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IN REPLY REFER TO: DTIC-R (FOIA 2015-1)

OCT 3 2014

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 OCT 3 2014

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Sincerely,

3 Enclosures

MICHAEL HAMILTON
FOIA Program Manager

Highest Classification: Unclassified

DTIC Bibliography

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FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Availability: Pub. in Artic Research in the United States, v12, p70-72, Fall/Winter 1998. Available only to DTIC users. No copies furnished by NTIS.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) High Frequency Active Auroral Research Program

PDF URL: (pdf) - 386 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA402480

Accession Number: ADA402480

Personal Author(s): Kossey, P A ; Heckscher, J L ; Carlson, H C ; Kennedy, E J

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA SPACE VEHICLES DIRECTORATE

Report Date: Jan 2002

Abstract: (U) A major facility for conducting experimental radio science research is under development in Gakona, Alaska, as part of the High Frequency Active Auroral Research Program (HAARP), jointly managed by he Air Force Research Laboratory and the Office of Naval Research. A key objective of the program is to identify and characterize the physical processes that can be initiated in the atmosphere, ionosphere, and space via interactions with high power radio waves.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:4 Page(s)

Report Number: AFRL-VS-TR-2002-1568 *(AFRLVSTR20021568)* , XC - AFRL-VS-HA *(XCAFRLVSHA)*

Monitor Series: AFRL-VS-HA *(AFRLVSHA)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Availability: Pub. in QST-Official Jnl of the American Radio Rely LEague, v80 n9, p33-35, Sep 1996. Available only to DTIC users. No copies furnished by NTIS.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) The High Frequency Active Auroral Research Program

PDF URL: (pdf) - 836 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA401810

Accession Number: ADA401810

Personal Author(s): Kennedy, Edward J ; Heckscher, John

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA SPACE VEHICLES DIRECTORATE

Report Date: Sep 1996

Abstract: (U) During a public open house at a new government facility in Gokona, Alaska, a visiting ham was overheard to say, 'this is a ham's dream station'. The visitor, a KL7 from Anchorage, was referring to the antenna array being constructed for the High Frequency Active Auroral Research Program (HAARP). The array, together with its associated transmitters - called the Ionospheric Research Instrument (IRI) - is being constructed to play an integral role in an area of physics called active ionospheric research.

Abstract Classification:Unclassified

Pages:4 Page(s)

Report Number: AFRL-VS-HA - TR-2002-1569 AFRL-VS-HA *(AFRLVSHATR20021569 AFRLVSHA)* , XC - TR-2002-1569 AFRL-VS-HA *(XCTR20021569 AFRLVSHA)*

Monitor Series: TR-2002-1569 *(TR20021569)* , AFRL-VS-HA *(AFRLVSHA)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) HAARP Diagnostic Instruments; High Frequency Active Auroral Research Program

PDF URL: (pdf) - 4 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA426081

Accession Number: ADA426081

Personal Author(s): Kossey, Paul A ; Battis, James C

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA SPACE VEHICLES DIRECTORATE

Report Date: Dec 2002

Abstract: (U) This report describes the suite of diagnostic instruments at a major facility for experimental radio science research, under development in Gakona, Alaska. This site is being developed as part of the High Frequency Active Auroral Research Program (HAARP). A key objective of the program is the identification and characterization of the physical processes initiated in the ionosphere and space via interactions with high power radio waves. Among these phenomena are: plasma instabilities and turbulence; electron acceleration, including the production of optical and infrared (IR) emissions; the generation, maintenance and/or suppression of ionization structures aligned along the earth's magnetic field; the modulation of currents in the ionosphere, thereby producing virtual antennas in space to generate ULF/ELF/VLF radio waves; and the production of stimulated electromagnetic emissions (SEE). The efficiencies that can be obtained in the initiation, maintenance, and control of such processes and techniques to excite selected (individual) processes, or to suppress unwanted ones, are also research areas of increasing interest. To provide the experimental capabilities required to meet its objectives, the HAARP Gakona facility includes a powerful, phased-array, high-frequency (HF) transmitter and an extensive complement of radio-frequency and optical diagnostic instruments.

Abstract Classification:Unclassified

Descriptive Note: Interim rept. 1 Oct 2002-30 Sep 2003

Pages:71 Page(s)

Report Number: AFRL-VS-TR-2003-1570 *(AFRLVSTR20031570)* , XC - AFRL-VS-HA *(XCAFRLVSHA)*

Monitor Series: AFRL-VS-HA *(AFRLVSHA)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Electromagnetic Spectrum Occupancy Study of a Potential Transmitter Site for the HF Active Auroral Research Program (HAARP).

PDF URL: (pdf) - 12 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA288909

Accession Number: ADA288909

Personal Author(s): Goldstein, Joseph A ; Kennedy, Edward J ; McGown, Monroe Y

Corporate Author: NAVAL RESEARCH LAB WASHINGTON DC

Report Date: 30 Sep 1994

Abstract: (U) This report presents the results of measurements conducted by the Naval Research Laboratory in May and June 1993. The purpose of the measurements was to ascertain the radio frequency occupancy in the immediate vicinity of the proposed High Frequency Active Auroral Research Program (HAARP) facility to be constructed in the Gakona, Alaska area. The HAARP facility will consist of a large planar array of antennas excited by phased high power transmitters operating in the lower portion of the HF band (2.8 to 8 MHz). The existing electromagnetic spectrum usage in the vicinity of Gakona was measured in order to assess the potential for electromagnetic interference problems arising from the HAARP facility. The measurements covered the frequency spectrum from 2 MHz to 1000 MHz. Data was collected for a period of 17 days in May and early June 1993. There are a large number of users in the HF band and data shows a normal diurnal pattern of energy increase in the lower portion of the band in the nighttime hours. The number of users decreases with increasing frequency because the propagation path at higher frequencies is dependent upon line-of-sight signal paths. Gakona is a very rural area and is separated by hilly terrain from surrounding residential and commercial activities. Above the HF bend, the most prominent signal identified is a 152 MHz transient signal that saturates the signal path of our measurement apparatus. The signal is so strong that it produces harmonics throughout the measurement band and distorts the display of the data. Another strong feature that is sometimes observed is a 450 MHz signal.

Abstract Classification:Unclassified

Descriptive Note: Interim rept. May-Jun 93,

Pages:50 Page(s)

Report Number: NRL/MR/5554--94-7622 *(NRLMR5554947622)* , XB - ONR *(XB)*

Monitor Series: ONR

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) HAARP, Research and Applications

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA355641

Accession Number: ADA355641

Personal Author(s): Papadopoulos, Dennis ; Bernhardt, Paul A ; Carlson, Herbert C , Jr ; Gordon, William E ; Gurevich, Alexander V

Corporate Author: NAVAL RESEARCH LAB WASHINGTON DC

Report Date: Jan 1990

Abstract: (U) This report describes and documents the scientific uses and the wide range of applications created by the HF Active Auroral Research Program (HAARP). The report is based on the deliberations of a scientific committee sponsored by the Air Force Research Laboratory and the Office of Naval Research and convened by the East-West Space Science Center of the University of Maryland. The HAARP represents a technological advancement with capabilities that allow for new and unique dual-use research and application opportunities. Use of the ionosphere as an active, nonlinear medium allows the primary HF energy to be transformed in a controlled fashion into coherent radiation from 0.001 Hz to 40 kHz and into incoherent IR and visible wavelengths. This function, supplemented with the generation of FAS and with the use of the transmitter as a radar, makes the HAARP transmitter a unique source for remote sensing and communication uses.

Abstract Classification:Unclassified

Pages:19 Page(s)

Report Number: XB - NRL *(XB)*

Monitor Series: NRL

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Investigation of Ionospheric Disturbances and Associated Diagnostic Techniques.

PDF URL: (pdf) - 981 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA307797

Accession Number: ADA307797

Personal Author(s): Duncan, L M

Corporate Author: CLEMSON UNIV SC

Report Date: 12 Dec 1995

Abstract: (U) The objectives of this research and development program were to conduct simulation modeling of the generation and propagation of atmospheric acoustic signals associated with surface and subsurface ground disturbances; to construct an experimental measurement system for exploratory research studies of acoustic generated ionospheric disturbances; to model high power radio wave propagation through the ionosphere, including nonlinear wave plasma interaction effects; and to assist in the assessment of diagnostic systems for observation of ionospheric modification experiments using existing and planned high latitude high power rf transmitting facilities. A computer simulation of ionospheric response to ground launched acoustic pulses was constructed and results compared to observational data associated with HF and incoherent scatter radar measurements of ionospheric effects produced by earthquakes and ground level explosions. These results were then utilized to help define the design, construct and test for an HF Doppler radar system. In addition, an assessment was conducted of ionospheric diagnostic instruments proposed for the Air Force/Navy High Frequency Active Auroral Research Program (HAARP).

