melt of the Martian mantle. As such, it provides a very useful probe of the mineralogy and depth of its mantle source region. Toward this end, we are conducting crystallization experiments on a synthetic Y98 composition at Martian mantle pressures and temperatures.
Derived from text
Basalt; Petrology; Shergottites; Mars (Planet); Planetary Mantles

20050167805 Search for Extraterrestrial Intelligence Inst., Moffett Field, CA, USA
Cryogenic Reflectance Spectroscopy of Highly Hydrated Sulfur-bearing Salts
Dalton, J. B.; Jamieson, C. S.; Quinn, R. C.; Prieto-Ballesteros, O.; Kargel, J.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Asymmetric and distorted absorption features in the near-infrared indicate the presence of hydrated materials on the surface of Europa. A number of species have been proposed as the material which plays host to the waters of hydration. The most promising class of these may well be the ones which retain high numbers of water molecules. Earlier work has shown discrepancies between near-infrared spectra of disrupted terrains on Europa gathered by the Galileo NIMS instrument and the spectral behavior of hydrated salts of low hydration states. Other work indicates that these discrepancies are reduced at higher levels of hydration. Here we report additional laboratory measurements which strengthen the case for highly hydrated materials on Europa.
Derived from text
Cryogenics; Hydration; Reflectance; Spectroscopy; Salts; Sulfur

20050167806 Arizona State Univ., Tempe, AZ, USA
Implications for Core Formation of the Earth from High Pressure-Temperature Au Partitioning Experiments
Danielson, L. R.; Sharp, T. G.; Hervig, R. L.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788
Contract(s)/Grant(s): NGT5-50276; NSF EAR-00-08758; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Siderophile elements in the Earth.s mantle are depleted relative to chondrites. This is most pronounced for the highly siderophile elements (HSEs), which are approximately 400x lower than chondrites. Also remarkable is the relative chondritic abundances of the HSEs. This signature has been interpreted as representing their sequestration into an iron-rich core during the separation of metal from silicate liquids early in the Earth's history, followed by a late addition of chondritic material. Alternative efforts to explain this trace element signature have centered on element partitioning experiments at varying pressures, temperatures, and compositions (P-T-X). However, first results from experiments conducted at 1 bar did not match the observed mantle abundances, which motivated the model described above, a 'late veneer' of chondritic material deposited on the earth and mixed into the upper mantle. Alternatively, the mantle trace element signature could be the result of equilibrium partitioning between metal and silicate in the deep mantle, under P-T-X conditions which are not yet completely identified. An earlier model determined that equilibrium between metal and silicate liquids could occur at a depth of approximately 700 km, 27(plus or minus 6) GPa and approximately 2000 (plus or minus 200) C, based on an extrapolation of partitioning data for a variety of moderately siderophile elements obtained at lower pressures and temperatures. Based on Ni-Co partitioning, the magma ocean may have been as deep as 1450 km. At present, only a small range of possible P-T-X trace element partitioning conditions has been explored, necessitating large extrapolations from experimental to mantle conditions for tests of equilibrium models. Our primary objective was to reduce or remove the additional uncertainty introduced by extrapolation by testing the equilibrium core formation hypothesis at P-T-X conditions appropriate to the mantle.
Derived from text
High Pressure; Siderophile Elements; Parameterization; Temperature Dependence; Earth Core; Gold

20050167811 Academy of Sciences (USSR), Moscow, USSR
New Lunar Meteorites from Oman: Dhofar 925, 960 and 961
Demidova, S. I.; Nazarov, M. A.; Kurat, G.; Brandstatter, F.; Ntaflos, T.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color and black and white illustrations
Contract(s)/Grant(s): RFBR-03-05-20008; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

New lunar meteorites have been recently discovered in the Dhofar region of Oman (Dhofar 925, 960 and 961). The stones were found in close proximity to each other and they are very similar in lithology, mineral chemistry and degree of weathering and, therefore, they must be paired. These are the first Dhofar lunar meteorites, which contain both highland and mare material as well as a KREEP component. The stones were found close to Dhofar 489, which differs from them in some features. Here we report first data on petrography, mineralogy and chemistry of the new meteorites.
Derived from text
Lithology; Meteoritic Composition; Mineralogy; Petrography; Oman; Lunar Geology

20050167813 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
First Imaging Results from the Iapetus B/C Flyby of the Cassini Spacecraft
Denk, T.; Neukum, G.; Roatsch, T.; McEwen, A. S.; Turtle, E. P.; Thomas, P. C.; Helfenstein, P.; Wagner, R. J.; Porco, C.C.; Perry, J. E.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The first of two relatively close Iapetus flybys in Cassini's primary mission occured on Dec 31, 2004 18:49 UTC near apoapsis from orbit 'B' to 'C' at an altitude of approximately 123,400 km over the northern leading hemisphere, resulting in a minimum pixel scale of 740 m for the ISS narrow angle camera (NAC). Data revealed details of a greater than 1300-km-long ridge that had been discovered just one week earlier in optical navigation images. Individual mountains within the western part of the ridge reach heights of approximately 20 km over surrounding terrain. The data set provides constraints on the origin of the albedo dichotomy. It appears very likely that the dark material is overlying an ice crust, but no evidence for emplacement of dark material via surface flows is apparent. Instead, signs for dark-material emplacement through processes that included ballistic transportation are visible. No bright-floor ('punch-through') craters have been found on the dark hemisphere. The ridge discovery may revive the idea of an endogenic origin of the dark side.
Author
Cassini Mission; Flyby Missions; Iapetus; Imaging Techniques

20050167814 Oklahoma State Univ., Stillwater, OK, USA
Radiative Transfer Calculations for the Atmosphere of Mars in the 200-900 nm Range
Deo, S.; Kalchgruber, R.; Mayer, B.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Due to the increasing interest in the climatic history of the planet Mars, efforts are made to develop a miniature dating device for in situ luminescence dating of Martian sediments. In luminescence dating the time elapsed since deposition of a sediment layer is determined from the radiation-dose accumulated in minerals since the last bleaching event, and the dose rate due to naturally occurring radioactive nuclides and cosmic radiation. During sunlight exposure the sediments are mainly bleached by wavelengths between 200 and 900 nm. Due to the well known solar spectrum, the solar resetting under terrestrial conditions has been investigated extensively; no measured data exist, however, for the spectral irradiance at the surface of Mars. Many radiative transfer calculations for the atmosphere of Mars focused on the UV range of the solar spectrum, due to its influence on lifeforms and atmospheric photochemical reactions. Extensive simulations, triggered by the data from TES, have also been carried out in the thermal IR. Almost no data however exist for the visible range. We used the libRadtran software package for radiative transfer calculations in the 200-900 nm range. The calculation is based on a vertical atmospheric profile file and accounts for absorption by CO2, O2, O3, and H2O, as well as Rayleigh scattering. The Lambertian surface albedo and extinction by dust particles were also included. The libRadtran software package and the input parameters are presented and the results of the simulations will be compared to spectra on Earth.
Derived from text
Mars Atmosphere; Miniaturization; Radiative Transfer

20050167815 Tennessee Univ., Knoxville, TN, USA
Comparative Petrology and Geochemistry of the LaPaz Mare Basalt Meteorites
Day, James M. D.; Taylor, Lawrence A.; Patchen, Allan D.; Schnare, Darren W.; Pearson, D. Graham; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Low-Ti lunar mare basalt meteorites LAP 02-205, -224, -226, -436, and LAP 03-632 were discovered in the LaPaz icefield, Antarctica during the 2002/2003 ANSMET field season. Oxygen isotope compositions of LAP 02-205, along with

mineralogy, mineral compositions, and strong negative whole-rock Eu anomalies in all of the basalts, confirm the lunar origins of these meteorites. Here we present a detailed petrological and geochemical study of these basalts demonstrating that they are paired as expected. The LaPaz basalts are evolved with abundant mesostasis areas (up to 3%), elevated rare earth element abundances, and extreme Fe enrichment, all the way to pyroxferroite. These basalts represent a significant new suite of evolved lunar lavas with which to compare with Apollo mare basalts, and on which to perform detailed geochemical studies. The basalt compositions best approximate to Apollo 12 ilmnenite or pigeonite mare basalts, perhaps indicating an origin in the region of Mare Procellarum.
Derived from text
Basalt; Geochemistry; Lunar Maria; Meteorites; Petrology; Mineralogy

20050167817 Arizona State Univ., Tempe, AZ, USA
The Meaning of Iron 60: A Nearby Supernova Injected Short-lived Radionuclides into Our Protoplanetary Disk
Desch, S. J.; Ouellette, N.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We discuss the sources of the known short-lived radionuclides (SLRs) in the early Solar System, those with half-lives 1 Myr (Ca-41, Cl-36, Al-26, Be-10, Fe-60, Mn-53, Pd-107, Hf-182 and I-129). We conclude that the presence of some, especially Fe-60, demands a nearby supernova source. Astronomical images suggest the supernova was very close (less than 1 pc) and occurred after the protoplanetary disk had formed. We briefly discuss the consequences of solar system formation near massive stars, including disk survival and structure, and the abundances of short-lived and stable isotopes.
Derived from text
Iron Isotopes; Protoplanetary Disks; Radioactive Isotopes; Supernovae; Solar System

20050167818 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Classification of Volcanic Eruptions on Io and Earth Using Low-Resolution Remote Sensing Data
Davies, A. G.; Keszthelyi, L. P.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Two bodies in the Solar System exhibit high-temperature active volcanism: Earth and Io. While there are important differences in the eruptions on Earth and Io, in low-spatial-resolution data (corresponding to the bulk of available and foreseeable data of Io), similar styles of effusive and explosive volcanism yield similar thermal flux densities. For example, a square metre of an active pahoehoe flow on Io looks very similar to a square metre of an active pahoehoe flow on Earth. If, from observed thermal emission as a function of wavelength and change in thermal emission with time, the eruption style of an ionian volcano can be constrained, estimates of volumetric fluxes can be made and compared with terrestrial volcanoes using techniques derived for analysing terrestrial remotely-sensed data. In this way we find that ionian volcanoes fundamentally differ from their terrestrial counterparts only in areal extent, with Io volcanoes covering larger areas, with higher volumetric flux. Io outbursts eruptions have enormous implied volumetric fluxes, and may scale with terrestrial flood basalt eruptions. Even with the low-spatial resolution data available it is possible to sometimes constrain and classify eruption style both on Io and Earth from the integrated thermal emission spectrum. Plotting 2 and 5 m fluxes reveals the evolution of individual eruptions of different styles, as well as the relative intensity of eruptions, allowing comparison to be made from individual eruptions on both planets. Analyses like this can be used for interpretation of low-resolution data until the next mission to the jovian system. For a number of Io volcanoes (including Pele, Prometheus, Amirani, Zamama, Culann, Tohil and Tvashtar) we do have high/moderate resolution imagery to aid determination of eruption mode from analyses based only on low spatial-resolution data.
Derived from text
Classifications; Io; Remote Sensing; Volcanology; Earth Surface; Spatial Resolution

20050167819 Chicago Univ., Chicago, IL, USA
Isotopic Mass Fractionation Laws and the Initial Solar System (sup26)Al/(sup27)Al Ratio
Davis, A. M.; Richter, F. M.; Mendybaev, R. A.; Janney, P. E.; Wadhwa, M.; McKeegan, K. D.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Excess Mg-26 from the decay of Al-26 was discovered in 1976 by thermal ionization mass spectrometry of mineral separates from a CAI. Since that time, the Al-26- Mg-26 system has been of great interest because of its potential for precise

early solar system chronology. Until recently, most of the data generated was by ion microprobe using a single collector and data that most precisely defined the early solar system Al-26/Al-27 ratio was based on ion probe analyses of minerals with high Al/Mg ratios. In the last few years, multicollector ICP and multicollector ion probe mass spectrometry have made possible high precision magnesium isotopic analyses that provide chronologically useful data on low-Al/Mg phases. Some of these studies have suggested that the initial solar system Al-26/Al-27 ratio may have been higher than the canonical value of 4.5 x 10(exp -5). Magnesium has three isotopes, 24, 25 and 26, and isotope ratios vary in solar system objects by mass dependent fractionation and by the effects of Al-26 decay. In order to infer the effects of the latter, the exact behavior of mass dependent fractionation must be known. CAIs, where most Al-26-Mg-26 studies are done, typically have mass fractionation effects of a few /amu and so-called FUN inclusions have larger mass fractionation signatures. The algorithm or law used to correct CAI data for natural mass fractionation effects can significantly affect the inferred amount of radiogenic Mg-26, especially in cases where the degree of mass fractionation is large and/or the Al/Mg in the phase analyzed is small. A variety of fractionation laws have been used to correct isotopic data. We review these laws, describe the results of experiments in which the mass fractionation law has been determined for vacuum evaporation of CAI compositions and recalculate a number of published supercanonical Al-26/Al-27 ratios.
Derived from text
Aluminum Isotopes; Magnesium Isotopes; Solar System; Isotope Ratios; Fractionation