Abstract Classification:Unclassified

Descriptive Note: Final rept. 1 Jan 92-31 Dec 94,

Pages:21 Page(s)

Report Number: PL* - TR-94-2309 PL/HANSCOM *(PLTR942309 PLHANSCOM)* , XC - TR-94-2309 PL/HANSCOM *(XCTR942309 PLHANSCOM)*

Monitor Series: TR-94-2309 *(TR942309)* , PL/HANSCOM *(PLHANSCOM)*

Contract/Grant/Transfer Number: F19628-90-K-0054 *(F1962890K0054)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Creation of Artificial Ionospheric Layers Using High-Power HF Waves

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA545439

Accession Number: ADA545439

Personal Author(s): Pedersen, T ; Gustavsson, B ; Mishin, E ; Kendall, E ; Mills, T ; Carlson, H C ; Snyder, A L

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA SPACE VEHICLES DIRECTORATE

Report Date: 30 Jan 2010

Abstract: (U) We report the first evidence of artificial ionospheric plasmas reaching sufficient density to sustain interaction with a high-power HF pump beam produced by the 3.6 MW High-Frequency Active Auroral Program (HAARP) transmitter in Gakona, Alaska. The HF-driven ionization process is initiated near the 2nd electron gyroharmonic at 220 km altitude in the ionospheric F region. Once the artificial plasma reaches sufficient density to support interaction with the transmitter beam it rapidly descends as an ionization wave to approximately 150 km altitude. Although these initial artificial layers appear to be dynamic and highly structured, this new ability to produce significant artificial plasma in the upper atmosphere opens the door to a new regime in ionospheric radio wave propagation where transmitter-produced plasmas dominate over the natural ionospheric plasma and may eventually be employed as active components of communications, radar, and other systems.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:5 Page(s)

Report Number: AFRL-RV-HA-TR-2011-1031 *(AFRLRVHATR20111031)* , XC - AFRL-RV-HA *(XCAFRLRVHA)*

Monitor Series: AFRL-RV-HA *(AFRLRVHA)*

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Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 26 - NOT AVAILABLE IN MICROFICHE

Distribution Statement:Approved for public release; distribution is unlimited., Availability: This document is not available from DTIC in microfiche.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Ionospheric Modification at Twice the Electron Cyclotron Frequency

PDF URL: (pdf) - 5 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA435721

Accession Number: ADA435721

Personal Author(s): Djuth, F T ; Pedersen, T R ; Gerken, E A ; Bernhardt, P A ; Selcher, C A ; Bristow, W A ; Kosch, M J

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA

Report Date: 01 Apr 2005

Abstract: (U) In 2004, a new transmission band was added to the HAARP high-frequency ionospheric modification facility that encompasses the second electron cyclotron harmonic at altitudes between 220 and 330 km. Initial observations indicate that greatly enhanced airglow occurs whenever the transmission frequency approximately matches the second electron cyclotron harmonic at the height of the upper hybrid resonance. This is the reverse of what happens at higher electron cyclotron harmonics. The measured optical emissions confirm the presence of accelerated electrons in the plasma.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:8 Page(s)

Report Number: AFRL-VS-HA-TR-2005-1070 *(AFRLVSHATR20051070)* , XC - AFRL/MA *(XCAFRLMA)*

Monitor Series: AFRL/MA *(AFRLMA)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Investigations of the Nature and Behavior of Plasma Density Disturbances That May Impact GPS and Other Transionospheric Systems

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA419703

Accession Number: ADA419703

Personal Author(s): Fremouw, Edward J ; Mazzella, Andrew J , Jr ; Rao, Guan-Shu

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC BELLEVUE WA

Report Date: 26 Nov 2001

Abstract: (U) This report summarizes research during the fourth year of a contract for investigating (a) natural variations in ionospheric total electron content (TEC) and (b) plasma and electromagnetic effects produced by transmitting high-powered HF waves into the ionosphere. Ongoing efforts to maintain and utilize data from the Air Force Ionospheric Measuring Systems are being conducted. Initial efforts in upgrading these systems for enhanced data collection and reporting capabilities also are being conducted. Preliminary scintillation capabilities at the GPS L1 and L2 frequencies were established, with additional arrangements for incorporating UHF scintillation measurements also being accomplished. An array of diagnostic instruments is being maintained and enhanced in association with the High-frequency Active Auroral Research Program (HAARP). In addition to a classic riometer and a GPS Total Electron

Content (TEC) sensor previously operating at the HAARP site, NWRA also operates a set of Transit receivers for measurements of TEC and scintillation at VHF and UHF, supplementing the receiver at HAARP with a receiver north of the site and an additional receiver installed south of the HAARP site.

Abstract Classification:Unclassified

Descriptive Note: Annual rept. 1 Sep 2000-31 Aug 2001

Pages:30 Page(s)

Report Number: NWRA-CR-01-R240 *(NWRACR01R240)* , AFRL-VS - TR-2002-1672 AFRL-VS *(AFRLVSTR20021672 AFRLVS)* , XC - TR-2002-1672 AFRL-VS *(XCTR20021672 AFRLVS)*

Monitor Series: TR-2002-1672 *(TR20021672)* , AFRL-VS *(AFRLVS)*

Contract/Grant/Transfer Number: F19628-97-C-0078 *(F1962897C0078)*

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Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Investigations of the Nature and Behavior of Plasma-Density Disturbances That May Impact GPS and Other Transionospheric Systems

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA417708

Accession Number: ADA417708

Personal Author(s): Andreason, Angela M ; Holland, Elizabeth A ; Fremouw, Edward J ; Mazzella, Andrew J , Jr ; Rao, G S

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC BELLEVUE WA

Report Date: 31 Oct 2002

Abstract: (U) This report summarizes research during a contract for investigating (a) natural variations in ionospheric total electron content (TEC) and (b) plasma and electromagnetic effects produced by transmitting high-powered HF waves into the ionosphere. Ongoing efforts to maintain and utilize data from the Air Force Ionospheric Measuring Systems are being conducted. Initial efforts in upgrading these systems for enhanced data collection and reporting capabilities also are being conducted. Preliminary scintillation capabilities at the GPS L1 and L2 frequencies were established, with additional arrangements for incorporating UHF scintillation measurements also being accomplished. An array of diagnostic instruments is being maintained and enhanced in association with the High-frequency Active Auroral Research Program (HAARP). In addition to a classic riometer and a GPS Total Electron Content (TEC) sensor previously operating at the HAARP site, NWRA also operates a set of Transit receivers for

measurements of TEC and scintillation at VHF and UHF, supplementing the receiver at HAARP with a receiver north of the site and an additional receiver installed south of the HAARP site.

Abstract Classification:Unclassified

Descriptive Note: Final rept. 10 Sep 1997-30 Sep 2002

Pages:33 Page(s)

Report Number: NWRA-CR-02-R247 *(NWRACR02R247)* , AFRL-VS - TR-2003-1540 AFRL-VS-HA *(AFRLVSTR20031540 AFRLVSHA)* , XC - TR-2003-1540 AFRL-VS-HA *(XCTR20031540 AFRLVSHA)*

Monitor Series: TR-2003-1540 *(TR20031540)* , AFRL-VS-HA *(AFRLVSHA)*

Contract/Grant/Transfer Number: F19628-97-C-0078 *(F1962897C0078)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) An Electromagnetic Interference Study of Potential Transmitter Sites for the HF Active Auroral Research Program (HAARP)

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA267743

Accession Number: ADA267743

Personal Author(s): Goldstein, Joseph A ; Kennedy, Edward J ; Eley, Adrian S ; Rupar, Michael A

Corporate Author: NAVAL RESEARCH LAB WASHINGTON DC

Report Date: 19 Jul 1993

Abstract: (U) This report presents the results of Electromagnetic Interference (EMI) measurements conducted by the Naval Research Laboratory in June of 1991. This study examined a number of potential sites for the location of the proposed High Frequency Active Auroral Research Program (HAARP) transmitter facility. The proposed HAARP facility will consist of a large planar array of antennas excited by phased high power transmitters operating in the lower portion of the HF band (2.8 to 8 MHz). Several candidate locations were identified for study in the vicinity of Fairbanks, Alaska. The magnitude of EMI in the population centers and on other commercial and public facilities in the vicinity of Fairbanks from the high power transmitter is a major factor in the site selection process for HAARP. The EMI investigations were conducted in two phases. For Phase I of the study, EMI measurements were conducted at two receiver locations using an airborne transmitter at thirteen potential HAARP sites. The results from the Phase I measurements were examined and the two most promising candidate transmitter locations were selected for more comprehensive measurements during Phase II. For

Phase II, comprehensive EMI measurements were made for each of the two candidate transmitter sites. Field strengths were measured at a variety of receiver locations that are representative of the impact area for the EMI from HAARP. The results for both the Phase I and Phase II measurements are presented in this report.

Abstract Classification:Unclassified

Descriptive Note: Interim rept.