20050167820 Kent Univ., Canterbury, UK
Catastrophic Disruption of Porous and Solid Ice Bodies
Dawe, W.; Murray, M.; Burchell, M. J.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The disruption limit for small icy bodies is of interest as regards understanding the evolution of such bodies under impact. This influences the size distribution of the many small icy bodies in the outer Solar System (e.g. Edgeworth-Kuiper Belt objects etc). It is also of interest in determining the fate under impact of comet nuclei, small icy satellites of outer planets, and even potentially of Pluto. Although mean impact speeds in the outer Solar System (e.g. 1.44 kilometers per second for Pluto) are accessible to laboratory experiment, the necessary target and projectile sizes are not. Nevertheless, laboratory investigation is a useful tool to explore what happens in impacts on finite icy bodies (i.e. ones where the consequences of the impact are on a size scale similar to the target body). As the energy density (Q, J per kilogram) in an impact increases, the size of the resultant crater grows to be a significant fraction of the target body size, and then above a critical energy density (Q*), disruption occurs instead of cratering. The energy density (Q*) at this transition can be determined by experiment. There have been several past experiments to determine Q* for icy bodies. This has been done for low speeds (100 to 300 meters per second) on solid ice targets, for low speeds on porous ice targets and high speeds (2.3 to 4.7 kilometers per second) on solid ice targets. In addition, catastrophic disruption has been reported at low speeds (150 to 670 meters per second) for impacts on porous ice and porous ice-silicate mixed targets. Given, that the Solar System impact speeds can be matched in the laboratory, we report here on high speed (1 to 7 kilometers per second) impacts on solid and porous ice targets.
Derived from text
Icy Satellites; Catastrophe Theory; Solar System; Porosity; Solids

20050167825 Brown Univ., Providence, RI, USA
Arsia Mons Flank Pit Craters and Valleys: Modification by Downslope Movement Processes
Dickson, J. L.; Head, J. W.; Parsons, R. L.; Neukum, G.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Pit craters and linear valleys at the southern margin and flank of the summit of Arsia Mons formed in association with volcanic activity related to lateral emplacement of magma from a reservoir beneath the summit and emplacement of a fan of lava flows along the edifice flank. We use new HRSC image data to document a range of features associated with modification processes of the pits and linear valleys. We find evidence for several candidate modification processes (e.g., mass wasting, slumping, gelifluction, solifluction, and glaciation).
Author
Fluid Flow; Craters; Mars Volcanoes; Magma

20050167830 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mars Geological Province Designations for the Interpretation of GRS Data
Dohm, J. M.; Kerry, K.; Baker, V. R.; Boynton, W.; Maruyama, Shige; Anderson, R. C.; Lunar and Planetary Science XXXVI,

Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Introduction: An overarching geologic theory, GEOMARS, coherently explains many otherwise anomalous aspects of the geological history of Mars. Premises for a theory of martian geologic evolution include: (1) Mars is a water-rich terrestrial planet, (2) terrestrial planets should evolve through progressive stages of dynamical history (accretion, differentiation, tectonism) and mantle convection (magma ocean, plate tectonism, stagnant lid), and (3) the early history of Earth affords an analogue to the evolution of Mars. The theory describes the following major stages of evolution for Mars (from oldest to youngest): Stage 1 - shortly after accretion, Mars differentiates to a liquid metallic core, a mantle boundary (MBL) of high-pressure silicate mineral phases, upper mantle, magma ocean, thin komatiic crust, and convecting steam atmosphere; Stage 2- Mars cools to condense its steam atmosphere and transform its mode of mantle convection to plate tectonism; subduction of waterrich oceanic crust initiates arc volcanism and transfers water, carbonates and sulfates to the mantle; Stage 3 - the core dynamo initiates, and the associated magnetosphere leads to conditions conducive to the development of near-surface life and photosynthetic production of oxygen; Stage 4 - accretion of thickened, continental crust and subduction of hydrated oceanic crust to the mantle boundary layer and lower mantle of Mars occurs; Stage 5 - the core dynamo stops during Noachian heavy bombardment while plate tectonism continues; Stage 6 - initiation of the Tharsis superplume (approx. between 4.0 and 3.8Ga) occurs, and Stage 7 - the superlume phase (stagnant-lid regime) of martian planetary evolution with episodic phases of volcanism and water outflows continues into the present. The GEOMARS Theory is testable through a multidisciplinary approach, including utilizing GRS-based information. Based on a synthesis of published geologic, paleohydrologic, topographic, geophysical, spectral, and elemental information, we have defined geologic provinces that represent significant windows into the geological evolution of Mars, unfolding the GEOMARS Theory and forming the basis for interpreting GRS data.

Derived from text

Mars Surface; Planetary Evolution; Planetary Geology

20050167831 Washington Univ., Saint Louis, MO, USA

Tectonic Evidence for Crustal Underplating of the Tharsis Montes, Mars

Dombard, A. J.; Phillips, R. J.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Tharsis Montes represent massive loads on the lithosphere in central Tharsis, and various studies have sought to constrain properties of the lithosphere by modeling its flexure under these loads. Attempting to match the placement of an annulus of graben around each volcano, Comer et al. estimated very thin elastic lithospheres of 18- 26 km; assuming elastic blocking temperatures of 300- 600 C, these thin lithospheres transform to heat flows 40 mW/sq m. McGovern et al. compared observed gravity/topography admittances with those predicted by a simple elastic shell model and determined a regional heat flow range of 0-140 mW/sq m.

Derived from text

Crusts; Elastic Shells; Geological Faults; Mars Surface; Tectonics; Topography

20050167832 NASA Johnson Space Center, Houston, TX, USA

Spectral Photometric Properties of the Moon

Dominque, D.; Vilas, F.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We modeled the solar phase curves of the moon at a series of wavelengths using the full disk telescopic observations [1]. We endeavored to keep the database self-contained, that is, to use the values derived for the solar magnitude and phase curves of the disk-integrated [1]. These observations were made in a suite of 10 narrowband filters between 0.315 microns and 1.06 microns, and in the broad band Johnson UBV filters, as part of a larger program to obtain photoelectric photometry of the larger planets. Two aspects of the lunar observations are unique. First, the observations cover phase angles from 6deg through 120deg. More importantly, the observers used a special 20-mm diameter f/15 fused quartz lens constructed solely for this purpose. The lens reduced the whole lunar image in the focal plane to a size comparable to the planets observed as part of the same program. This image was fed directly into the photometer. Thus, these observations constitute the only existing set of phase curves of the entire lunar disk over a range of wavelengths. Table 1 lists the values of the Hapke model parameters which fit the data. Figure 1 is an example of the model fits to the data.

Author

Photometers; Spectra; Moon; Photometry; Broadband; Phase Shift

20050167834 Arizona Univ., Tucson, AZ, USA
Mercury: First Spectra from 8 to 25 Microns Using MIRSI
Hanna, K. L. Donaldson; Sprague, A. L.; Kozlowski, R. W. H.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 1 pp.; In English; See also 20050167788; Original contains black and white illustrations
Contract(s)/Grant(s): NCC5-538; NSF AST-04-06796; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Spectral measurements from 8 to 25 microns of Mercury's surface were taken using MIRSI (Mid-InfraRed Spectrometer and Imager) mounted on the NASA Infrared Telescope Facility (IRTF) on Mauna Kea, Hawaii [1]. Few spectral observations of Mercury have been made between 8 and 14 m and these are the first to be made between 17 and 25 m. The goal for these observations is to measure the emission from Mercury in the Restrahllen Bands in the 8 to 25 micron region in an effort to identify spectral features that may give clues to Mercury s composition. These observations will be compared to previous observations [2] [3] [4], and future observations made with instrumentation on Messenger at other spectral regions [5]. Spectra from the Moon were also obtained with the same instrumentation and telescope during the same observing periods.
Derived from text
Mercury Surface; Spectral Bands; Spectrum Analysis

20050167835 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA, Arizona Univ., Tucson, AZ, USA
Aerosol and Cloud Properties at the Huygens Entry Site as Derived from the Descent Imager/Spectral
Doose, L. R.; Engel, S.; Tomasko, M. G.; Dafoe, L. E.; West, R.; Lemmon, M.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 1 pp.; In English; See also 20050167788; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Huygens Probe descended through Titan s atmosphere on January 14, 2005. The Descent Imager/Spectral Radiometer (DISR) instrument made optical measurements which constrain the nature and vertical distribution and of the aerosols in the atmosphere.
Derived from text
Aerosols; Cloud Physics; Huygens Probe; Radiometers

20050167836 Tennessee Univ., Knoxville, TN, USA
Re-187-Os-187 Isotope Disturbance in LaPaz Mare Basalt Meteorites
Day, James M. D.; Pearson, D. Graham; Taylor, Lawrence, A.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Lunar mare basalt meteorites LAP02-205, -224, -226, -436, and LAP03-632 were discovered in the LaPaz icefield, Antarctica during the 2002/2003 ANSMET field season. These basalts have been recognized as being paired on the basis of petrographic and geochemical studies. The LaPaz basalts, as well as offering a new suite of material in which to understand the origin and evolution of the lunar mare, also provide insight into the effects that impact and eventual arrival on Earth have on the isotopic and elemental composition of extraterrestrial materials. We present new Re-Os isotope data for the LaPaz mare basalts which indicates that both impact-induced shock and fusion melting during fall through the Earths atmosphere may have affected the Re-Os isotope systematics of these meteorites. Despite these effects, the new data demonstrate the extremely low highly siderophile element (HSE) abundances in lunar mare basalts and indicate the importance of analysing unshocked lunar mare basalts to provide further understanding of the HSE budget and Os isotope evolution of the lunar mantle.
Derived from text
Basalt; Geochemistry; Lunar Maria; Meteorites; Petrography; Osmium Isotopes; Rhenium Isotopes

20050167837 Grenoble-1 Univ., France
Nature and Composition of the Icy Terrains of the South Pole of Mars from MEX OMEGA Observations
Doute, S.; Schmitt, B.; Bibring, J-P.; Langevin, Y.; Altieri, F.; Bellucci, G.; Gondet, B.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Monitoring fluxes of energy and matter between the atmosphere, regolith, seasonal deposits and permanent polar caps of Mars is required to study the seasonal and climatic cycles of the Planet. The main species involved in the exchange of matter are volatiles (CO2, H2O) and mineral dust. At the surface, the monitoring consists of following the changes of spatial distribution and abundances of these species as a function of time. Until recently, such a task relied essentially on time

sequences of albedo (in the visible) or temperature maps covering seasonal and permanent caps (e.g.[1]). None of these observations are directly diagnostic of ices and dust. Since January 2004, the imaging spectrometer OMEGA (Observatoire pour la Mineralogie, l'Eau, les Glaces et l'Activite) of Mars Express provides a more direct way of detecting and characterizing these compounds. This instrument acquires, nearly on a day to day basis, spectro-images of the polar regions in the 0.35-5.09 micron range. In the near and mid infrared, CO2, H2O, and, to a lesser extent dust, display numerous and distinctive absorption bands allowing a more accurate detection and characterization than was done before. Three main objectives become feasible : (i) estimating the abundance and physical state (pure or diluted ices, clathrate, temperature, etc.) of H2O and CO2 as a function of location and time, (ii) determining the nature of these ices (daily, seasonal or perennial), (iii) studying the microphysics of processes affecting the volatiles such as condensation, metamorphosis, and sublimation.
Derived from text
Ice; Terrain; Mars Surface; Polar Regions; Polar Caps; Regolith; Deposits

20050167838 New Mexico Univ., Albuquerque, NM, USA
Crystallization of a Martian Magma Ocean and the Formation of Shergottite Source Regions: A Less Fe-rich Mars?
Draper, D. S.; Borg, L. E.; Agee, C. B.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In a recent paper, we modeled the formation of martian basalt (shergottite) source regions via crystallization of an early, extensive magma ocean on Mars [1; BD03 hereafter]. The modeling provided reasonable matches to both isotopic and trace element compositions of martian meteorites while providing an explanation for their broader major element compositions in general and of their superchondritic CaO/Al2O3 ratios in particular. An important inference of the major-element section of the model was that the martian mantle crystallized from an initial composition that was somewhat less Fe-rich than had been previously supposed. Separately, high pressure experimentation on ultramafic compositions used as analogs for the martian interior led Agee and Draper [2, 3] to a similar conclusion. Here we revisit the BD03 model using a less Fe-rich starting composition. The new model uses the same procedures as in BD03, but replaces the starting composition, which originally was the silicate fraction of the Homestead L5 ordinary chondrite, with that of the silicate fraction of the Farmville H chondrite. The bulk composition of the silicate fraction of Homestead is very similar to Mars compositions such as that proposed by Dreibus and Wanke [4]. The silicate fraction of Farmville has a nearly identical composition to that of Homestead except that its Mg# (molar Mg/Mg+Fe) is 80.4 instead of 76.6. This slightly higher Mg# is the value suggested by both the numerical modeling of BD03 and the experimental results of Agee and Draper [3].
Derived from text
Shergottites; Crystallization; Magma; Planetary Mantles; Basalt; Trace Elements; Isotopic Labeling

20050167841 Tennessee Univ., Knoxville, TN, USA
Using Thermal Emission Spectra to Model Modal Mineralogies of Alkalic Rocks: Applications for Mars
Dun, T. L.; McSween, H. Y., Jr.; Milam, K. A.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Thermal Emission Spectrometer (TES) on the Mars Global Surveyor spacecraft measures thermal infrared (TIR) energy emitted from the martian surface. TES emissivity spectra can be used to derive the mineralogy and infer the chemical composition of martian surface materials. TES data indicate that the martian surface is primarily composed of subalkaline volcanic materials, mainly basalt and either andesite or weathered basalt. However, it has been suggested by some that alkalic rocks may occur on the surface of Mars [3], so the potential presence of these rock types should not be overlooked.
Derived from text
Mars Surface; Mineralogy; Thermal Emission; Infrared Radiation