Pages:40 Page(s)

Report Number: NRL/MR/5554--93-7375 *(NRLMR5554937375)* , XC - PL/HANSCOM *(XCPLHANSCOM)*

Monitor Series: PL/HANSCOM *(PLHANSCOM)*

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Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Approved for public release; distribution is unlimited. Available only to DTIC users. U.S. Government or Federal Purpose Rights License.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Observations of Amplitude Saturation in ELF/VLF Wave Generation by Modulated HF Heating of the Auroral Electrojet

PDF URL: (pdf) - 252 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA514953

Accession Number: ADA514953

Personal Author(s): Moore, R C ; Inan, U S ; Bell, T F

Corporate Author: STANFORD UNIV CA DEPT OF ELECTRICAL ENGINEERING

Report Date: 28 Jun 2006

Abstract: (U) We present detailed observations of the onset of amplitude saturation in ELF/VLF waves generated via modulated HF heating of naturally-forming, large-scale current systems, such as the auroral electrojet. Broadband ELF/VLF measurements at a ground-based receiver located near the High-Frequency Active Auroral Research Program (HAARP) HF transmitter in Gakona, Alaska, exhibit variations in signal amplitude which are qualitatively consistent with a hard-limiting approximation of the saturation process. A method to approximate the saturation curve as a function of HF power from experimental data is presented, and the results indicate that a tilde 5-10% reduction in generated ELF signal amplitude is typical at the maximum radiated HF power level (771 kW) for modulation frequencies between 1225 Hz and 3365 Hz. For HF transmissions using sinusoidal amplitude modulation, the saturation dominantly affects the second harmonic of the generated ELF/VLF signal, with amplitudes on average 16% lower than expected at the maximum HF power level.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:6 Page(s)

Report Number: XB - ONR *(XB)*

Monitor Series: ONR

Contract/Grant/Transfer Number: N00014-03-0631 *(N00014030631)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) ELF Waves Generated by Modulated HF Heating of the Auroral Electrojet and Observed at a Ground Distance of Approximately 4400 km

PDF URL: (pdf) - 252 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA514755

Accession Number: ADA514755

Personal Author(s): Moore, R C ; Inan, U S ; Bell, T F ; Kennedy, E J

Corporate Author: STANFORD UNIV CA DEPT OF ELECTRICAL ENGINEERING

Report Date: 22 May 2007

Abstract: (U) We present calibrated measurements of ELF waves generated by modulated HF heating of the auroral electrojet by the High frequency Active Auroral Research Program (HAARP) HF transmitter in Gakona, Alaska, and detected after propagating more than 4400 km in the Earth-ionosphere waveguide to Midway Atoll. The magnitude of the 2125 Hz wave received at Midway Atoll is consistent with the radiation from a horizontal dipole located at the altitude of the maximum Hall conductivity variation (created by modulated HF heating) and radiating approximately 4-32 W. The HF-ELF conversion efficiency at HAARP is thus estimated to be approximately 0.0004-0.0032% for the 2125 Hz wave generated using sinusoidal amplitude modulation.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:8 Page(s)

Report Number: XB - ONR *(XB)*

Monitor Series: ONR

Contract/Grant/Transfer Number: N00014-00-1-0643 *(N000140010643)* , N00014-05-C-0308 *(N0001405C0308)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Physics of the Geospace Response to Powerful HF Radio Waves

PDF URL: (pdf) - 119 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA569091

Accession Number: ADA569091

Personal Author(s): Mishin, Evgeny

Corporate Author: AIR FORCE RESEARCH LAB KIRTLAND AFB NM SPACE VEHICLES DIRECTORATE

Report Date: 31 Oct 2012

Abstract: (U) This report describes the results of studies of the response of the Earth's space plasma to high-power HF radio waves from the High-frequency Active Auroral Research Program (HAARP) facility in Alaska under the 2010-2012 AFOSR task Physics of the Geospace Response to Powerful HF Radio Waves'. A first-principle model of a HF-created ionizing wave has been developed, quantitatively explaining the observed artificial plasma layers. The FLIP model has been adapted to the conditions of HF heating and explored to simulate artificial ducts. DMSP-HAARP experiments revealed that HF-created ion outflows and artificial density ducts in the topside ionosphere appeared faster than predicted by the models, pointing to kinetic (suprathermal) effects. CHAMP/GRACE-HAARP experiments presented the first evidence of F2-region atmospheric gravity waves generated by HF heating. A novel 3D numerical model of nonlinear interactions of lower hybrid waves with plasma particles has been explored. The resulting spectral energy distribution virtually reproduced the satellite observations.

Abstract Classification:Unclassified

Descriptive Note: Final rept. 1 Oct 2009-30 Sep 2012

Pages:5 Page(s)

Report Number: 377ABW-2012-1401 *(377ABW20121401)* , XC - AFOSR/VA *(XCAFOSRVA)*

Monitor Series: AFOSR/VA *(AFOSRVA)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Investigations of the Effects of Ionospheric Total Electron Content and Scintillation on Transionospheric Radio Wave Propagation

PDF URL: (pdf) - 2 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA402136

Accession Number: ADA402136

Personal Author(s): Andreasen, C C ; Fremouw, Edward J ; Holland, Elizabeth A ; Mazzella, Andrew J , Jr ; Rao, Guan-Shu

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC BELLEVUE WA

Report Date: 26 Oct 1998

Abstract: (U) Numerous DoD communication, navigation, and surveillance systems depend upon transionospheric propagation of radio signals between space and the ground. The group delay and phase advance encountered by such signals depend upon the path integral of ionospheric plasma density - the so-called total electron content (TEC). Their phase and intensity also can fluctuate due to refractive/diffractive scatter in plasma-density irregularities - i.e., they can suffer complex-signal scintillation. In this project, Northwest Research Associates (NWRA) collaborated with researchers at the Air Force Research Laboratory (AFRL) at Hanscom AFB in the observation and modeling of TEC and scintillation. Central to the TEC effort was operation and refinement of the Air Force Ionospheric Measuring System (AN/GMQ-35). The scintillation effort was confined to development of operational code, called WBMGRID, for running a gridded version of NWRA's scintillation model, WBMOD, with AFRL's Scintillation Decision Aid (SCINDA). Late in the project, effort was re-directed from scintillation research to broader ionospheric questions, as part of the High Frequency Active Auroral Research Program.

Abstract Classification:Unclassified

Descriptive Note: Final rept. 8 Jul 1994-31 Aug 1998

Pages:46 Page(s)

Report Number: NWRA-CR-98-R186 *(NWRACR98R186)* , AFRL-VS-HA - TR-98-0120 AFRL-VS-HA *(AFRLVSHATR980120 AFRLVSHA)* , XC - TR-98-0120 AFRL-VS-HA *(XCTR980120 AFRLVSHA)*

Monitor Series: TR-98-0120 *(TR980120)* , AFRL-VS-HA *(AFRLVSHA)*

Contract/Grant/Transfer Number: F19628-94-C-0067 *(F1962894C0067)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Multi-hop Whistler-Mode ELF/VLF Signals and Triggered Emissions Excited by the HAARP HF Heater

PDF URL: (pdf) - 468 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA515081

Accession Number: ADA515081

Personal Author(s): Inan, U S ; Golkowski, M ; Carpenter, D L ; Reddell, N ; Moore, R C ; Bell, T F ; Paschal, E ; Kossey, P ; Kennedy, E ; Meth, S Z

Corporate Author: STANFORD UNIV CA SPACE TELECOMMUNICATIONS AND RADIOSCIENCE LAB (STAR)

Report Date: 28 Dec 2004

Abstract: (U) Modulated heating of the lower ionosphere with the HAARP HF heater is used to excite 1-2 kHz signals observed on a ship-borne receiver in the geomagnetic conjugate hemisphere after propagating as ducted whistler-mode signals. These 1-hop signals are believed to be amplified, and are accompanied by triggered emissions. Simultaneous observations near (tilde 30 km) HAARP show 2-hop signals which travel to the northern hemisphere upon reflection from the ionosphere in the south. Multiple reflected signals, up to 10-hop, are detected, with the signal dispersing and evolving in shape, indicative of re-amplification and re-triggering of emissions during successive traversals of the equatorial interaction regions.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:5 Page(s)

Report Number: XB - ONR *(XB)*

Monitor Series: ONR

Contract/Grant/Transfer Number: N00014-03-0631 *(N00014030631)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Contrasting O/X-mode Heater Effects on O-Mode Sounding echo and the Generation of Magnetic Pulsations

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA513500

Accession Number: ADA513500

Personal Author(s): Kuo, Spencer ; Cheng, Wei-Te ; Snyder, Arnold ; Kossey, Paul ; Battis, James

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA SPACE VEHICLES DIRECTORATE

Report Date: 06 Jan 2010

Abstract: (U) The effects on the ionosphere of powerful O-mode and X-mode pump waves, modulated 3 minutes on and 1 minute off, were explored. The experiments were monitored using the digisonde and magnetometer located at the HAARP facility. The results show that the virtual heights of the O-mode sounding echoes shifted down/up as the O/X mode heater was turned on; the ionosphere also moved downward/upward accordingly. Enhanced spread-f was also observed in O-mode heater-on periods. Heater-induced magnetic pulsation was observed. Its intensity increased progressively in the heater on/off sequence and X-mode heater was more effective than O-mode heater in the generation of magnetic pulsation. In the last X-mode heater-on period, when the magnetic pulsation reached the highest level, pc 3 pulsations, with increasing intensity, were also observed.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:6 Page(s)

Report Number: AFRL-RV-HA-TR-2010-1001 *(AFRLRVHATR20101001)* , XC - AFRL *(XC)*

Monitor Series: AFRL

Contract/Grant/Transfer Number: N00014-05-1-0109 *(N000140510109)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Approved for public release; distribution is unlimited. Available only to DTIC users. U.S. Government or Federal Purpose Rights License.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Magnetospheric Amplification and Emission Triggering by ELF/VLF Waves Injected by the 3.6 MW HAARP Ionospheric Heater

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA514662

Accession Number: ADA514662

Personal Author(s): Golkowski, M ; Inan, U S ; Gibby, A R ; Cohen, M B

Corporate Author: STANFORD UNIV CA DEPT OF ELECTRICAL ENGINEERING

Report Date: 01 Oct 2008

Abstract: (U) The HF dipole array of the High Frequency Active Auroral Research Program (HAARP) in Gakona, Alaska, was recently upgraded to 180 elements, facilitating operations at a total radiated power level of 3.6 MW and an effective radiated power of 575 MW. In the first experiments at the new power level, the HAARP array is used for magnetospheric wave injection. Modulated heating of auroral electrojet currents in the ionosphere yields radiation in the ELF/VLF frequency range. The HAARP-generated signals are injected into the magnetosphere, where they propagate in the whistler mode in field-aligned ??ducts,?? allowing them to be observed at the conjugate point on a ship-borne receiver and on autonomous buoy platforms. The observation of the 1-hop signals is accompanied by the observation of associated 2-hop components in the northern hemisphere, which have reflected from the ionospheric boundary in the southern hemisphere. The observed signals are accompanied by triggered emissions and exhibit temporal amplification of 15?25 dB/s and bandwidth broadening to 50 Hz. Amplification occurs at injected signal frequencies selected in near real time on the basis of observations of natural emission activity, and only certain components of the frequency-time formats transmitted are amplified.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:13 Page(s)

Report Number: XD - DARPA *(XD)*

Monitor Series: DARPA

Contract/Grant/Transfer Number: N00014-05-C-0308 *(N0001405C0308)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) HAARP 2011 Summer Student Research Campaign

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA578332

Accession Number: ADA578332

Personal Author(s): Kennedy, Edward J ; Secan, J A ; Snyder, A L

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC REDMOND WA

Report Date: 16 Oct 2012

Abstract: (U) The 2011 Summer Student Research Campaign (SSRC) was conducted at the High Frequency Active Auroral Research Program (HAARP) Research Station in Gakona, Alaska during the period 18 27 July 2011. The SSRC included 26 students and mentors representing 11 universities and federal research laboratories. The program included daily

meetings to provide a forum for reporting results and discussion of individual experiments and included a daily scientific presentation or tutorial. Scientific topics addressed experimentally included studies of Stimulated Electromagnetic Emission, F-region Artificial Field-Aligned Irregularities, effects of scintillation on GPS signals, studies of the Extremely Low Frequency (ELF) generation region and of methods for improving conversion efficiency, and the incorporation of sophisticated modulation techniques to improve the quality of ionospherically generated ELF communication signals using QPSK and error correction.

Abstract Classification:Unclassified

Descriptive Note: Final rept. 18 Jul 2008-25 Jul 2012

Pages:44 Page(s)

Report Number: NWRA-12-RS478 *(NWRA12RS478)* , AFRL-RV-PS - TR-2012-0152 AFRL-RV-PS *(AFRLRVPSTR20120152 AFRLRVPS)* , XC - TR-2012-0152 AFRL-RV-PS *(XCTR20120152 AFRLRVPS)*

Monitor Series: TR-2012-0152 *(TR20120152)* , AFRL-RV-PS *(AFRLRVPS)*

Contract/Grant/Transfer Number: FA8718-08-C-0049 *(FA871808C0049)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) The Energy Spectrum of Accelerated Electrons from Wave-Plasma Interactions in the Ionosphere

PDF URL: (pdf) - 295 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA563531

Accession Number: ADA563531

Personal Author(s): Kosch, Michael J

Corporate Author: LANCASTER UNIV (UNITED KINGDOM) DEPT OF PHYSICS

Report Date: 29 Jun 2012

Abstract: (U) A HAARP campaign was executed 1-15 April 2010. Dr. Bjorn Gustavsson attended from the United Kingdom with optical equipment from Sweden and the United Kingdom. Unfortunately, no useful data were obtained. It was therefore necessary to find the resources to repeat the campaign effort (see budget below). A HAARP campaign was executed 21 March-5 April 2011. Dr. Bjorn Gustavsson (3/21-4/5) and Prof. Mike Kosch (3/21-3/25) attended from the United Kingdom with optical equipment from Sweden and the United Kingdom. Very good optical data were obtained at multiple wavelengths (427.8, 557.7, 630.0, 7320.0, 777.4, and 844.6 nm). However, the emissions were highly structured in space and time. This fact, and the lack of electron temperature data at HAARP, made data analysis difficult. It

became necessary to develop a quantitative model of the pump-wave self-absorption in the ionospheric D-region (publication 1), a quantitative model of electron heating in the ionospheric F-region (publication 2) taking into account D-region absorption, and an empirical model of electron temperature and optical emission intensity enhancements (publication 3) as a function of pump wave power. These tasks have been completed (see publications 1-3) using the EISCAT facility with its incoherent scatter radar, so progress on the originally specified task at HAARP can now be made.

Abstract Classification:Unclassified

Descriptive Note: Final rept. 10 Mar 2010-31 Dec 2011

Pages:5 Page(s)

Report Number: AFRL - AFOSR-UK-TR-2012-0014 EOARD *(AFRLAFOSRUKTR20120014)* , XC - AFOSR-UK-TR-2012-0014 EOARD *(XCAFOSRUKTR20120014)*

Monitor Series: AFOSR-UK-TR-2012-0014 *(AFOSRUKTR20120014)* , EOARD

Contract/Grant/Transfer Number: FA8655-10-1-3036 *(FA86551013036)* , EOARD-10-3036 *(EOARD103036)*

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Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) DEMETER Observations of ELF Waves Injected With the HAARP HF Transmitter

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA514936

Accession Number: ADA514936

Personal Author(s): Platino, M ; Inan, U S ; Bell, T F ; Parrot, M ; Kennedy, E J

Corporate Author: STANFORD UNIV CA SPACE TELECOMMUNICATIONS AND RADIOSCIENCE LAB (STAR)

Report Date: 17 Aug 2006

Abstract: (U) Modulated HF heating of the auroral electrojet is used to inject ELF signals into the magnetosphere that are observed on the low altitude DEMETER spacecraft. The HF heater is a component of the High-Frequency Active Auroral Research Program (HAARP) facility in Gakona, Alaska, (located at L tilde 4.9). Simultaneous observations of all six components of the

ELF electromagnetic fields on the DEMETER spacecraft are used to estimate the total ELF power radiated downward into the Earth-ionosphere waveguide. ELF signals generated by the HAARP heater are also simultaneously observed at a nearby ground-based site, allowing a comparison of the ELF power in the Earth-ionosphere waveguide versus that detected on DEMETER. The estimated values of power onboard DEMETER at different frequencies range from 0.32W to 4W, while the values of power estimated from a ground receiver at a distance of 36 km from HAARP range from 2.71W to 4.22W.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:7 Page(s)

Report Number: XB - ONR *(XB)*

Monitor Series: ONR

Contract/Grant/Transfer Number: N00014-03-0631 *(N00014030631)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Approved for public release; distribution is unlimited. Available only to DTIC users. U.S. Government or Federal Purpose Rights License.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) HF-Induced Airglow at Magnetic Zenith: Thermal and Parametric Instabilities Near Electron Gyroharmonics

PDF URL: (pdf) - 538 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA444392

Accession Number: ADA444392

Personal Author(s): Mishin, E V ; Kosch, M J ; Pedersen, T R ; Burke, W J

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA SPACE WEATHER CENTER OF EXCELLENCE

Report Date: Jan 2005

Abstract: (U) We analyze airglow induced by intense radio waves at the High-frequency Active Auroral Research Program (HAARP) facility for pump frequencies fo near the second and third electron gyroharmonic (fc). While passing through the double resonance in the weakening ionosphere during heating at fo 2fc, airglow intensities rose abruptly and remained elevated during four consecutive pulses. During this period both the thermal and parametric instabilities coexisted. Subsequently, the thermal parametric instability was hampered. The effectiveness of heating near the second gyroharmonic is ascribed to specific dispersion characteristics near the double resonance. The observations suggest that Langmuir waves participate in cyclotron

acceleration when the local plasma and second gyroharmonic frequencies match. With fo 3fc the airglow terminated due to the suppression of cyclotron acceleration and parametric decay instability.