20050167842 Centre d'Etude Spatiale des Rayonnements, Toulouse, France
MANGA, a Gamma-Ray and Neutron Spectrometer for the BepiColombo Mission
dUston, C; Thocaven, J. J.; Hasebe, N.; Klingelhoefer, G.; Gellert, R.; Chernenko, A.; Leleux, P.; Gasnault, O.; Maurice, S.; Pirard, B., et al.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

MANGA (Mercury Analysis of Neutrons and GAmma-rays), a neutron and gamma-ray spectrometer, has been proposed

and pre-selected on the Mercury Planetary Orbiter (MPO) of the BepiColombo mission to planet Mercury. Bepicolombo is a joint ESA-JAXA mission scheduled for launch in 2012 and arrival at Mercury in 2016. MPO, a three-axis-stabilized spacecraft will have a nominal life of one year in a 400 km 1500 km polar orbit. Combined high-resolution gamma-ray spectrometers and neutron spectrometers such as MANGA have already been implemented on several planetary exploration missions (Mars Odyssey, Lunar Prospector Messenger, Selene) and have become key instruments to determine and map elemental composition of planetary surfaces. The following presents an overview of the MANGA investigation in terms of scientific objectives, technical design and detection performances.
Author
Mercury (Planet); Neutron Spectrometers; Planetary Surfaces; Gamma Ray Spectrometers; Chemical Composition

20050167843 California Univ., Los Angeles, CA, USA
Rapidly Changing Oxygen Fugacity in the Early Solar Nebula Recorded by CAI Rims
Dyl, K. A.; Simon, J. I.; Russell, S. S.; Young, E. D.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Most rocky objects in the solar system formed at oxygen fugacities within several log units of the Iron-Wustite (IW) fO2 buffer. Calcium aluminum-rich inclusions (CAIs), on the other hand, apparently formed at fO2 values approximately 6 to 7 log units lower just below those defined by a solar gas. We present estimates of Ti3+/Ti4+ in Al-Ti-rich diopsides showing that Wark-Lovering (WL) rims on CAIs record this shift from nearly solar fO2 during initial CAI crystallization to chondritic fO2 (approximately IW) during condensation that formed the rims. In combination with phase equilibria models for WL rim formation and new initial 26Al/27Al measurements for the rims, these results show that CAIs experienced a shift from approximately solar to approximately chondritic fO2 in less than 300,000 years.
Author
Chondrites; Oxygen; Solar Nebula; Veins (Petrology); Meteoritic Composition

20050167844 Mount Holyoke Coll., South Hadley, MA, USA
Integrated Spectroscopic Studies of MIL03346
Dyar, M. D.; Pieters, C. M.; Hiroi, T.; Lane, M. D.; Marchand, G. J.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations
Contract(s)/Grant(s): NNG04GB53G; NNG04GG12G; NAG5-12687; NAG5-13609; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Spectroscopic studies of the SNC meteorites continue to be of great interest because they provide the only 'ground truth' available for ongoing Mossbauer, thermal emittance, MidIR, nearIR, and visible spectral analysis of the martian surface. We present here results of an integrated series of measurements made on the same split of MIL03346, in order to expand our understanding of the properties of these materials and to relate them to other SNCs.
Derived from text
Near Infrared Radiation; SNC Meteorites; Spectrum Analysis; Thermal Emission

20050169201 Texas Univ., Austin, TX, USA
New Inquiry into Distribution and Mechanism of Deep Moonquakes with Recently Identified Seismic Events
Nakamura, Yosio; [2005]; 3 pp.; In English
Contract(s)/Grant(s): NNG04GG62G; NAG5-11619; No Copyright; Avail: CASI; A01, Hardcopy

The objectives of the project were (1) to complete our preceding effort, supported by NASA grant NAGS-1 1619, of searching for deep moonquakes in the far hemisphere of the Moon among the seismic events detected by the Apollo seismic array; and (2) to re-examine the distribution and mechanism of deep moonquakes in the light of the newly identified deep moonquakes. The project was originally planned for completion in three years, of which only the first year, covered by this report, was funded. As a result, we were able to address only the first objective during the period, and the major part of the second objective was left for the future.
Author
Moonquakes; Lunar Far Side; Geographic Distribution

20050169207 Laurin Publishing Co., Inc., Pittsfield, MA, USA
UV Spectroscopy Detects Martian Nightglow
Hogan, Hank, Editor; Photonics Spectra; April 2005; ISSN 0731-1230; Volume 39, No. 4, pp. 60-61; In English; Copyright; Avail: Other Sources

When atmospheres settle down for the night, they glow as photodissociated atoms stream from dayside to night-side and combine in the dark. Scientists analyze this effect, called nightglow, because it reveals facts about atmospheric composition and movement, particularly in the upper atmosphere. Until recently, however, the nightglow on Mars had escaped detection. Now, an international team of astronomers from France, Russia, Belgium, the Netherlands, Finland and the US has spotted martian nightglow using the Spicam UV/IR dual spectrometer aboard the European Space Agency's Mars Express orbiter. The researchers found the ultraviolet spectrum of the nightglow dominated by NO and hydrogen, which are produced in a process that begins on the planet's day-side when atmospheric gases are exposed to extreme radiation from the sun.
Derived from text
Nightglow; Ultraviolet Spectroscopy; Detection; Mars Atmosphere

20050169216 Dornheim (Michael A.), Los Angeles, CA, USA
Freeing Opportunity
Dornheim, Michael A.; Aviation Week and Space Technology; May 09, 2005; ISSN 0005-2175; Volume 162, No. 19, pp. 33-35; In English; Copyright; Avail: Other Sources

Engineers are optimistic they can free the Opportunity Mars rover, perhaps as early as this week, from fluffy soil that trapped it during a long run over flat terrain late last month.
Author
Mars Roving Vehicles; Accidents; Soils

20050169224 Texas Univ., Austin, TX, USA
Spatial Extent of a Deep Moonquake Nest: A Preliminary Report of Reexamination
Nakamura, Yosio; [2005]; 2 pp.; In English; Lunar and Planetary Science XXXVI
Contract(s)/Grant(s): NNG04GG62G; Copyright; Avail: CASI; A01, Hardcopy

Deep moonquakes, occurring at depths about halfway to the center of the Moon, were discovered during the Apollo lunar landing missions, 1969-1972. Their near-monthly occurrence with nearly identical waveforms at any given seismic station suggests that they are strongly influenced by tides, caused by the Earth and the Sun, acting on certain limited regions of the deep lunar interior. However, much about them is unknown, why they are restricted to certain depths and to limited source regions (nests), and what they tell us about the nature of the material and dynamics of the interior of the Moon. A piece of information helphl to decipher their true nature is the spatial extent and distribution of their hypocenters. The occurrence of nearly identical waveforms suggests groups of hypocenters appear in close proximity to one another, but can we tell how closely they are located and how they are distributed? Additional information is included in the original extended abstract.
Author (revised)
Moonquakes; Lunar Geology; Selenology; Lunar Mantle

20050169479 Lunar and Planetary Inst., Houston, TX, USA
Lunar and Planetary Science XXXVI, Part 7
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Topics discussed include: Lunar Geologic Mapping: Preliminary Mapping of Copernicus Quad High-Resolution Topography of Layers in the Valles Marineris Via Thermoclinometry ; The Critical Importance of Data Reduction Calibrations in the Interpretability of S-type Asteroid Spectra; (sup 238)U-(sup 206)Pb Age and Uranium-Lead Isotope Systematics of Mare Basalt 10017; Morphological Investigations of Martian Spherules, Comparisons to Collected Terrestrial Counterparts; The Vapor Pressure of Palladium at Temperatures up to 1973K; Areas of Favorable Illumination at the Lunar Poles Calculated from Topography; An Indigenous Origin for the South Pole-Aitken Basin Thorium Anomaly; Ar-Ar Ages of Nakhlites Y000593, NWA998, and Nakhla and CRE Ages of NWA998; Experiments on the Acoustic Properties of Titan-like Atmospheres; Analysis of Downstream Transitions in Morphology and Structure of Lava Channels on Mars; Structure and Bonding of Carbon in Clays from CI Carbonaceous Chondrites; Comparison of Three Hydrogen Distributions at the Equator of Mars; An Impact Origin for the Foliation of Ordinary Chondrites; A New Micrometeorite Collection from Antarctica and Its Preliminary Characterization by Microobservation, Microanalysis and Magnetic Methods; Volcanic Plumes and Plume Deposits on Io; Results of the Alpha-Particle-X-Ray Spectrometer on Board of the Mars Exploration Rovers; Effects of Oceans

on Atmospheric Loss During the Stage of Giant Impacts; and Identification of Predominant Ferric Signatures in Association to the Martian Sulfate Deposits
Derived from text
Carbonaceous Chondrites; High Resolution; Landforms; Mars Exploration; Mars Volcanoes; Planetary Geology; Lunar Topography

20050169480 Leiden Univ., Netherlands
Experiments on the Acoustic Properties of Titan-like Atmospheres
Garry, J. R. C.; Shettle, T.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The arrival of the Huygens spacecraft at Titan offers a novel opportunity for the study of an atmosphere via its acoustic properties. Preliminary measurements of the speed of sound in cryogenic nitrogen, methane, and ethane have been made, with absorptivity factors in gas mixes being the goal. With such data, it is expected that it would be possible to discriminate between two-component particulateladen mixtures, or clean three-component gas mixtures. Additional information is included in the original extended abstract.
Author (revised)
Titan Atmosphere; Analogs; Environment Simulation; Acoustic Properties; Cryogenic Temperature; Low Temperature Tests; Gas Mixtures

20050169481 Manchester Univ., UK
Iron Isotope Geochemistry of Metal Grains in Ordinary Chondrites
Gildea, K. J.; Burgess, R.; Lyon, I. C.; Sears, D. W.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Iron isotope variations between components of ordinary chondrites are studied to help understand their source materials and the processes that formed them. Metal/silicate fractionation, chondrule formation, metamorphism, aqueous alteration, and terrestrial weathering have probably all influenced the Fe in chondrites, and there may be other processes. Thus, while the study of Fe isotopes is going to be complicated, the potential return is large. Fortunately, since Fe is a major element present in almost all components, we have much mineralogical, petrographic and geochemical data to help. We are determining the iron isotope ratios of the metallic iron of 29 ordinary chondrites with different classes (H, L and LL), different petrographic types (3-6) and different weathering status (falls and finds) in order to attempt to disentangle the effects of these different processes. Additional information is included in the original extended abstract.
Author
Iron Isotopes; Geochemistry; Meteoritic Composition; Chondrites; Isotope Ratios

20050169482 Oslo Univ., Norway
Tsunami Generated by the Mjolnir Impact
Glimsdal, Sylfest; Pedersen, Geir; Shuvalov, Valery; Dypvik, Henning; Langtangen, Hans Petter; Kristiansen, Oyvind; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations Contract(s)/Grant(s): NRC-154831; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the late Jurassic, 142 +/- 2.6 million years ago, an about 1.6 km in diameter asteroid hit the 400 to 600 m deep paleo-Barents Sea. A 40 km in diameter crater was formed on the sea bed and the vaporized asteroid and target rocks along with crushed material, were ejected. According to simulations the water was pushed aside and did not return to the impact site before after about 20 minutes. In the reconstructed bathymetry of paleo-Arctic seas, the positions of todays coastlines are also plotted. The reconstruction is based on field work and regional compilations, in combination with the present regional bathymetry. In this abstract we will describe the propagation of the tsunami generated by the Mjolnir impact. Additional information is included in the original extended abstract.
Author (revised)
Craters; Barents Sea; Tsunami Waves; Ocean Bottom; Meteorite Collisions

20050169483 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA, Smithsonian Institution, Washington, DC, USA

Crater Gradation in Gusev Crater, Meridiani Planum, and on the Earth

Grant, J. A.; Golombek, M. P.; Haldemann, A. F. C.; Crumpler, L.; Li, R.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Exploration Rovers Spirit and Opportunity have examined multiple impact craters since landing in Gusev Crater (14.569 deg. S, 175.473 deg. E) and Meridiani Planum (1.946 deg. S, 354.473 deg. E), respectively. Craters at both locations are in varying states of preservation and comparison between their evolved gradation signatures and those around simple, unglaciated terrestrial craters provide clues to the processes and amount of Martian crater modification.

Derived from text

Mars Craters; Earth Surface; Mars Surface

20050169486 NASA Ames Research Center, Moffett Field, CA, USA

Revisiting Valley Development on Martian Volcanoes Using MGS and Odyssey Data

Gulick, Virginia C.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The valley networks found on the slopes of Martian volcanoes represent an interesting subset of the Martian valley networks. Not only do the volcanoes constrain the possible geologic settings, they also provide a window into Martian valley development through time, as the volcanoes formed throughout the geologic history of Mars. Here I take another look at this intriguing subset of networks by revisiting conclusions reached in my earlier studies using the Viking imagery and the valleys on Hawaii as an analog. I then examine more recent datasets.