Abstract Classification:Unclassified

Pages:5 Page(s)

Report Number: F19628-02-C-0012 *(F1962802C0012)* , AFRL-VS-HA - TR-2006-1033 AFRL/VSBX *(AFRLVSHATR20061033 AFRLVSBX)* , XC - TR-2006-1033 AFRL/VSBX *(XCTR20061033 AFRLVSBX)*

Monitor Series: TR-2006-1033 *(TR20061033)* , AFRL/VSBX *(AFRLVSBX)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 26 - NOT AVAILABLE IN MICROFICHE

Distribution Statement:Approved for public release; distribution is unlimited., Availability: This document is not available from DTIC in microfiche.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Creation of Visible Artificial Optical Emissions in the Aurora by High-Power Radio Waves

PDF URL: (pdf) - 2 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA435730

Accession Number: ADA435730

Personal Author(s): Pedersen, Todd R ; Gerken, Elizabeth A

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA SPACE VEHICLES DIRECTORATE

Report Date: 03 Feb 2005

Abstract: (U) Generation of artificial light in the sky by means of high-power radio waves interacting with the ionspheric plasma has been envisaged since the early days of radio exploration of the upper atmosphere, with proposed applications ranging from regional night-time street lighting to atmospheric measurements. Weak optical emissions have been produced for decades in such ionospheric heating experiments, where they serve as key indicators of electron acceleration, thermal heating, and other effects of incompletely understood wave-particle interactions in the plasma under conditions difficult to replicate in the laboratory. The extremely low intensities produced previously have, however, required sensitive instrumentation for detection, preventing applications beyond scientific research. Here we report observations of radio-induced optical emissions bright enough to be seen by the naked eye, and produced not in the quiet mid-latitude ionosphere, but in the midst of a pulsating natural aurora. This may open the door to visual applications of ionospheric heating technology or provide a way to probe the dynamics of the natural aurora and magnetosphere.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:5 Page(s)

Report Number: AFRL-VS-HA-TR-2005-1069 *(AFRLVSHATR20051069)* , XC - AFRL/MA *(XCAFRLMA)*

Monitor Series: AFRL/MA *(AFRLMA)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) The WIND-HAARP-HIPAS Interferometer Experiment

PDF URL: (pdf) - 503 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA362758

Accession Number: ADA362758

Personal Author(s): Rodriguez, P ; Keskinen, M J ; Kennedy, E J ; McCarrick, M ; Preston, J

Corporate Author: NAVAL RESEARCH LAB WASHINGTON DC PLASMA PHYSICS DIV

Report Date: 22 Apr 1999

Abstract: (U) We report on the first experiment using two high power, high frequency transmitting facilities in a bistatic, interferometer mode. The HAARP and HIPAS facilities in Alaska radiated at 4525 kHz with total combined power of about 700 kW, in the direction of the WIND spacecraft. The WAVES experiment aboard WIND received the transmissions at a distance of about 25 earth radii. The experimental setup thus resembled Young's two-slit experiment. The expected interference pattern was observed, and at the distance of WIND, the fringes sizes were about 30 km peak to peak.

Abstract Classification:Unclassified

Descriptive Note: Interim rept.

Pages:12 Page(s)

Report Number: NRL/MR/6750--99-8349 *(NRLMR6750998349)* , XB - ONR *(XB)*

Monitor Series: ONR

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) On the Onset of HF-Induced Airglow at HAARP

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA434533

Accession Number: ADA434533

Personal Author(s): Mishin, E V ; Burke, W J ; Pedersen, T

Corporate Author: BOSTON COLL CHESTNUT HILL MA INST FOR SCIENTIFIC RESEARCH

Report Date: 13 Feb 2004

Abstract: (U) Observations of airglow at 630 nm (red line) and 557.7 nm (green line) during the February 2002 campaign at the High Frequency Active Auroral Research Program (HAARP) heating facility are analyzed. We find that during injections toward magnetic zenith (MZ) the green and red lines gain 5 R within 1 s and 20 R within 10 s, respectively. We term this period the onset of the HF-induced airglow. A model of the onset at magnetic zenith is developed. It accounts for background photoelectrons and dissociative recombination of O(+)2. It is shown that heating and acceleration of background electrons dominate the airglow onset. We propose a scenario for the generation of strong Langmuir turbulence for injections outside the Spitze region, including magnetic zenith.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:11 Page(s)

Report Number: AFRL-VS-HA - TR-2005-1061 AFRL-VS-HA *(AFRLVSHATR20051061 AFRLVSHA)* , XC - TR-2005-1061 AFRL-VS-HA *(XCTR20051061 AFRLVSHA)*

Monitor Series: TR-2005-1061 *(TR20051061)* , AFRL-VS-HA *(AFRLVSHA)*

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Distribution Statement:Approved for public release; distribution is unlimited. Available only to DTIC users. U.S. Government or Federal Purpose Rights License.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Amplitude and Phase of Nonlinear Magnetospheric Wave Growth Excited by the HAARP HF Heater

PDF URL: (pdf) - 760 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA528535

Accession Number: ADA528535

Personal Author(s): Golkowski, M ; Inan, U S ; Cohen, M B ; Gibby, A R

Corporate Author: STANFORD UNIV CA STAR LAB

Report Date: Feb 2010

Abstract: (U) The High Frequency Active Auroral Research Program (HAARP) HF ionospheric heater is used to inject ELF/VLF signals into the magnetosphere to study wave-particle interactions that lead to nonlinear amplification. HAARP-generated whistler mode echoes are observed after twice crossing the equatorial plane in magnetospheric ducts. The magnetospheric paths traversed by the signals are determined to be in the range 5.06 less than L less than 5.19 with associated cold plasma densities of 177 cm(-3) less than N(eq) less than 185 cm(-3). The amplitude and phase of the echoes are observed to exhibit exponential temporal increase. A decrease in input amplitude by 14 dB is observed to yield a delay in onset of nonlinear growth by approx. 1 s. Nonlinear theory of cyclotron resonant currents formed by electrons phase trapped in the potential well of the input wave is used to analyze the simultaneous evolution of amplitude and phase of the observations. The average nonlinear resonant current vector is found to rotate in relation to the input wavefields during growth, and the magnetospheric linear growth rate is estimated to be 31-45 dB/s.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:11 Page(s)

Report Number: XB - ONR *(XB)*

Monitor Series: ONR

Contract/Grant/Transfer Number: N00014-05-C-0308 *(N0001405C0308)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) The WIND-HAARP Experiment: Initial Results of High Power Radiowave Interactions with Space Plasmas

PDF URL: (pdf) - 989 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA332515

Accession Number: ADA332515

Personal Author(s): Rodriguez, P ; Kennedy, E ; Keskinen, M ; Siefring, C ; Basu, S

Corporate Author: NAVAL RESEARCH LAB WASHINGTON DC PLASMA PHYSICS DIV

Report Date: 10 Nov 1997

Abstract: (U) Results from the first science experiment with the new HF Active Auroral Research Program (HAARP) facility in Alaska are reported. The initial experiments involved transmission of high frequency waves from HAARP to the NASA/WIND satellite. The objective was to investigate the effects of space plasmas on high power (approx. 300 kW) radiowave transmission from the ground to high altitudes in the magnetosphere. The data acquired suggest that structured space plasmas along the propagation path impose a power law spectrum of intensity fluctuations on the transmitted waves, resembling that of scintillation interactions. However, because the transmitted wave frequencies are near ionospheric plasma frequencies, other types of wave-plasma interactions may occur. The measurements can provide an important new diagnostic tool for space plasmas.

Abstract Classification:Unclassified

Descriptive Note: Interim rept.

Pages:18 Page(s)

Report Number: NRL/MR/6750--97-7979 *(NRLMR6750977979)* , XC - PL* *(XCPL)*

Monitor Series: PL* *(PL)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Magnetic Zenith Enhancement of HF Radio-Induced Airglow Production at HAARP

PDF URL: (pdf) - 272 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA515734

Accession Number: ADA515734

Personal Author(s): Pedersen, T R ; McCarrick, M ; Gerken, E ; Selcher, C ; Sentman, D ; Carlson, H C ; Gurevich, A

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA SPACE VEHICLES DIRECTORATE

Report Date: 22 Feb 2003

Abstract: (U) Airglow production at various beam positions relative to the magnetic field was investigated as part of an optics campaign at HAARP in February 2002. Strong emissions up to several hundred Rayleigh at 630.0 nanometers and more than 50 R at 557.7 nanometers were produced in a small spot approximately 6 inches diameter located near the magnetic zenith when the transmitter beam was directed up the magnetic field. This effect was observed hundreds of times over a wide range of frequencies and ionospheric conditions. The spot at HAARP appears on average just equatorward of the nominal magnetic field direction, deflects somewhat toward the beam center when the beam is scanned, and varies slightly in size with transmitter frequency.

Red-to-green ratios as low as 3 were observed, with both wavelengths showing significant onset delay. Identifiable enhancements in red-line emission were produced down to 2 MW ERP in a power ramp experiment.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:5 Page(s)

Report Number: XD - XD *(XD)*

Monitor Series: XD

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Diagnostics and Modeling of the Auroral Ionosphere Under the Influence of the Gakona HF Transmitter

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA408040

Accession Number: ADA408040

Personal Author(s): Sentman, Davis D ; Wescott, Eugene M ; Olson, John V ; Otto, Antonius ; Bristow, William A

Corporate Author: ALASKA UNIV FAIRBANKS GEOPHYSICAL INST

Report Date: Aug 2001

Abstract: (U) This project comprises five separate elements that address science and education objectives of the HAARP program. These elements are: (1) To establish the characteristics of the ionospheric source region responsible for the ELF/VLF waves generated by modulation of HAARP HF emissions, and to measure the ELF radiation pattern. (2) To attempt to stimulate hydromagnetic waves in the onospheric waveguide using the HAARP heater. (3) To develop a simulation model for the plasma physical and electromagnetic ffects of localized ionospheric heating with the purpose of predicting outcomes of heating experiments and to guide the design of ew experiments. (4) Using the SuperDARN instrument on Kodiak, to examine the formation of ionospheric irregularities within the heated volume and the relationship of the irregularities to other observations such as the generation of Stimulated Electromagnetic missions. (5) To provide scientific education about HAARP and physical science in general to members of the local Copper Valley ommunity. In this report the results of research obtained to date in each of the five program elements are reviewed, and ecommendations for follow up activities are presented.

Abstract Classification:Unclassified

Descriptive Note: Technical rept. 29 Jul 1999-31 Jan 2001

Pages:39 Page(s)

Report Number: AFRL-VS - TR-2001-1622 AFRL-VS *(AFRLVSTR20011622 AFRLVS)* , XC - TR-2001-1622 AFRL-VS *(XCTR20011622 AFRLVS)*

Monitor Series: TR-2001-1622 *(TR20011622)* , AFRL-VS *(AFRLVS)*

Contract/Grant/Transfer Number: F19628-99-C-0059 *(F1962899C0059)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Telescopic Imaging of Heater-Induced Airglow at HAARP

PDF URL: (pdf) - 591 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA460185

Accession Number: ADA460185

Personal Author(s): Kelley, Michael C

Corporate Author: CORNELL UNIV ITHACA NY OFFICE OF SPONSORED PROGRAMS

Report Date: Jan 2007

Abstract: (U) HF-induced fine-scale electron density variations and/or enhanced airglow in the ionosphere were investigated. These irregularities appear to trap waves and cause them to self-focus. Knowing what irregularities exist is important for improving communications and for pure discovery research on wave-particle interactions in the lower ionosphere at high latitudes. To develop accurate models of its behavior, lower ionospheric structure must be known. Under this grant, we conducted telescopic imaging of heater-induced airglow at HAARP to optically measure fine structure in the ionosphere and to study airglow sources. In the presence of aurora and a strong blanketing E layer, HAARP was modulated at intervals of several seconds. For several cycles, small bright airglow spots were observed whenever HAARP was on. These spots are elongated horizontally, indicating drift motion, and are the same order of brightness as the aurora. Such bright artificial airglow was never recorded previously. These results were published in the journal Nature.

Abstract Classification:Unclassified

Descriptive Note: Final rept., 10 Sep 2003-10 Sep 2006

Pages:6 Page(s)

Report Number: CU-44467 *(CU44467)* , XB - ONR *(XB)*

Monitor Series: ONR

Contract/Grant/Transfer Number: N00014-03-1-0978 *(N000140310978)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) HF-Induced Airglow at Magnetic Zenith: Theoretical Considerations

PDF URL: (pdf) - 552 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA434534

Accession Number: ADA434534

Personal Author(s): Mishin, E V ; Burke, W J ; Pedersen, T

Corporate Author: BOSTON COLL CHESTNUT HILL MA INST FOR SCIENTIFIC RESEARCH

Report Date: 31 Jan 2005

Abstract: (U) Observations of airglow at 630 nm (red line) and 557.7 nm (green line) during HF modification experiments at the High Frequency Active Auroral Research program (HAARP) heating facility are analyzed. We propose a theoretical framework for understanding the generation of Langmuir and ion acoustic waves during magnetic zenith injections. We show that observations of HF-induced airglow in an underdense ionosphere as well as a decrease in the height of the emitting volume are consistent with this scenario.

Abstract Classification:Unclassified

Descriptive Note: Conference paper

Pages:6 Page(s)

Report Number: AFRL-VS-HA - TR-2005-1058 AFRL-VS-HA *(AFRLVSHATR20051058 AFRLVSHA)* , XC - TR-2005-1058 AFRL-VS-HA *(XCTR20051058 AFRLVSHA)*

Monitor Series: TR-2005-1058 *(TR20051058)* , AFRL-VS-HA *(AFRLVSHA)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Ionospheric Modification from Under-Dense Heating by High-Power HF Transmitter

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA539435

Accession Number: ADA539435

Personal Author(s): Kuo, Spencer ; Snyder, Arnold ; Mishin, Evgeny ; Kossey, Paul ; Battis, James

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA SPACE VEHICLES DIRECTORATE

Report Date: 03 Mar 2011

Abstract: (U) Under-dense HF heating experiments were conducted near local solar noon as well as in the nighttime with the HF heater transmitting at 9.1 MHz directed along the geomagnetic zenith and run at 2 min on and 2 min off. The effective isotropic radiated power of the HF transmitter exceeded 3 GW. The Digisonde operated in a fast mode was used to monitor the temporal evolution of the ionospheric electron density distributions in the bottomside of the ionosphere (in the ranges from 90 to 190 km in the noontime and from 230 to 350 km in the nighttime). The electron temperature distributions were then evaluated. The results show that the electron density distributions are modified continuously over the experimental periods. In the noontime, the electron density decreases/increases in time in the region below/above a height at about 140 km, manifesting the change of the balance between the photoionization and the electron-ion recombination and the electron-oxygen dissociative attachment losses by the heating. In the nighttime, the ionosphere was lifted by 30 to 50 km through continuously upward expansion, resulting in the drop of the electron density in the bottomside of the ionosphere in time. A comparison with the ionogram, height, and electron density distribution of unheated ionosphere with similar background conditions further elaborates the observation of thermal expansion.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:8 Page(s)

Report Number: AFRL-RV-HA-TR-2011-1012 *(AFRLRVHATR20111012)* , XB - ONR *(XB)*

Monitor Series: ONR

Contract/Grant/Transfer Number: N00014-10-1-0856 *(N000141010856)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Approved for public release; distribution is unlimited. Available only to DTIC users. U.S. Government or Federal Purpose Rights License.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Observation of Artificial Spread-F and Large Region Ionization Enhancement in an HF Heating Experiment at HAARP

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA518937

Accession Number: ADA518937

Personal Author(s): Kuo, Spencer ; Snyder, Arnold

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC REDMOND WA

Report Date: Jan 2010

Abstract: (U) A large-scale ionospheric modification by HF heaters was explored via HAARP digisonde operated in a fast mode. The results show that the ionogram virtual heights and the height spread of the ordinary-wave sounding echoes were changed significantly by the O-mode heater; the X-mode heater imposed no noticeable effect on the ionograms. The enhanced virtual height spread exceeds 40 km, more than 15% of sounding echo's average virtual height. The heater downshifted/upshifted the virtual height in the low/high frequency region around the heater frequency by as much as 15 and 7.5 km. The modifications were developing to last more than 10 seconds after the heater was turned off. The perturbed ionosphere took more than 60 seconds to recover. The modified electron density distribution indicates that the electron density and temperature increases exceed 10% and 25% over a large altitude region (30 km) from below to above the HF reflection height.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:6 Page(s)

Report Number: AFRL-RV-HA - TR-2010-1031 AFRL-RV-HA *(AFRLRVHATR20101031 AFRLRVHA)* , XC - TR-2010-1031 AFRL-RV-HA *(XCTR20101031 AFRLRVHA)*

Monitor Series: TR-2010-1031 *(TR20101031)* , AFRL-RV-HA *(AFRLRVHA)*

Contract/Grant/Transfer Number: FA8718-08-C-0049 *(FA871808C0049)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Investigations of the Nature and Behavior of Plasma-Density Disturbances That May Impact GPS and Other Transionospheric Systems

PDF URL: (pdf) - 2 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA402166

Accession Number: ADA402166

Personal Author(s): Fremouw, E J ; Holland, E A ; Mazzella, A J , Jr

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC BELLEVUE WA

Report Date: 21 Oct 1998

Abstract: (U) As solar maximum approaches, the 'space-weather' vulnerability of systems that depend upon transionospheric radio propagation will increase. Likely effects include variable range errors in the Global Positioning System (GPS) due to variations in ionospheric 'total electron content' (TEC), spatial gradients in such errors, and the scintillation' of signals employed in a variety of navigation, communication, and other systems. This report summarizes research performed in the first year of a contract aimed at: (a) investigating the behavior of naturally occurring variations in TEC and the plasma-density irregularities that produce scintillation as solar activity increases, and (b) observing such phenomena and others that may be produced artificially by means of high-frequency (HF) heating of the ionosphere in the HF Active Auroral Research Program (HAARP). The first-year efforts included collection and processing of TEC data from USAF's Ionospheric Measuring System (IMS); campaign operation of a portable ionospheric monitor for measurement of TEC and scintillation at Ascension Island; preliminary assessment of plasmaspheric contribution to TEC; and coordinating development of a variety of diagnostic instruments for HAARP.