Author

Mars Volcanoes; Mars Global Surveyor; Paleontology; Valleys

20050169488 Manchester Univ., UK

Reconsideration of the Constraints on Nucleosynthetic Sources of Xenon in Presolar Material

Gilmour, J. D.; Turner, G.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Xenon isotopes in presolar grains show clear evidence of contributions from nucleosynthetic processes. S-process xenon, Xe-G, has been identified in SiC grains along with a more 'normal' component Xe-N, while high temperature releases from nanodiamonds exhibit mixing between Xe-HL and Xe-P6. Gilmour et al. recently reported that Xe-P6 was present only in coarser grain size fractions of a nanodiamond separate from Efremovka. This behavior contrasts with Xe-HL, which is distributed across all grain-size fractions. They argued that similar enrichments in heavy and light isotopes over solar-xenon in Xe-P6 and Xe-HL suggested that they were products of the same process(es) operating under slightly different conditions in different stellar environments. There is a problem in constraining the isotopic compositions characteristic of particular processes from the mixing lines observed in analyses of presolar material. Separates of both SiC grains and nanodiamonds contain sub-populations from different sources, so the mixing lines most likely represent mixing between endmembers trapped in grain subpopulations. Additional information is included in the original extended abstract.

Author

Solar Nebula; Xenon Isotopes; Meteoritic Composition

20050169489 Aix-Marseilles Univ., France

An Impact Origin for the Foliation of Ordinary Chondrites

Gattacceca, J.; Rochette, P.; Denise, M.; Consolmagno, G.; Folco, L.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A large number of observations and measurements of the anisotropy of their magnetic susceptibility (AMS) reveal the existence of foliation in almost all chondrites, and lineation in some of them. Explanations proposed in literature include accretional sedimentation, metamorphism, lithostatic compaction and hypervelocity impacts, but the former two can be confidently ruled out. Impacts and lithostatic compaction remain as the two most plausible explanations. However, no

definitive conclusion can be reached, mostly because of the limited dataset in former studies with respect to the number of potential parameters (group, petrologic type, shock stage, weathering). In this work, we present a large dataset of AMS measurements, mostly on ordinary chondrites, in order to elucidate the origin of chondrite foliation. This anisotropy database contains 259 different chondrites, as well as 35 achondrites (HED and SNC).
Derived from text
Chondrites; Anisotropy; Magnetic Permeability; Data Bases

20050169490 Imperial Coll. of Science, Technology and Medicine, London, UK
Geological Constraints on Extrasolar Earth-like Planets
Ghail, R. C.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 1 pp.; In English; See also 20050169479; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Stellar composition is known to vary considerably within even the local stellar neighbourhood. Although there is a random component to this variability, caused by different degrees of mixing within pre-stellar nebulae, there is also a secular component caused by the ongoing chemical evolution of the universe. The effect of these chemical differences on stellar evolution is predictable and well-known. Less well known is the effect on the geological properties and evolution of (terrestrial) planetary bodies. Using simplified equilibrium condensation sequences and first-order geological evolution models of planetary bodies, I examine the effects variable chemical composition on Earth-mass planets and discuss the implications for the search for extrasolar life.
Derived from text
Extrasolar Planets; Planetary Geology; Stellar Composition; Earth (Planet)

20050169491 Arizona Univ., Tucson, AZ, USA
Hydrocode Modeling of the Sierra Madera Impact Structure
Goldin, T. J.; Wunnemann, K.; Melosh, H. J.; Collins, G. S.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Sierra Madera Structure (Pecos County, Texas, USA) is the result of a Late Cretaceous or early Tertiary impact into a thick sedimentary target sequence [1]. The crater is complex, with an intensely folded and faulted central uplift. The present structure consists of central hills exposing Permian strata, a surrounding structural depression floored by Lower Cretaceous strata, and a concentric ring of outer hills topped by Lower Cretaceous strata and cut by inward-facing normal faults. The diameter of the crater, as defined by the outer limit of deformation and analogies with lunar craters and assuming the outer hills to represent the eroded rim, is 13 km [1, 2]. Impact breccias, shocked quartz, and shatter cones offer evidence for an impact origin and give shock pressure estimates. The Sierra Madera impact is of interest as it occurred in a 5.5-km thick sedimentary sequence and did not involve any crystalline basement rock, unlike most other known terrestrial craters.
Derived from text
Craters; Shatter Cones; Breccia; Quartz; Deformation; Cretaceous Period

20050169492 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Climate Change from the Mars Exploration Rover Landing Sites: From Wet in the Noachian to Dry and Desiccating Since the Hesperian
Golombek, M. P.; Grant, J. A.; Crumpler, L. S.; Greeley, R.; Arvidson, R. E.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mars Exploration Rover Opportunity discovered sedimentary dirty evaporites in Meridiani Planum that were deposited in salt-water playas or sabkhas in the Noachian, roughly coeval with a variety of geomorphic indicators (valley networks, degraded craters and highly eroded terrain) of a possible early warmer and wetter environment. In contrast, the cratered plains of Gusev that Spirit has traversed (exclusive of the Columbia Hills) have been dominated by impact and eolian processes and a gradation history that argues for a dry and desiccating environment since the Late Hesperian. This paper reviews the surficial geology and gradation history of the plains in Gusev crater as observed along the traverse by Spirit that supports this climate change from the two landing sites on Mars.
Derived from text
Climate Change; Landing Sites; Mars Exploration; Mars Roving Vehicles; Mars Surface

20050169493 Arizona State Univ., Tempe, AZ, USA

Fluid Lava Flows in Gusev Crater, Mars

Greeley, R.; Wiliams, D. A.; Neukum, G.; Werner, S. C.; Zegers, T.; Foing, B. H.; vanKan, M.; Lanagan, P. D.; Pinet, P.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Rocks on the floor of Gusev crater are basaltic in composition, as determined from measurements by the Mars Exploration Rover, Spirit. Based on compositional data, models of the basaltic lavas at the time of their emplacement suggest viscosities of 2.3 to 50 Pa(raised dot)s, somewhat similar to lunar mare lavas. Morphological data and crater counts derived from the High Resolution Stereo Camera on Mars Express suggest that the lavas flooded Gusev crater at about 3.65 by, thus post-dating older floor materials, such as putative sediments emplaced by Ma'adim Vallis.

Author

Mars Surface; Mars Craters; Lava; Fluid Flow; Volcanology

20050169496 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Cassini Radio and Plasma Wave Observations at Saturn

Gurnett, D. A.; Kurth, W. S.; Hospodarsky, G. B.; Persoon, A. M.; Averkamp, T. F.; Ceccni, B.; Lecacheux, A.; Zarka, P.; Canu, P.; Cornilleau-Wehrlin, N., et al.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 1 pp.; In English; See also 20050169479; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Results are presented from the Cassini radio and plasma wave instrument during the approach and first few orbits around Saturn. During the approach the intensity modulation of Saturn Kilometric Radiation (SKR) showed that the radio rotation period of Saturn has increased to 10 hr 45 min plus or minus 36 sec, about 6 min longer than measured by Voyager in 1980-81. Also, many intense impulsive radio signals called Saturn Electrostatic Discharges (SEDs) were detected from saturnian lightning, starting as far as 1.08 AU from Saturn, much farther than terrestrial lightning can be detected from Earth. Some of the SED episodes have been linked to cloud systems observed in Saturn s atmosphere by the Cassini imaging system. Within the magnetosphere plasma wave emissions have been used to construct an electron density profile through the inner region of the magnetosphere. With decreasing radial distance the electron density increases gradually to a peak of about 100 per cubic centimeter near the outer edge of the A ring, and then drops precipitously to values as low as .03 per cubic centimeter over the rings. Numerous nearly monochromatic whistler-mode emissions were observed as the spacecraft passed over the rings that are believed to be produced by meteoroid impacts on the rings. Whistlermode emissions, similar to terrestrial auroral hiss were also observed over the rings, indicating that an electrodynamic interaction, similar to auroral particle acceleration, may be occurring in or near the rings. During the Titan flybys Langmuir probe and plasma wave measurements provided observations of the density and temperature in Titan's ionosphere.

Author

Plasma Waves; Saturn (Planet); Cassini Mission; Radio Waves

20050169497 Geological Survey, Flagstaff, AZ, USA

High-Resolution Topography of Layers in the Valles Marineris Via 'Thermoclinometry'

Gaddis, L.; Soderblom, L.; Kirk, R.; Titus, T.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This study addresses the use of high-resolution topographic data and morphologic analyses to study the origin of interior layered deposits in the Valles Marineris (Figure 1). These deposits are examined in part because they allow us to look into the geologic past of Mars and to study ancient depositional environments. Also, western portions of the VM have relatively high hydrogen abundance, and water may have played a significant role in the formation of layers in the canyon walls and floors there. Detailed studies of the topography, morphology, coherence, and continuity of layered deposits in the VM may allow us to assess the importance of water in their formation.

Derived from text

High Resolution; Topography; Mars Surface; Hydrogen

20050169498 Geological Survey, Flagstaff, AZ, USA

Lunar Geologic Mapping: Preliminary Mapping of Copernicus Quad

Gaddis, L.; Skinner, J. A., Jr.; Hare, T.; Tanaka, K.; Hawke, B. R.; Spudis, P.; Bussey, B.; Pieters, C.; Lawrence, D.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We describe preliminary 1:2.5 M scale geologic map results of the Copernicus quad as part of a new pilot program for systematic, global lunar geologic mapping (Figure 1). This program continues the systematic lunar geologic mapping efforts that ended almost 30 years ago during the Apollo era.

Derived from text

Geological Surveys; Lunar Maps; Lunar Surface; Topography; Lunar Orbiter

20050169499 Centre National de la Recherche Scientifique, Orsay, France

Sulfates on Mars Layered Terrains: OMEGA High Resolution Campaign Confirms Low Resolutions Identifications

Gendrin, Aline; Mangold, Nicolas; Bibring, Jean-Pierre; Langevin, Yves; Gondet, Brigitte; Poulet, Francois; Bonello, Guillaume; Quantin, Cathy; Mustard, John; Arvidson, Ray, et al.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

OMEGA, the imaging spectrometer onboard Mars Express, is the first orbital instrument able to identify sulfates associated to layered deposits in Terra Meridiani and Valles Marineris. Though layered deposits have been priority science targets since their identification, distinct signatures of sulfates had not been recognized until now. This is due to the wavelengths range covered and to OMEGA excellent spatial resolution (300 m to 4 km/pixel). Since September 2004, OMEGA has started a high resolution campaign which allows the observation at high resolution (approximately 300 m /pixel) of sulfate rich areas already mapped at lower resolution (2-4 km/pixel). The spatial location of sulfate identifications at lower and higher resolution match very well. Here, we report on the sulfate identification by OMEGA, and we present some examples of areas observed at high resolution, and compare the mineralogy mapped at high and low resolution.

Derived from text

High Resolution; Mars Surface; Sulfates; Terrain; Planetary Geology; Mineralogy

20050169500 New Mexico Univ., Albuquerque, NM, USA

(sup 238)U-(sup 206)Pb Age and Uranium-Lead Isotope Systematics of Mare Basalt 10017

Gaffney, A. M.; Borg, L. E.; Asmerom, Y.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Analysis and interpretation of lunar Pb isotopic compositions has been challenging, given the low Pb concentrations of lunar materials and the ease with which the Pb isotopic system can be disturbed. Because lunar (204)Pb concentrations are low, and thus difficult to measure, previous Pb investigations primarily relied on using combined (238)U-(206)Pb and (235)U-(207)Pb systematics to determine crystallization ages and initial Pb isotopic compositions of the samples, and to interpret magma source region history. With the current study, we have measured the Pb and U isotopic compositions of Apollo 11 sample 10017, and we interpret the Pb isotope systematics in the context of previously determined Rb-Sr ages. 10017 is an ilmenite-rich, high-Ti basalt, with a moderate KREEP component, and represents an enriched end-member of mare volcanism. For comparison, we also discuss 15085, which represents a more depleted mare end-member. Additional information is included in the original extended abstract.