Abstract Classification:Unclassified

Descriptive Note: Scientific rept. no. 1, 10 Sep 1997-31 Aug 1998

Pages:31 Page(s)

Report Number: NWRA-CR-98-R188 *(NWRACR98R188)* , AFRL-VS - TR-1999-1515 AFRL-VS-HA *(AFRLVSTR19991515 AFRLVSHA)* , XC - TR-1999-1515 AFRL-VS-HA *(XCTR19991515 AFRLVSHA)*

Monitor Series: TR-1999-1515 *(TR19991515)* , AFRL-VS-HA *(AFRLVSHA)*

Contract/Grant/Transfer Number: F19628-97-C-0078 *(F1962897C0078)*

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Document EF093402 from collection ured in format FOIA-U2 is missing on this export.
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Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Further Investigations of Ionospheric Total Electron Content and Scintillation Effects on Transionospheric Radiowave Propagation

PDF URL: (pdf) - 2 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA345678

Accession Number: ADA345678

Personal Author(s): Andreasen, C C ; Fremouw, Edward J ; Mazzella, Andrew J ; Rao, G S ; Secan, James A

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC BELLEVUE WA

Report Date: 12 Feb 1998

Abstract: (U) The effects of the ionosphere on numerous communication, navigation, and surveillance systems continue to be of Air Force concern. In this project, Northwest Research Associates (NWRA) is collaborating with researchers from Air Force Research Laboratory at Hanscom AFB and others to address these concerns in three broad areas. In the most advanced effort, operational code for running a gridded version of the WBMOD ionospheric scintillation model, called WBMGRID, with the full Scintillation Decision Aid (SCINDA) system was delivered to the 50th Weather Squadron (now the 55th Space Weather Squadron). The most extensive of the NWRA efforts involved careful use of two-frequency GPS receivers to measure ionospheric total electron content (TEC), which introduces range errors on operational GPS links. Central tasks in this effort included utilization of receivers at four operational sites of the Ionospheric Measuring System (IMS), continued development and refinement of the IMS employing a fifth receiver located at Hanscom, and assessment and analysis of the resulting data. The newest of the efforts goes beyond passive observation of ionospheric effects on radiowave systems to preparation for active experiments in the High Frequency Active Auroral Research Program (HAARP).

Abstract Classification:Unclassified

Descriptive Note: Scientific rept. no. 3

Pages:41 Page(s)

Report Number: NWRA-CR-98-R177 *(NWRACR98R177)* , AFRL-VS-HA - TR-98-0037 AFRL-VS-HA *(AFRLVSHATR980037 AFRLVSHA)* , XC - TR-98-0037 AFRL-VS-HA *(XCTR980037 AFRLVSHA)*

Monitor Series: TR-98-0037 *(TR980037)* , AFRL-VS-HA *(AFRLVSHA)*

Contract/Grant/Transfer Number: F19628-94-C-0067 *(F1962894C0067)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Diagnostics and Modeling of the Auroral Ionosphere Under the Influence of the Gakona HF Transmitter

PDF URL: (pdf) - 2 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA425103

Accession Number: ADA425103

Personal Author(s): Sentman, Davis D ; Wescott, Eugene M ; Olson, John V ; Otto, Antonius ; Bristow, William A

Corporate Author: ALASKA UNIV FAIRBANKS GEOPHYSICAL INST

Report Date: 27 Feb 2004

Abstract: (U) This Final Report covers the activities and results of the subject contract during the period 29 July, 1999 to 31 August, 2003. The concept underlying the research was to investigate the manner in which the Gakona HF Transmitter interacts with the ionospheric D-region, and by means of a number of experiments and theoretical models to characterize the resultant effects. A Public Outreach program was instituted to help educate the community in the Gakona area about the goals and research of the HAARP program. The work in the contract was divided into 5 subtasks, each under the direction of a separate UAF investigator: 1. ELF/VLF Wave Measurement and Interpretation Program (I). Sentman), 2. ULF Wave Measurement Program (J. Olson), 3. Simulation (A. Otto), 4. SuperDARN Operations (W. Bristow), and (5) Public Outreach (D. Solie). These subtasks are described in their respective Sections.

Abstract Classification:Unclassified

Descriptive Note: Final rept. 29 Jul 1999-31 Aug 2003

Pages:53 Page(s)

Report Number: AFRL-VS-HA - TR-2004-1038 AFRL-VS-HA *(AFRLVSHATR20041038 AFRLVSHA)* , XC - TR-2004-1038 AFRL-VS-HA *(XCTR20041038 AFRLVSHA)*

Monitor Series: TR-2004-1038 *(TR20041038)* , AFRL-VS-HA *(AFRLVSHA)*

Contract/Grant/Transfer Number: F19628-99-C-0059 *(F1962899C0059)*

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Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Approved for public release; distribution is unlimited. Available only to DTIC users. U.S. Government or Federal Purpose Rights License.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Geometric Modulation: A More Effective Method of Steerable ELF/VLF Wave Generation With Continuous HF Heating of the Lower Ionosphere

PDF URL: (pdf) - 325 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA514654

Accession Number: ADA514654

Personal Author(s): Cohen, M B ; Inan, U S ; Golkowski, M A

Corporate Author: STANFORD UNIV CA DEPT OF ELECTRICAL ENGINEERING

Report Date: 18 Jun 2008

Abstract: (U) ELF/VLF radio waves (300 Hz - 30 kHz) are difficult to generate with practical antennae, because of their extraordinarily long (10 - 1000 km) wavelengths, and the lossy nature of the Earth's surface at these frequencies. ELF/VLF waves have been successfully generated via amplitude modulated (AM) HF (2 - 10 MHz) heating of the lower ionosphere. Through the temperature-dependent conductivity of the lower ionospheric plasma, a patch of the ionospheric current becomes a large radiating antenna. We implement a new method of ELF/VLF wave generation, herein named geometric modulation, involving scanning the HF heating beam in a geometric pattern without modulating its power. Utilizing results from the upgraded 3.6 MW radiated HAARP HF antenna array, we show that geometric modulation can enhance ELF/ VLF wave generation by up to 11 dB over the conventional AM method. Geometric modulation also allows directional launching of the signal into the Earth-ionosphere waveguide, forming an unprecedented steerable large-element ELF/VLF ionospheric phased array.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:7 Page(s)

Report Number: XB - ONR *(XB)*

Monitor Series: ONR

Contract/Grant/Transfer Number: N00014-05-C-0308 *(N0001405C0308)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Environmental Impact Analysis Process. Final Environmental Impact Statement. Part 2. Proposed High Frequency Active Auroral Research Program.

PDF URL: (pdf) - 15 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA267521

Accession Number: ADA267521

Corporate Author: AIR FORCE MATERIEL COMMAND WRIGHT-PATTERSON AFB OH

Report Date: Jul 1993

Abstract: (U) The FEIS describes the potential environmental impacts of constructing and operating a proposed ionospheric research facility in interior Alaska. The system is referred to as HAARP (High-frequency Active Auroral Research Program), and would be used primarily for conducting pioneering studies of ionospheric properties. This proposed facility would be the most technologically advanced in the world. The program could lead to a better understanding of the ionosphere and enable researchers to develop methods for enhanced communications for both civilian and defense applications. The HAARP system consists of a powerful high frequency radio transmitter, referred to as the ionospheric research instrument, and a number of scientific data gathering (diagnostic) instruments

Abstract Classification:Unclassified

Pages:410 Page(s)

Report Number: XC - AFMC *(XC)*

Monitor Series: AFMC

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Approved for public release; distribution is unlimited. Available only to DTIC users. U.S. Government or Federal Purpose Rights License.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Simultaneous Generation of Large-Scale Density Irregularities and Geomagnetic Pulsations via Filamentation Instability

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA501024

Accession Number: ADA501024

Personal Author(s): Kuo, Spencer P ; Cheng, Wei-Te ; Cohen, J A ; Pradipta, R ; Lee, M C ; Kuo, Steven S ; Snyder, Arnold

Corporate Author: NORTHWEST RESEARCH ASSOCIATES STOCKTON SPRINGS ME

Report Date: 14 May 2009

Abstract: (U) Results of experiment conducted at Gahona, Alaska, using intensity-modulated HF heating waves of 3.2 MHz to generate geomagnetic pulsations and large-scale field-aligned density irregularities (FAI), are reported. The echo traces of o- and x-mode sounding pulses from 3.53 to 4 MHz were recorded during heater on/off periods. The ionograms showed that only xmode echo traces were significantly affected by the HF heater. The returns from 3.53 to 3.8 MHz disappeared during heater on period and reappeared after heater was turned off. Ray tracings are performed to explore the effect of FAI on the backscattering o- and x-mode sounding pulses. The drastic difference between the FAI effects on o- and x-mode backscattering trajectories provides a theoretical interpretation of the observation. Geomagnetic pulsations as large as 2.5 nT were also recorded by a Fluxgate Magnetometer. Thermal filamentation of the HF heater leads to the simultaneous generation of FAI and geomagnetic pulsations.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:6 Page(s)

Report Number: AFRL-RV-HA - TR-2009-1048 AFRL-RV-HA *(AFRLRVHATR20091048 AFRLRVHA)* , XC - TR-2009-1048 AFRL-RV-HA *(XCTR20091048 AFRLRVHA)*

Monitor Series: TR-2009-1048 *(TR20091048)* , AFRL-RV-HA *(AFRLRVHA)*

Contract/Grant/Transfer Number: FA8718-08-C-0049 *(FA871808C0049)* , N00014-05-1-0109 *(N000140510109)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) HAARP Imaging Riometer Diagnostic

PDF URL: (pdf) - 822 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA343679

Accession Number: ADA343679

Personal Author(s): Rosenberg, Ted J

Corporate Author: ADVANCED POWER TECHNOLOGIES INC WASHINGTON DC

Report Date: 16 Jul 1997

Abstract: (U) This report describes the prototype 16-beam, 38.6 MHz riometer system developed by APTI and the University of Maryland for the HAARP program. The prototype system is the forerunner for a full-scale imaging riometer diagnostic instrument for characterizing the ionospheric volume perturbed by controlled RF heating experiments. The prototype system, installed at the HAARP site near Gakona, AK, consists of a 1 x 16 antenna array phased in one dimension (beam width of 6.7 deg) and oriented approximately along the magnetic meridian. The system responds sensitively to natural variations or auroral absorption, such as those caused by magnetospheric substorms, and provides clear evidence of its capability to discern spatial structure and motion. A newly observed feature seen near dusk are intense, short-duration absorption spikes accompanied by only weak magnetic signatures. The proximity of the prototype system to the HAARP RF heater can result in significant interference to the riometer signal, making the data unusable at times. Detailed data comparisons have not yet been made with operations of the heater. However, the full scale imaging capability of the proposed instrument, and a remote location, may be required to detect small scale modifications of the ionosphere caused by the RF heater.