Author

Uranium Isotopes; Lead Isotopes; Lunar Composition; Lunar Maria; Basalt

20050169501 Collegium Budapest/Inst. for Advanced Study, Budapest, Hungary

Morphological Investigations of Martian Spherules, Comparisons to Collected Terrestrial Counterparts

Ganti, T.; Pocs, T.; Berczi, Sz.; Ditroi-Puskas, Z.; Gal-Solymos, K.; Horvath, A.; Nagy, M.; Kubovics, I.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

On the basis of the microscope camera imaging of Opportunity we studied the morphology of the blueberries , the Martian spherules. Such hematite spherules occur in several terrestrial environments: 1) spherules found by Chan et al. in Utah State

are considered to be terrestrial counterparts, and 2) spherules collected by T. Pocs in Venezuela and West Australian deserts are possible analogues with the Martian spherules.
Author
Morphology; Mars (Planet); Spherules

20050169503 Massachusetts Inst. of Tech., Cambridge, MA, USA
Areas of Favorable Illumination at the Lunar Poles Calculated from Topography
Garrick-Bethell, I.; Byrne, S.; Hoffman, J. A.; Zuber, M. T.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The lunar poles represent an interesting science target due to their possible stores of cold-trapped volatiles. From an operational standpoint the poles offer a favorable illumination environment that can provide consistent solar power and benign thermal conditions. Full knowledge of the year-round illumination conditions at the surface is therefore important to both scientific and operational objectives. To date, most analysis of lighting conditions at the poles has been conducted using photomosaics of polar Clementine images assembled into animations. These data are limited to southern winter and northern summer. Simulations of lighting conditions within idealized simple craters and constraints from near-polar Clementine laser altimetry have also been used to help determine the total area of permanent shadow. Illumination models based on stereo imagery and radar interferometry DEM s have shown good correspondence with single Clementine and Lunar Orbiter images. In order to obtain information about the integrated lighting conditions at the poles at any time of year, and identify areas of favorable illumination, we have developed a full year illumination model based on DEM's derived from Arecibo radar interferometry. Our illumination model permits identification of areas of near-permanent sunlight and allows visualization of the sun's path as it moves across the lunar horizon.
Author
Lunar Topography; Computation; Solar Activity; Craters

20050169504 Massachusetts Inst. of Tech., Cambridge, MA, USA
An Indigenous Origin for the South Pole-Aitken Basin Thorium Anomaly
Garrick-Bethell, I.; Zuber, T.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The thorium anomaly at the northwest corner of the South Pole-Aitken (SPA) basin interior was first observed by the Apollo gamma ray spectrometers. Sections of the thorium anomaly were later found to be located near a mapped geologic unit of 'grooves and mounds' and dissected crater walls. Explanations for both the thorium anomaly and grooves include antipodal convergence of thorium-enriched Imbrium basin ejecta, local volcanic processes, and convergence of Serenitatis basin ejecta. Based on analysis of a combination of datasets we propose that the thorium anomaly most likely reflects an indigenous process. Data: The thorium data is updated from a preliminary
Author
Anomalies; Craters; Lunar Maria; Volcanoes

20050169505 NASA Johnson Space Center, Houston, TX, USA
Ar-Ar Ages of Nakhlites Y000593, NWA998, and Nakhla and CRE Ages of NWA998
Garrison, D. H.; Bogard, D. D.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The seven known Martian nakhlites are Nakhla, Lafayette, Governador Valadares, and four recent finds from hot and cold deserts: MIL03346 from the Transantarctic Mountains, a paired group from the Yamato Mountains (Y000593, Y000749, and Y000802, and two from Morocco (NWA998 and NWA817. Radiometric ages (Sm-Nd, Rb-Sr, U-Pb, and Ar-Ar) for the first three nakhlites, along with Chassigny, fall in the range of 1.19-1.37 Gyr and may suggest a common formation age. These meteorites also show very similar cosmic-ray (space) exposure ages, suggesting a single ejection event from Mars. The ages for nakhlites are different from those of Martian shergottites, whose radiometric ages vary by nearly a factor of three (approx. 165-475 Myr) and whose space exposure ages vary over a factor of approx. 20. Shergottite ages suggest that multiple locations on the Martian surface have been sampled, whereas nakhlite data imply sampling of only one Mars surface location. Because older Martian surfaces are expected to be more abundant, it seems surprising that all nakhlites would represent only one

Martian impact event. To address this issue, we are measuring the (39)Ar-(40)Ar ages of Y-000593, NWA-998, Nakhla, and MIL-03346, and the space (CRE) exposure age of NWA998. Additional information is included in the original extended abstract.
Author (revised)
Nakhlites; SNC Meteorites; Argon Isotopes; Radioactive Age Determination; Meteoritic Composition

20050169506 Imperial Coll. of Science, Technology and Medicine, London, UK
Multiple Chondrule Populations Within Micrometeorites
Genge, M. J.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Micrometeorites (MMs) are extraterrestrial dust particles that are recovered from the Earth's surface. Of those particles that survive atmospheric entry without significant melting three general types have been identified: (1) fine-grained MMs (fgMMs) dominated by phyllosilicates or their thermal decomposition products, which broadly resemble the matrices of C1 and C2 chondrites, (2) coarse grained MMs (cgMMs), that are dominated by pyroxene, olivine and glass and usually have igneous textures similar to chondrules, and (3) composite MMs (which can be either cgMMs or fgMMs) that contain both fine-grained matrix, similar to fgMMs, and igneous textured objects similar to cgMMs. In the current study the distribution of types of igneous object within composite MMs is presented in order to evaluate the relative abundance of chondrule types within the parent bodies of hydrated fgMMs. The overall distribution of cgMM types is also considered to demonstrate that at least two separate populations of chondrule are sampled by MMs, one of which resembles that of carbonaceous chondrites, the other having ordinary chondrite-like abundances of Type I and Type II materials.
Derived from text
Chondrule; Meteoritic Composition; Micrometeorites; Interplanetary Dust

20050169507 Buffalo Univ., NY, USA
Analysis of Downstream Transitions in Morphology and Structure of Lava Channels on Mars
Garry, W. Brent; Gregg, Tracy K. P.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Lava channels on Mars exhibit a downstream change in morphology and structure similar to morphologic zones observed in terrestrial lava channels and simulated channeled flows using polyethylene glycol wax (PEG). These morphologic zones form regardless of material composition, scale, and emplacement duration in fluids with a temperature- dependent rheology. Here we present a preliminary analysis and application of the morphologic zones to a lava channel on Mars, identified in a THEMIS visible image.
Author
Mars Volcanoes; Geomorphology; Lava; Valleys

20050169508 Academy of Sciences (Russia), Moscow, Russia
Impacts of Large Meteorites as a Possible Source of Complex Organic Species on Titan
Gerasimov, M. V.; Safonova, E. N.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations
Contract(s)/Grant(s): RFBR-02-05-64419; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Titan is a unique satellite in the Solar system, which have a dense atmosphere composed mainly of nitrogen, argon, and methane. Such a composition of the atmosphere is favorable for production of some simple organic molecules (C2H2, C2H4, etc.) at high altitudes in the atmosphere due to photochemical processes and an interaction with high energy particles. Decent and accumulation of these organics in the surface ice is considered as a possible reason for coloring of Titan's surface. An impact of a large meteorite or a comet can produce a liquid water reservoir, which is capable to exist before its freeze out for hundreds and thousands of years. The complication of organic species, which can be trapped from surface ice into such crater ponds, is considered as a possible process for the origin of Titan's life. Existed models do not consider the role of an impact itself in the production or degradation of organics in the vicinity of the crater. There is a large number of works showing the possibility of synthesis of complex organic molecules at reduced conditions under the action of various energy sources. Hypervelocity impact itself is generally considered as destructive process for organics because counteractions of space bodies

usually occur at high velocities with release of large energies, which result in destructive for organics high temperatures. But the expansion of the hot impact-generated plume, its rapid cooling, and counteraction with the environment also acts as an energy source capable of production of organic species. Earlier we reported about rather efficient synthesis of volatile organic molecules during simulated impact-induced vaporization of silicates in atmosphere of He and H2. The formation of nonvolatile organic components in such processes was indicated by the abundance of carbon in C-C and C-H bonding during investigation of the forming condensates by methods of X-ray photoelectron-spectroscopy (XPS). The aim of the present work was to investigate experimentally the possibility of synthesis of complex organic molecules from atmospheric methane in case of an impact of a siliceous body on Titan's surface.
Derived from text
Meteorites; Titan; Planetary Geology; Organic Materials

20050169509 Observatoire de Midi-Pyrenees, Toulouse, France
Comparison of Three Hydrogen Distributions at the Equator of Mars
Gasnault, O.; Maurice, S.; deUston, C.; Feldman, W. C.; Boynton, W. V.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Onboard Mars Odyssey, the neutron spectrometers and the gamma-ray spectrometer are sensitive to hydrogen abundance in the Martian soil. From the Neutron Spectrometer two maps of hydrogen distribution have been derived: one using the fast neutron counting rate, and one using the epithermal neutrons. From the Gamma-Ray sensor Head one map is made with the 2.223 MeV gamma-ray line. These maps are not totally independent since the epithermal neutrons result from the moderation of the fast neutrons, and the 2.223 MeV line is the product of a neutron capture by a nuclei of hydrogen. For convenience, these maps are turned into water-equivalent hydrogen (WEH) distributions although the nature of the hydrogen as water is not established in the equatorward regions that we are studying here.
Author
Capture Effect; Fast Neutrons; Hydrogen; Mars Surface; Neutrons; Soils; Water

20050169510 Aix-Marseilles Univ., France
A New Micrometeorite Collection from Antarctica and Its Preliminary Characterization by Microobservation, Microanalysis and Magnetic Methods
Gattacceca, J.; Rochette, P.; Folco, L.; Perchiazzi, N.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In December 2003, the meteorite recovery party of the XIX PNRA expedition collected, hundreds of micrometeorites in the 100- 800 microns size range from aeolian deposits at the top of Frontier Mountain (northern Victoria Land, Antarctica), a glacially eroded surface that may be as old as a few Myr. Micrometeorites embedded in sand were discovered thanks to a magnetic gradiometer, and magnetically extracted. Such large and well preserved population of micrometeorites offers a good opportunity to test and develop a magnetic classification procedure, in parallel to 'classical' mineralogical and geochemical characterization (SEM, EMP). After SEM imaging, magnetic measurements were performed on individual particles with diameter above 150 microns. EDAX detectable Ni and Cr contents of the particles confirm their extraterrestrial origin. Hysteresis loop parameters, magnetic susceptibility and demagnetization of isothermal remanence at saturation were obtained on single particles.
Author
Classifications; Demagnetization; Deposits; Micrometeorites; Mineralogy

20050169511 Geological Survey, Flagstaff, AZ, USA
Volcanic Plumes and Plume Deposits on Io
Geissler, P. E.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Voyager spacecraft s discovery of enormous plumes reaching several hundred kilometers above Io s surface provided the first spectacular evidence of active volcanism beyond Earth. Io s volcanic activity is the most prodigious in the solar system, fueled by tidal heating generated by the gravitational grip of Jupiter. More than 400 volcanic paterae dot the surface of the satellite but so far only a handful of these volcanic centers have been seen to produce plumes. Most plumes are

associated with new lava flows that explosively vaporize existing surface ices of SO2, but the largest plumes vent sulfur-rich gases from the interior of Io.
Derived from text
Io; Volcanoes; Plumes; Deposits

20050169512 NASA Johnson Space Center, Houston, TX, USA
Results of the Alpha-Particle-X-Ray Spectrometer on Board of the Mars Exploration Rovers
Geller, R.; Zipfel, J.; Brueckner, J.; Dreibus, G.; Lugmair, G.; Rieder, R.; Waenke, H.; Klingelhoefer, G.; Clark, B. C.; Ming, D. W., et al.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Exploration Rovers Spirit and Opportunity landed at Gusev crater and Meridiani Planum. The Alpha Particle X-ray Spectrometer (APXS) is part of the instrument suite on both rovers. It is equipped with six 244Cm sources which provide x-ray excitation with alpha-particles (PIXE) and x-ray radiation (XRF). This combination allows x-ray spectroscopy of elements from Na to Br in the energy range of 0.9 to 16 keV. X-ray detectors with a high energy resolution of 160 eV at Fe K allow us to separate even closely spaced energy peaks, such as Na, Mg, Al and Si. The APXS is attached to the rover s arm and provides in-situ measurements of the chemical composition of soils, surfaces of rocks and outcrops and their abraded surfaces. This abstract gives an overview of APXS results obtained during the first year of operation on both landing sites.
Author
Alpha Particles; Chemical Composition; Mars Surface

20050169514 Smithsonian Institution, Washington, DC, USA
A Comparison of Impact-related Deposits Surrounding Craters on the Moon, Venus, and Mars
Ghent, R. R.; Carter, L. M.; Leverington, D. W.; Campbell, B. A.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The goal of this work is to explore the distribution and properties of surficial impact-related deposits on the Moon, Mars, and Venus. We have previously reported on radar-dark haloes surrounding impact craters on the lunar nearside based on newly acquired and previously existing Earth-based 70-cm radar observations of the Moon. In the present work, we continue to explore lunar ejecta deposits using Earth-based radar observations. Further, we use the results obtained for lunar craters as a framework for exploration of the nature and distribution of potentially similar deposits on Venus and Mars. Because the deposits responsible for radar-dark crater haloes on the Moon are likely produced during impacts, similar deposits should be produced in impacts on Venus and Mars as well. The emplacement mechanisms differ in some respects for Venus and Mars because of the presence of atmospheres on those planets; likewise, the spatial distribution and long-term survival prospects of such deposits may be different from the lunar case because of aeolian and other alteration processes active on the other two planets.
Author
Venus (Planet); Deposits; Moon; Mars Surface; Lunar Craters; Impact

20050169516 Paris XI Univ., Orsay, France
Identification of Predominant Ferric Signatures in Association to the Martian Sulfate Deposits
Gendrin, A.; Bibring, J.-P.; Mustard, J.; Mangold, N.; Quantin, C.; Gondet, B.; Langevin, Y.; Poulet, F.; Sotin, C.; LeMouelic, S., et al.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

OMEGA, the imaging spectrometer onboard Mars Express has identified sulfates in association to layered deposits in Valles Marineris and Terra Meridiani. Here, we report the identification of a strong ferric band in association with these sulfate deposits, sometimes overlapping the sulfate deposits, sometimes closeby. This band is much stronger than the ferric band previously identified in bright Martian terrains. Enhanced ferric signatures were identified in the ISM/Phobos2 dataset, the father of OMEGA, inside Candor Chasma. These enhanced ferric signatures were then attributed to red hematite. A comparison with the areas mapped as crystalline grey hematite rich by the Thermal Emission Spectrometer (TES) onboard Mars Global Surveyor is also of interest. TES data indicate the presence of crystalline grey hematite in Terra Meridiani, Aram

Chaos, and Valles Marineris. Some of the areas identified with TES data interestingly match areas that we identify here. We will also address the question of the possible mineralogy corresponding to these areas, and propose possible constituting minerals. Dataset: OMEGA, the imaging spectrometer onboard
Author
Mars Surface; Mineralogy; Minerals; Sulfates

20050169517 Kingsborough Community Coll., Brooklyn, NY, USA
Northwest Africa 1500: A Plagioclase-bearing Monomict Ureilite
Goodrich, C. A.; Wlotzka, F.; Ross, D. K.; Spettel, B.; Dreibus, G.; Bartoschewitz, R.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Northwest Africa (NWA) 1500 was classified as an anomalous ureilite. Bartoschewitz et al. described this meteorite as having similarities to typical monomict ureilites, but with significant differences notably, the presence of plagioclase that might represent the missing basaltic component of the ureilite parent body (UPB). They noted, however, that its oxygen isotopic composition is not within the field of ureilites. Mittlefehldt and Hudon considered it to be a unique achondrite. We report an in-depth study of NWA 1500. Petrologically, this meteorite appears to be a ureilite, and one that provides new information about the differentiation of the UPB. Although plagioclase is minor, its presence is highly significant. The oxygen isotopes of this ureilite remain unexplained.
Derived from text
Africa; Plagioclase; Ureilites; Petrography

20050169518 NASA Johnson Space Center, Houston, TX, USA
An Achondritic Micrometeorite from Antarctica: Expanding the Solar System Inventory of Basaltic Asteroids
Gounelle, M.; Engrand, C.; Chaussidon, M.; Zolensky, M. E.; Maurette, M.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Micrometeorites with sizes below 1 mm are collected in a diversity of environments such as deep-sea sediments and polar caps. Chemical, mineralogical and isotopic studies indicate that micrometeorites are closely related to primitive carbonaceous chondrites that amount to only approximately 2% of meteorite falls. While thousands of micrometeorites have been studied in detail, no micrometeorite has been found so far with an unambiguous achondritic composition and texture. One melted cosmic spherule has a low Fe/Mn ratio similar to that of eucrites, the most common basaltic meteorite group. Here we report on the texture, mineralogy, Rare Earth Elements (REEs) abundance and oxygen isotopic composition of the unmelted Antarctic micrometeorite 99-21-40 that has an unambiguous basaltic origin.
Derived from text
Antarctic Regions; Asteroids; Basalt; Micrometeorites; Mineralogy; Solar System; Carbonaceous Chondrites

20050169519 Washington Univ., Saint Louis, MO, USA
MarsLab Investigation of the Spectral Signature of Gypsum Bearing Rocks of Differing Composition and Formation Environment
Greenhagen, B. T.; Kirkland, L. E.; Adams, P. M.; Grabowski, T. K.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Infrared spectroscopy has long been used to identify the presence of minerals in laboratory, satellite, and most recently field-based measurements. However, high fidelity compositional identification has largely been limited to laboratory based studies where the numerous mineralogical and textural factors that affect spectral signature can be identified and constrained. In this study, we used field based infrared spectroscopy to compare naturally formed gypsum bearing rocks of differing composition and formation environment to enhance our knowledge of the role of several mineralogical and textural factors in clouding high fidelity compositional identification. Infrared spectroscopy is a primary method used to explore the mineralogy of Mars remotely. The goals of this project, and ongoing MarsLab efforts, are: (1) define the types of materials that infrared airborne (satellite analog) and ground-based (rover analog) spectrometers identify and miss, and explain why; and (2) define implications for the exploration of Mars [1,2].
Derived from text
Gypsum; Infrared Radiation; Mars Surface; Mineralogy; Planetary Geology; Rocks

20050169520 Buffalo Univ., NY, USA

What is Hesperia Planum, Mars? An Examination of Multiple Working Hypotheses

Gregg, Tracy K. P.; Crown, D. A.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Hesperia Planum, Mars, characterized by a high concentration of mare-type wrinkle ridges and ridge rings [1-4], encompasses a region of over 2 million square kilometers in the southern highlands (Fig. 1). The most common interpretation is that the plains materials were emplaced as flood lavas that filled in low-lying regions [5-10]. Deposit thickness, based on partially buried craters, is \h3 km [4]. Its stratigraphic position and crater-retention age [e.g., 9, 11, 12; Tanaka, 1986] define the base of the Hesperian System. In addition, the mare-type wrinkle ridges on its surface make Hesperia Planum the type locale for Hesperian-aged ridged plains on Mars [e.g., 9]. In spite of this significance, there are still many unresolved issues surrounding the formation and evolution of Hesperia Planum.

Derived from text

Planetary Geology; Hypotheses; Highlands; Deposits; Craters; Mars Surface

20050169521 Arizona State Univ., Tempe, AZ, USA

Structure and Bonding of Carbon in Clays from CI Carbonaceous Chondrites

Garview, Laurence a. J.; Buseck, Peter R.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479

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Carbonaceous chondrites (CC) contain a diverse suite of C-rich materials. Acid dissolution of these meteorites leaves a C-rich residue with chemical and structural affinities to kerogen. This material has primarily been analyzed in bulk, and much information has been provided regarding functional groups and elemental and isotopic compositions. However, comparatively little work has been done on C in unprocessed meteorites. Studies of CCs suggest a spatial relationship of some C-rich materials with products of aqueous alteration. Recent studies revealed discrete submicronsized, C-rich particles in Tagish Lake and a range of CM2 meteorites. A challenge is to correlate the findings from the bulk acid-residue studies with those of high-spatial resolution-mineralogical and spectroscopic observations of unprocessed meteorites. Hence, the relationship between the C-rich materials in the acid residues and its form and locations in the unprocessed meteorite remains unclear. Here we provide information on the structure and bonding of C associated with clays in CI carbonaceous chondrites. Additional information is included in the original extended abstract.

Author

Carbonaceous Chondrites; Meteoritic Composition; Clays; Carbon

20050169522 California Univ., San Diego, La Jolla, CA, USA

Electron Beam Analysis of Micrometeoroids Captured in Aerogel as Stardust Analogues

Graham, G. A.; Sheffield-Parker, J.; Bradley, P.; Kearsley, A. T.; Dai, Z. R.; Mayo, S. C.; Teslich, N.; Snead, C.; Westphal, A. J.; Ishii, H.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations

Contract(s)/Grant(s): W-7405-eng-48; NNH04AB49I; NAG5-119; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In January 2004, NASA s Stardust spacecraft passed through the tail of Comet 81P/Wild-2. The on-board dust flux monitor instrument indicated that numerous micro- and nano-meter sized cometary dust particles were captured by the dedicated silica aerogel capture cell. The collected cometary particles will be returned to Earth in January 2006. Current Stardust analogues are: (i) Light-gas-gun accelerated individual mineral grains and carbonaceous meteoritic material in aerogels at the Stardust encounter velocity ca.approximately 6 kilometers per second. (ii) Aerogels exposed in low-Earth orbit (LEO) containing preserved cosmic dust grains. Studies of these impacts offer insight into the potential state of the captured cometary dust by Stardust and the suitability of various analytical techniques. A number of papers have discussed the application of sophisticated synchrotron analytical techniques to analyze Stardust particles. Yet much of the understanding gained on the composition and mineralogy of interplanetary dust particles (IDPs) has come from electron microscopy studies. Here we discuss the application of scanning electron microscopy (SEM) for Stardust during the preliminary phase of post-return investigations.

Derived from text

Aerogels; Electron Beams; Micrometeoroids; Stardust Mission; Mineralogy; Analogs

20050169523 Graham (R. A.), Uvalde, TX, USA

Reinvestigation of the Bee Bluff Structure South of Uvalde, Texas, 'The Uvalde Crater'

Graham, R. A.; Wilson, W. F.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

After a careful, detailed, onsite study of an area near Bee Bluff on the Nueces River in 1979, Wilson and Wilson proposed that the strongly-geologically-disturbed area was a probable impact crater. Four subsequent investigations found evidences of PDF in quartz on-site and at distant locations, but limited data were available that could be directly connected to the local structure. The Bee Bluff Crater was removed from the worldwide crater database in November 2003. Recent on-site study, new samples, calculations, and analysis reported in the present work supports interpretation of the Bee Bluff Structure as an impact crater.

Derived from text

Meteorite Craters; Planetary Geology; Texas

20050169526 Intergraph Corp., Kapolei, HI, USA

Remote Sensing Studies of the Dionysius Region of the Moon

Giguere, T. A.; Hawke, B. R.; Gaddis, L. R.; Blewett, D. T.; Lucey, P. G.; Peterson, C. A.; Smith, G. A.; Spudis, P. D.; Taylor, G. J.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Dionysius region is located near the western edge of Mare Tranquillitatis and is centered on Dionysius crater (2.8 N, 17.3 E). This 18 km-diameter crater exhibits a well-developed dark ray system. The nature and origin of these dark rays have been the subject of much controversy. Proposed origins include impact melt deposits and dark primary ejecta from Dionysius. It has been proposed that the dark primary ejecta was derived from surface basalt flows, cryptomare deposits, or a mafic plutonic complex. We have been investigating the origin of lunar crater rays in support of the new Lunar Geologic Mapping Program. Clementine multispectral images and a variety of spacecraft photography were utilized to investigate the composition and origin of geologic units in the Dionysius region. The goals of this study include the following: 1) To determine the composition and origin of the dark rays associated with Dionysius, 2) To investigate the origin of mafic material exposed by Dionysius crater, and 3) To identify possible cryptomare deposits in the region. Additional information is included in the original extended abstract.

Author

Lunar Maria; Lunar Craters; Ejecta; Lunar Rays

20050169527 Hawaii Univ., Honolulu, HI, USA

Evidence that UVVIS Ratio is not a Simple Linear Function of TiO2 Content for Lunar Mare Basalts

Gillis, J. J.; Lucey, P. G.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Lunar basalts exhibit obvious variations in ultraviolet-visible (UVVIS) color and these variations have been attributed to Ti content, the major compositional variable in mare basalts. Charette first showed that Ti content in lunar samples is correlated with telescopic measurements of UVVIS ratio in mature (agglutinate rich) basaltic regolith, whereby samples with high TiO2 concentrations exhibit relatively flatter and 'bluer' UVVIS slopes (e.g., Mare Tranquillitatis) than basalts with lower concentrations in TiO2, which are considered to be redder (e.g., central Mare Serenitatis). The optical properties of spectrally neutral opaques are suggested to influence the relationship between UVVIS spectral slope and Ti. Ilmenite, the major carrier of Ti and the principal oxide phase in lunar soils, is dark and spectrally neutral relative to the spectrally red mature lunar mare soils. Consequently, the UVVIS color ratio has been one of the most widely used spectral parameters in lunar science to estimate the TiO2 composition of mature mare basalts. The extent to which color variations are dependent upon TiO2 or other compositional parameters, however, is not well established. For example, uncertainties in the Charette relation were revealed with failure to accurately predict the low-Ti contents of the Luna 24 basalts. Consequently we examine the correlation between UVVIS color and TiO2 content by integrating Clementine Spectral Reflectance (CSR) and Lunar Prospector neutron spectrometer (LPNS) data. Additional information is included in the original extended abstract.

Author (revised)

Lunar Maria; Basalt; Color; Titanium Oxides; Ultraviolet Astronomy; Lunar Composition

20050169528 Hawaii Univ., Honolulu, HI, USA

Clementine 2.7 microns Data and 70-cm Earth-based Radar Data Provide Additional Constraints for UVVIS-based Estimates of TiO2 Content for Lunar Mare Basalts

Gillis, J. J.; Lucey, P. G.; Hawke, B. R.; Campbell, B. A.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Examination of the correlation between UV/VIS ratio and TiO2 has revealed that UVVIS color is not only a function of the TiO2 content of mare soils but also includes spectral properties of a multitude of components that impart color to lunar soils. Hence, UVVIS color is not a reliable predictor of Ti without the use of additional information to provide other constraints. Recently calibrated Clementine near infrared data (NIR) and newly acquired 70-cm backscatter radar data may provide these additional and important constrains as both data sets provide independent information concerning ilmenite content in the lunar regolith. Data: Clementine collected 11-band multispectral data (0.415 - 2.79 micron) at 100-200 meter per pixel spatial resolution for most of the lunar surface. Color ratio maps were constructed using the 415 and 750 nm images from the US Geological Survey (USGS) digital image model. The 2.7 m data are from the global NIR mosaic produced by the USGS at 500-m/pixel. The 70-cm radar backscatter data presented here were recently collected using the Arecibo and Greenbank telescopes for transmission and reception. The radar echoes are measured in both senses of circular polarization, and with a spatial resolution of approx. 400 m. Typically, 6-8 looks are averaged to reduce speckle in the final maps. These data represent a considerable improvement in resolution over previous radar images. ISIS (Integrate Software for Imagers and Spectrometers) was used to reproject the Clementine UVVIS, NIR, and earth-based radar data to 500 m/pixel. Additional information is included in the original extended abstract.

Author (revised)

Color; Lunar Maria; Basalt; Infrared Astronomy; Radar Astronomy; Titanium Oxides; Lunar Composition

20050169529 Lunar and Planetary Inst., Houston, TX, USA

Changes in the Temperature of Saturn's Stratosphere from 2002 to 2004 and Direct Evidence of a Mesopause

Greathouse, Thomas K.; Roe, Henry G.; Richter, Matthew J.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The state of a planetary stratosphere is intricately linked to the radiation it receives from its host star. The stellar flux impinging on the the planetary stratosphere affects the temperature and chemistry occurring there. The revolution of the planet about its orbit coupled to the planets axial tilt can cause variations in the amount of flux captured by the planet at a given latitude over the period of a year even if the flux output of the star is constant. This variation of stellar flux at a given latitude during the orbit of a planet is what causes seasons. Saturn, with its axial tilt of 27 degrees, experiences seasonal forcing much like the Earth, albeit with far less solar flux and a year equal to 30 Earth years. In an attempt to measure the effect seasonal forcing has on the temperature structure of Saturn's stratosphere, we have started a long term observing program. By observing Saturn with a high-resolution mid-infrared spectrograph in the v(sub 4) band of methane, we can infer the stratospheric temperature between the pressure levels of 10 and 0.01 mbar. We present latitudinally resolved observations of Saturn's southern hemisphere from 2002 and 2004. We have analyzed the data using a line-by-line radiative transfer model and inferred stratospheric temperatures and winds. We compare the temperatures from the two observing runs and the predictions of a stratospheric seasonal climate model. The zonal winds in the southern hemisphere, between the 10 and 0.01 mbar pressure levels, will be shown and discussed.

Derived from text

Stratosphere; Saturn Atmosphere; Mesopause; Annual Variations; Saturn (Planet); Planetary Temperature

20050169530 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Generation and Performance of Automated Jarosite Mineral Detectors for Vis/NIR Spectrometers at Mars

Gilmore, M. S.; Bornstein, B.; Merrill, M. D.; Castano, R.; Greenwood, J. P.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Sulfate salt discoveries at the Eagle and Endurance craters in Meridiani Planum by the Mars Exploration Rover Opportunity have proven mineralogically the existence and involvement of water in Mars past. Visible and near infrared spectrometers like the Mars Express OMEGA, the Mars Reconnaissance Orbiter CRISM and the 2009 Mars Science Laboratory Rover cameras are powerful tools for the identification of water-bearing salts and other high priority minerals at Mars. The increasing spectral resolution and rover mission lifetimes represented by these missions currently necessitate data

compression in order to ease downlink restrictions. On board data processing techniques can be used to guide the selection, measurement and return of scientifically important data from relevant targets, thus easing bandwidth stress and increasing scientific return. We have developed an automated support vector machine (SVM) detector operating in the visible/near-infrared (VisNIR, 300-2500 nm) spectral range trained to recognize the mineral jarosite (typically KFe3(SO4)2(OH)6), positively identified by the Mossbauer spectrometer at Meridiani Planum. Additional information is included in the original extended abstract.
Author
Mars Surface; Minerals; Infrared Spectrometers; Infrared Detectors

20050169533 Bern Univ., Bern, Switzerland
Visible and NIR BRDF Measurements of Lunar Soil Simulant
Gunderso, K.; Whitby, J.; Thomas, N.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Bidirectional reflectance distribution functions (BRDFs) characterize the outgoing intensity of light from illuminated surfaces according to the illumination and observation geometries of those surfaces. Complete BRDF measurements for extraterrestrial objects over a full 2 steradians are rarely possible because the solar position at the time of observation tends to dictate the system geometry irregardless of whether the observation point is on Earth or a spacecraft. Additionally, zero phase angle observations are rarely possible, especially for inner solar system objects. Consequently, surface reflectances for many geometries must be inferred from models that have been fit to the available data. A practical example is the need for reflectances of surfaces that are being measured with laser altimeters. Since such instruments operate at effectively zero phase angle, reflectances of the underlying surfaces must be known at zero phase angle in order to determine link budgets and define specifications for the instruments. Zero phase NIR reflectance of Mercury is of particular importance, but no such data are available. However, BRDF models that have been fitted to a set of reflectance measurements can be extrapolated to zero phase angle in order to estimate typical normal albedos. Because the validity of such extrapolations is questionable, and at risk of introducing further questions of the similarity of the Moon and Mercury, we have performed BRDF measurements of lunar soil simulant JSC-1 and discuss results in the context of Hermean reflectance.
Derived from text
Bidirectional Reflectance; Lunar Soil; Near Infrared Radiation; Light (Visible Radiation)

20050169534 Colorado Univ., Boulder, CO, USA
Wavy and Cycloidal Lineament Formation on Europa from Combined Diurnal and Nonsynchronous Stresses
Gleeson, Damhnait; Crawford, Zane; Barr, Amy C.; Mullen, McCall; Pappalardo, Robert T.; Prockter, Louise M.; Stempel, Michelle M.; Wahr, John; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In a companion abstract, we show that fractures propagated into combined diurnal and nonsynchronous rotation (NSR) stress fields can be cycloidal, 'wavy,' or arcuate in planform as the relative proportion of NSR stress in increased. These transitions occur as NSR stress accumulates over approx. 0 to 10 deg of ice shell rotation, for average fracture propagation speeds of approx. 1 to 3 m/s. Here we consider the NSR speed parameter space for these morphological transitions, and explore the effects on cycloids of adding NSR to diurnal stress. Fitting individual Europan lineaments can constrain the combined NSR plus diurnal stress field at the time of formation.
Author
Europa; Ice; Crusts; Tectonics; Structural Properties (Geology); Stress Distribution

20050169535 University of Northern Arizona, Flagstaff, AZ, USA
Automated Procedures for Detecting Martian Dust Devils
Gibbons, A.; Yang, F.; Mlsna, P.; Geissler, P.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have begun to explore the application of numerical pattern recognition techniques to the problem of locating Martian dust-devils in orbital imagery. Three characteristics of dust-devils can be exploited by this approach: (1) the plumes appear as localized bright clouds with a finite range of dimensions; (2) the plumes cast shadows with known orientations; and (3) the

plumes are present in particular images of any given area but are absent from others. We have divided the problem of identifying dust devils into several steps. The first step is to locate possible candidate plumes, using a scalable matched filter. Second is to classify the candidates to separate likely plumes from other surface features (such as crater rims) that are misidentified by the filter. The final step is to reject static features such as hills and knobs that appear unchanged in multiple images. Additional information is included in the original extended abstract.
Author (revised)
Dust Storms; Mars (Planet); Planetary Mapping; Pattern Recognition; Mars Photographs

20050169536 Arizona State Univ., Tempe, AZ, USA
Factor Analysis and Target Transformation of Mini-TES Spectra: Recovery of Scene Endmembers at Meridiani Planum
Glotch, T. D.; Bandfield, J. L.; Christensen, P. R.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A main objective of sending the MER Opportunity Rover to Meridiani Planum was to investigate the occurrence of gray, crystalline hematite detected by the Mars Global Surveyor Thermal Emission Spectrometer (MGS-TES) instrument. Among the instruments on the rover payload is the Mini-TES, which serves as a complement to the orbital TES instrument and mid-infrared laboratory studies. The gray hematite at Meridiani Planum is present in the form of spherules that have been interpreted as concretions weathering out of a sulfate-rich outcrop. The spherules are also abundant on the plains of Meridiani and may be present as a lag. The shapes of the hematite features in Mini-TES spectra have not varied substantially over the course of the Opportunity mission, implying that the composition of the hematite spherules is relatively uniform. Factor analysis and target transformation techniques have been applied to Mini-TES spectra to isolate the surface component spectral shapes at Meridiani Planum, including that of hematite. These techniques have previously been applied to TES spectra to recover atmospheric and surface spectral shapes. The recovered hematite spectrum is similar to the TES hematite spectrum derived in the same way, and is best matched by a spectrum of hematite derived by dehydroxylation of goethite. Three other spectral shapes were recovered from the Mini-TES data. They include a relatively good match to TES Surface Type 1 (basalt), a spectrum similar to the TES globally homogenous dust spectrum, and a final surface component that appears to be composed largely of sulfate and amorphous silica. An acceptable match to TES Surface Type 2 was not found.
Author
Planetary Composition; Mars Exploration; Mars Surface Samples; Spectrometers

20050169538 Massachusetts Univ., Amherst, MA, USA
Microstructure and Thermal History of Metal Particles in CH Chondrites
Goldstein, J. I.; Jones, R. H.; Kotula, P. G.; Michael, J. R.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations
Contract(s)/Grant(s): DE-AC04-94-AL-85000; NAG5-11778; NAG5-9463; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Fe-Ni metal particles with smooth Ni, Co, and Cr zoning patterns, 8-13 wt.% Ni in the center of the particle to 3-5 wt% Ni at the rim, have been identified in several CR-clan (CH, Bencubbinlike, and CR) chondrites. These zoning patterns are broadly consistent with an origin by gas-solid condensation in the solar nebula at temperatures between approximately 1500 to 1300 K and fast cooling rates, 2 to 25 K/day. Apparently, this condensate metal was not melted during chondrule formation or affected significantly in the solid-state by alteration during parent body processing. Consideration of diffusional redistribution of Ni, Co, Cr and siderophile elements have further constrained the calculated condensation temperatures and cooling rates of the zoned condensates. These condensate metals have irregular shapes and vary in size from 50 to 350 m as revealed in some detail by optical and SEM techniques. In addition to zoned condensate particles, other types of metal particles have been observed. These include zoned condensates with exsolution-precipitates, unzoned homogeneous metal with no exsolution precipitates, unzoned metal exhibiting exsolution precipitates and high Ni metal grains.
Derived from text
Chondrites; Metal Particles; Microstructure; Temperature Dependence; Meteoritic Composition

20050169539 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Assessment of Mars Exploration Rover Landing Site Predictions

Golombek, M. P.; Arvidson, R. E.; Bell, J. F., III; Christensen, P. R.; Crisp, J. A.; Ehlmann, B. L.; Fergason, R. L.; Grant, J. A.; Haldemann, A. F. C.; Parker, T. J.; Squyres, S. W.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mars Exploration Rover (MER) landing sites in Gusev crater and Meridiani Planum were selected because they appeared acceptably safe for MER landing and roving and had strong indicators of liquid water. The engineering constraints critical for safe landing were addressed via comprehensive evaluation of surface and atmospheric characteristics from existing and targeted remote sensing data and models that resulted in a number of predictions of the surface characteristics of the sites, which are tested more fully herein than a preliminary assessment. Relating remote sensing signatures to surface characteristics at landing sites allows these sites to be used as ground truth for the orbital data and is essential for selecting and validating landing sites for future missions.

Derived from text

Landing Sites; Mars Exploration; Remote Sensing; Mars Roving Vehicles

20050169543 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Constraints on Thermal Evolution of Mars from Relaxation Models of Crustal and Topographic Dichotomy

Guest, A.; Smrekar, S. E.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The early thermal evolution of Mars is largely unconstrained. Models such as degree one convection [1,2,3], plate tectonics [4], and a transition to stagnant lid [5] have been proposed to explain formation of the dichotomy, the Tharsis rise, crustal production, and dynamo evolution. Here we model both the early deformation of the dichotomy and the long-term preservation as a means of examining the plausibility of a range of early thermal evolution models. Constraints include the preservation of crustal thickness and topographic differences between the northern and southern hemispheres and the geologic history of the dichotomy [6]). Our previous modeling indicates that the lower crust must have been weak enough to allow for relaxation early on, but the Martian interior had to cool fast enough to preserve the crustal difference and the associated topographic difference (~5 km) over approx. 3-3.5 Gyr [7].

Derived from text

Paleontology; Planetary Crusts; Topography; Plates (Tectonics); Mars Surface; Dichotomies

20050169544 North Dakota Univ., Grand Forks, ND, USA

The Critical Importance of Data Reduction Calibrations in the Interpretability of S-type Asteroid Spectra

Gaffey, Michael J.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479

Contract(s)/Grant(s): NAG5-13792; NNG04GJ86G; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There is significant dispute concerning the interpretation and meteoritic affinities of S-type asteroids. Some of this arises from the use of inappropriate analysis methods and the derivation of conclusions which cannot be supported by those interpretive methodologies [1]. The most frequently applied inappropriate technique is curve matching. Whether matching spectra from a spectral library or mixing end-member spectra to match the asteroid spectrum, curve matching for S-type spectra suffers from a suite of weaknesses that are virtually impossible to overcome. Chief among these is the lack of a comprehensive comparison set. Lacking a complete library that includes both the mineralogical variations and the spectrally significant physical variations (e.g., particle size, petrographic relationships, etc.), curve matches are plagued with potential unresolved ambiguities. The other major weakness of virtually all curve matching efforts is that equal weight is given to matching all portions of the spectrum. In actuality, some portions of the spectrum (e.g., centers of absorption features) must be matched very accurately while other portions of the spectrum (e.g., continuum regions and overall slopes) do not require good matches since they are strongly effected by parameters unrelated to the mineralogy of the sample.

Derived from text

Asteroids; Calibrating; Petrography; Continuums; Curve Fitting; Data Reduction; Spectra

20050169545 Arizona State Univ., Tempe, AZ, USA

A Newly Discovered Hematite-rich Unit in Aureum Chaos: Comparison of Hematite and Associated Units with Those in Aram Chaos

Glotch, T. D.; Rogers, D.; Christensen, P. R.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color and black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Results from the MER Rover Opportunity have pointed to an aqueous depositional mechanism for the hematite-rich unit discovered by the Mars Global Surveyor Thermal Emission Spectrometer (MGS-TES) instrument [1, 2]. Though Meridiani Planum is the site of the largest hematite deposit by area, other hematite-rich units have been discovered in Aram Chaos and Ophir and Candor Chasma [3]. The Aram Chaos hematite-rich deposit has been described as both a hydrothermal [4] and a lacustrine environment [5]. The newly discovered hematite-rich deposit in Aureum Chaos shares several similarities with Aram Chaos, including the presence of hematite in a friable layered unit, and the presence of a light-toned caprock. In addition, the Iani and Arsinoes chaotic terrains, although lacking evidence for crystalline hematite, have interior layered deposits similar to those seen in Aram and Aureum Chaos. The presence of these units over a distance of several hundred kilometers in the equatorial latitudes of Mars may point to a preferred global mechanism for hematite formation.

Derived from text

Chaos; Hematite; Mars Global Surveyor; Mars Surface; Thermal Emission; Crystallinity; Deposits

20050169546 University of West Hungary, Sopron, Hungary

Cathodoluminescence Spectral Studies of the Experimentally Shock-deformed Plagioclase: A Possible Explanation of CL Peak Shifts

Gucsik, A.; Nishido, H.; Ninagawa, K.; Toyoda, S.; Bidlo, A.; Brezsnyanszky, K.; Tsuchiyama, A.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

When an energetic electron beam impinges on the solid surface its energy generates a number of physical processes including emission of secondary electrons (SE), back-scattering of electrons (BSE), electron absorption (sample current), characteristic X-ray, and cathodoluminescence (CL) emission (Marshall, 1988). Much of the total incident beam energy is transformed into heat resulting nonradiative emissions such as phonons. In general, the penetration depth of electrons according to the energy of the electrons (10-20 keV) is approximately in the range of 2-8 m [1]. Cathodoluminescence is a visible radiation in the range of wavelengths between 400 and 700 nm, corresponding to energies between 1.77 and 3.10 electron volts. The relationship between energy and wavelength can be expressed as follows: energy in electron volts (eV) = 1239.8/(wavelength in nm).

Derived from text

Cathodoluminescence; Backscattering; Electron Beams; Solid Surfaces; X Rays

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20050167033 NASA Ames Research Center, Moffett Field, CA, USA

Cooked GEMS - Insights into the Hot Origins of Crystalline Silicates in Circumstellar Disks and the Cold Origins of GEMS

Brownlee, D. E.; Joswiak, D. J.; Bradley, J. P.; Matrajt, G.; Wooden, D. H.; Lunar and Planetary Science XXXVI, Part 2; [2005]; 2 pp.; In English; See also 20050166923; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The comparison of interstellar, circumstellar and primitive solar nebula silicates has led to a significant conundrum in the understanding of the nature of solid materials that begin the planet forming processes. Crystalline silicates are found in circumstellar regions around young stars and also evolved stars ejecting particles into the interstellar medium (ISM) but they are not seen in the interstellar medium itself, the source material for star and planet formation. Crystalline silicates are minor to major components of all known early solar system materials that have been examined as meteorites or interplanetary dust samples. The strong presence of Mg-rich crystalline silicates in Oort cloud comets and their minor presence in some Kuiper belt comets is also indicated by 11.2 m peak in approx. 10 microns ‘silicate’ infrared feature. This evidence strongly indicates

that Mg-rich crystalline silicates were abundant components of the solar nebula disk out to at least 10 AU, and present out to 30 AU.
Derived from text
Interstellar Matter; Interplanetary Dust; Crystallinity; Comets; Planetary Evolution; Silicates

20050167735 Massachusetts Inst. of Tech., Cambridge, MA, USA
Solar Wind Acceleration, Heating, and Evolution with Wave-Particle Interactions
Chang, Tom; August 30, 2004; 7 pp.; In English
Contract(s)/Grant(s): NAG5-9616; No Copyright; Avail: CASI; A02, Hardcopy
The major accomplishment of the research was the comparision of the effects of wave-particle interactions and the kinetic suprathermal electron population on the acceleration of the solar wind.
Author (revised)
Solar Wind; Wave-Particle Interactions; Particle Acceleration; Solar Electrons

20050169197 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Fitting Flux Ropes to a Global MHD Solution: A Comparison of Techniques
Riley, Pete; Linker, J. A.; Lionello, R.; Mikic, Z.; Odstrcil, D.; Hidalgo, M. A.; Cid, C.; Hu, Q.; Lepping, R. P.; Lynch, B. J.; Rees, A.; Journal of Atmospheric and Solar-Terrestrial Physics; 2004; ISSN 1364-6826; No. 66, pp. 1321-1331; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAS5-02061; CIT-PC251439; NAG5-6912; Copyright; Avail: Other Sources
Flux rope fitting (FRF) techniques are an invaluable tool for extracting information about the properties of a sub-class of coronal mass ejections (CMEs) in the solar wind. However, it has proven difficult to assess their accuracy since the underlying global structure of the CME cannot be independently determined from the data. In contrast, large-scale MHD simulations of CME evolution can provide both a global view as well as localized time series at specific points in space. In this study we apply five different fitting techniques to two hypothetical time series derived from MHD simulation results. Independent teams performed the analysis of the events in 'blind tests', for which no information, other than time series, was provided. From the results, we infer the following: 1) Accuracy decreases markedly with increasingly glancing encounters; 2) Correct identification of the boundaries of the flux rope can be a significant limiter; 3) Results from techniques that infer global morphology must be viewed with caution. In spite of these limitations, FRF techniques remain a useful tool for describing in situ observations of flux rope CMEs.
Author
Magnetohydrodynamics; Time Series Analysis; Coronal Mass Ejection; Fitting

20050169484 Eidgenoessische Technische Hochschule, Zurich, Switzerland
Trapping and Release Data of Artificially Implanted Noble Gases into Metals: Tests for Genesis Targets
Grimberg, A.; Buehler, F.; Bochsler, P.; Heber, V.; Baur, H.; Wieler, R.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document
The collection of Solar Wind (SW) on NASA's Genesis mission [1] has been achieved by the implantation of SW ions into high-purity collection substrates. The trapping efficiency of ions in any material is mainly controlled by losses due to backscattering. This in turn leads to mass discrimination for implanted isotopes. To correct for these effects, especially under SW conditions, it is necessary to simulate the irradiation and test modelling data with reality. Therefore two different experiments were carried out: In the first, different target materials were artificially bombarded with noble gases to determine mass discrimination. The results of subsequent mass-spectrometric analyses were then used to test the validity of TRIM-calculated predictions [2]. In the second experiment, we implanted Ne-20 and Ne-22 with different energies into Ax1 metallic glass [3] to simulate the SW and the higher energetic SEP component [4]. This was to test whether the depth resolution of closed-system stepwise etching (CSSE) [5] on the glass is high enough to separate the two components.
Derived from text
Solar Wind; Genesis Mission; Rare Gases; Implantation; Metals; Trapping; Neon Isotopes

20050169502 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Vapor Pressure of Palladium at Temperatures up to 1973K
Gardner, K. G.; Feguson, F. T.; Nuth, J. A.; Lunar and Planetary Science XXXVI, Part 7; [2005]; 2 pp.; In English; See also 20050169479; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Understanding high-temperature processes is imperative for modeling the formation of the solar system. It is unfortunate that since the 1950 s little has been done in the area of thermodynamics to continue gaining information on metals such as iron (Fe), nickel (Ni), cobalt (Co), palladium (Pd) and many others. Although the vapor pressures of these metals can be extrapolated to higher temperatures, the data is often limited to temperature ranges too low to be applicable to processes that occur during the formation of the solar system (T approx. 2000K). Experimental techniques inhibited the data in the past by restricting the testing of metals to temperatures below their melting point. Today, higher temperature testing is possible by using a Thermo- Cahn Thermogravimetric system that is able to reach temperatures up to 1973K in vacuo and measure a 10 gram change in a sample with mass of up to 100 grams.
Derived from text
Vapor Pressure; High Temperature; Palladium; Solar System; Evolution (Development)

93
SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

20050167791 NASA Johnson Space Center, Houston, TX, USA
A New Perspective on Trapped Radiation Belts in Planetary Atmospheres
Diaz, A.; Lodhi, M. A. K.; Wilson, T. L.; Lunar and Planetary Science XXXVI, Part 4; [2005]; 2 pp.; In English; See also 20050167788; Original contains color illustrations; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The charged particle fluxes trapped in the magnetic dipole fields of certain planets in our Solar System are interesting signatures of planetary properties in space physics. They also represent a source of potentially hazardous radiation to spacecraft during planetary and interplanetary exploration. The Earth s trapped radiation belts have been studied for years and the physical mechanisms by which primary radiation from the Sun and Galaxy is captured is well understood. The higher-energy particles collide with molecules in the planetary atmosphere and initiate large cascades of secondary radiation which itself becomes trapped by the magnetic dipole field of the planet. Some of it is even backscattered as albedo neutrons.
Derived from text
Atmospheric Physics; Charged Particles; Magnetic Dipoles; Planetary Atmospheres; Trapped Magnetic Fields; Radiation Belts

99
GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20050165775 National Inst. of Information and Communications Technology, Japan
The Single Molecule Nanometry for the Bio-supermolecule Research
Kojima, Hiroaki; Review of the National Institute of Information and Communications Technology, Volume 50, Nos. 3/4; September/December 2004, pp. 7-15; In Japanese; See also 20050165771; Copyright; Avail: Other Sources

In order to understand functions of bio-supermolecules, it is important to characterize their behaviors by observing and manipulating them directly at a single molecule level. The newly developed technique; single molecule nanometry makes it possible to perform such characterization. Here, we introduce the principles, system configurations, and applications of the single molecule observations, the single molecule manipulation, and their derivative techniques mainly from the technical point of view.
Author
Molecules; Molecular Structure; Nanotechnology; Derivation; Characterization

20050166363 NASA, Washington, DC, USA

National Aeronautics and Space Administration 2003 Strategic Plan

2003; 64 pp.; In English; Original contains color illustrations

Report No.(s): NASA/NP-2003-01-298-HQ; No Copyright; Avail: CASI; A04, Hardcopy

Imagine knowing that we are not alone, but that life is abundant in our solar system and throughout the universe. Imagine a world where we can safely travel anywhere, anytime, on our home planet, and in space. Imagine a world in which long-term weather forecasts are reliable, and natural disasters are predictable and perhaps even preventable. NASA is changing our understanding of the world, exploring the unknown, and creating new awareness about who we are and what our place is in the cosmos. For the first time in history, we have the tools, the insight and ability to seek answers to some of humanity's most profound questions: 1) How did we get here? 2) Where are we going? 3) Are we alone? In addition to pursuing these compelling questions, NASA helps the Nation to meet its challenges and address its urgent national needs. Among these are the requirements to improve the security and safety of our air transportation system and counter the looming shortage of U.S. scientists and engineers in our next generation of Americans.

Author (revised)

NASA Programs; General Overviews; Policies; Astronautics; Space Exploration

20050167066 Research and Technology Organization, Neuilly-sur-Seine, France

RTO Technical Publications: A Quarterly Listing

April 2005; 2 pp.; In English

Report No.(s): RTO-05-01; No Copyright; Avail: CASI; A01, Hardcopy

This is a listing of recent unclassified RTO technical publications processed by the NASA Center for AeroSpace Information. Reports may be downloaded for free from the RTO web site at http://www.rta.nato.int or they may be purchased from the NASA Center for AeroSpace Information, 7121 Standard Drive, Hanover, MD 21076-1320 USA, phone 301-621-0390, fax 301-621-0134. Prices and order forms are available from the NASA STI web site at http://www.sti.nasa.gov. An automatic distribution of unclassified RTO technical publications on CD-ROM is also available within the U.S. by annual subscription from the NASA Center for AeroSpace Information.

Author

Bibliographies; Military Technology; North Atlantic Treaty Organization (NATO); Armed Forces (Foreign)

20050169199 NASA, Washington, DC, USA

Aeronautics and Space Report of the President: Fiscal Year 1999 Activities

[1999]; 113 pp.; In English

Report No.(s): NASA/NP-2000-10-259-HQ; No Copyright; Avail: CASI; A06, Hardcopy

The National Aeronautics and Space Act of 1958 directed the annual Aeronautics and Space Report to include a 'comprehensive description of the programmed activities and the accomplishments of all agencies of the USA in the field of aeronautics and space activities during the preceding calendar year.' In recent years, the reports have been prepared on a fiscal year basis, consistent with the budgetary period now used in programs of the Federal Government. This year's report covers activities that took place from October 1, 1998, through September 30, 1999.

Author

Presidential Reports; Aeronautics; Astronautics

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