Abstract Classification:Unclassified

Descriptive Note: Final rept. 17 Sep 91-31 Dec 97

Pages:20 Page(s)

Report Number: PL* - TR-97-2101 PL* *(PLTR972101 PL)* , XC - TR-97-2101 PL* *(XCTR972101 PL)*

Monitor Series: TR-97-2101 *(TR972101)* , PL* *(PL)*

Contract/Grant/Transfer Number: F19628-91-C-0158 *(F1962891C0158)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Sensor and Analysis Developments for Near-Earth Plasma Density Investigations

PDF URL: (pdf) - 2 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA401954

Accession Number: ADA401954

Personal Author(s): Andreasen, A M ; Fremouw, E J ; Mazzella, A J , Jr

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC BELLEVUE WA

Report Date: 12 Nov 1999

Abstract: (U) With the progressive increase in solar activity, effects in the near-earth space environment (space weather) are becoming more intense and variable. They are manifested as increased plasma content of the ionosphere and protonosphere and as greater variability in these regions, with impacts on Global Positioning System (GPS) navigation, radio-wave communications, and other applications. This report summarizes research performed in the second year of a contract intended to: (a) investigate natural variations in total electron content (TEC) and scintillation associated with solar activity, and (b) observe artificially induced changes in the ionosphere by means of ground-based radio-wave emissions. The efforts for this second year included collection and processing of TEC data from the USAF Ionospheric Measuring Systems deployed at various sites, development of techniques for monitoring the electron content of the protonosphere. augmenting capabilities for providing near-real-time data for space-weather monitoring for the Space Environment Network Display, and coordinating and implementing development of diagnostic instruments for the High-frequency Active Aurora Research Program. Technical developments also were pursued to avoid the effects of artificial limitations imposed by the Year 2000' problem and the similar 'GPS Week Poll-over'.

Abstract Classification:Unclassified

Descriptive Note: Scientific rept. no. 2, 1 Sep 1998-31 Aug 1989

Pages:43 Page(s)

Report Number: NWRA-CR-99-R208 *(NWRACR99R208)* , AFRL-VS - TR-2000-1580 AFRL-VS *(AFRLVSTR20001580 AFRLVS)* , XC - TR-2000-1580 AFRL-VS *(XCTR20001580 AFRLVS)*

Monitor Series: TR-2000-1580 *(TR20001580)* , AFRL-VS *(AFRLVS)*

Contract/Grant/Transfer Number: F19628-97-C-0078 *(F1962897C0078)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Ionospheric Sensor Developments for the Year-2000 Solar Maximum

PDF URL: (pdf) - 2 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA419928

Accession Number: ADA419928

Personal Author(s): Fremouw, E J ; Mazzella, A J , Jr ; Rao, G S

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC BELLEVUE WA

Report Date: 23 Oct 2000

Abstract: (U) This report summarizes research during the third year of a contract for investigating (a) natural variations in ionospheric total electron content (TEC) and (b) plasma and electromagnetic effects produced by transmitting high-powered HF waves into the ionosphere. The efforts included collecting, processing, and analyzing TEC data from USAF Ionospheric Measuring Systems (IMS) and Real-Time Monitors (RTM) deployed at various sites, maintaining and operating those MS and RTM units, negotiating the Year-2000 transition, developing 20-Hz GPS data-collection systems for deployment. and initial developments toward extending current IMS capabilities. in addition to recording TEC variations by means of two-frequency GPS receivers at several locations, work during the year enhanced and exploited several diagnostic instruments deployed for the High frequency Active Aurora Research Program (HAARP). Under HAARP, measurements employing both GPS and coherent VHF-UHF signals transmitted from satellites in low-earth polar orbit resulted in time histories and latitudinal scans of absolute TEC over Maska, and enhanced operation of the HAARP classic riometer resulted in essentially continuous observations of 30-MHz radiowave absorption over south-central Alaska. Analysis of a thermal instability expected to enhance generation of ELF/VLF waves by amplitude modulation of an HF heating wave has been extended into the non-linear regime.

Abstract Classification:Unclassified

Descriptive Note: Scientific rept. No.3., 1 Sep 1999-31 Aug 2000

Pages:45 Page(s)

Report Number: NWRA-CR-00-R225 *(NWRACR00R225)* , AFRL-VS - TR-2001-1538 AFRL-VS *(AFRLVSTR20011538 AFRLVS)* , XC - TR-2001-1538 AFRL-VS *(XCTR20011538 AFRLVS)*

Monitor Series: TR-2001-1538 *(TR20011538)* , AFRL-VS *(AFRLVS)*

Contract/Grant/Transfer Number: F19628-97-C-0078 *(F1962897C0078)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Equator and High-Latitude Ionosphere-to-Magnetosphere Research

PDF URL: (pdf) - 892 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA542466

Accession Number: ADA542466

Personal Author(s): Reinisch, B W ; Sales, G S ; Paznukhov, V ; Galkin, I A ; Zong, Q ; Khmyrov, G ; Galushko, V ; Altadill, D F

Corporate Author: MASSACHUSETTS UNIV LOWELL CENTER FOR ATMOSPHERIC RESEARCH

Report Date: 04 Dec 2010

Abstract: (U) Significant research effort has been directed at global ionospheric specification using the UML-operated Global Ionospheric Radio Observatory (GIRO). In 2010, GIRO continued acquisition and dissemination of both real-time and retrospective knowledge of electron density profile (EDP) in the ionosphere from 64 digisonde locations around the world. Highly accurate, manually validated EDP records from GIRO were used to calibrate DMSP F18 UV sensors and quantify errors introduced by the horizontal smear of COSMIC radio occultations. Comparative analysis of the profile inversion algorithms against incoherent scatter radar measurements has identified a deficiency of the POLAN technique used in QualScan software involved in EDP uncertainty analysis for AFWA. The utility of the high-resolution and high cadence Doppler skymaps in characterizing the plasma velocity profile in the heated region above HAARP has been clearly established. Specification of D region absorption from Digisonde measurements has proven to be highly sensitive and thus able to detect and model M-class flare events.

Abstract Classification:Unclassified

Descriptive Note: Scientific rept. 26 Aug 2009-25 Aug 2010

Pages:36 Page(s)

Report Number: 4 *(4)* , AFRL-RV-HA - TR-2010-1138 AFRL-RV-HA *(AFRLRVHATR20101138 AFRLRVHA)* , XC - TR-2010-1138 AFRL-RV-HA *(XCTR20101138 AFRLRVHA)*

Monitor Series: TR-2010-1138 *(TR20101138)* , AFRL-RV-HA *(AFRLRVHA)*

Contract/Grant/Transfer Number: FA8718-06-C-0072 *(FA871806C0072)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Imaging and Forecasting of Ionospheric Structures and Their System Impacts

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA424402

Accession Number: ADA424402

Personal Author(s): Reinisch, Bodo ; Sales, Gary

Corporate Author: MASSACHUSETTS UNIV LOWELL CENTER FOR ATMOSPHERIC RESEARCH

Report Date: 05 Dec 2003

Abstract: (U) The coordinated South American ionospheric measurement campaign, COPEX was held from October through December, 2002. Analysis of the sounder data from the equatorial site at Cachimbo, Brazil reinforced the general understanding of the difficulty in predicting the onset of spread F on any particular night Measurement of sporadic E formation at the magnetic field footprint in the anomaly regions provided no insight into the spread F formation problem. RPI/IMAGE reception of groundbased VLF transmissions in space over a period of two years was used to determine the efficiency for generating whistler mode waves that propagate along the magnetic field to the satellite. These results are compared with AFRL ray tracing simulations. Extensive analysis was carried out on the use of VLF/LF transmissions from a space platform to interact with high energy trapped electrons in the plasmasphere and scatter them so that they cannot cause damage to low earth orbiting satellites.

Abstract Classification:Unclassified

Descriptive Note: Scientific rept. no. 1, 30 Sep 2002-30 Sep 2003

Pages:35 Page(s)

Report Number: AFRL-VS-HA - TR-2004-1037 AFRL/MA *(AFRLVSHATR20041037 AFRLMA)* , XC - TR-2004-1037 AFRL/MA *(XCTR20041037 AFRLMA)*

Monitor Series: TR-2004-1037 *(TR20041037)* , AFRL/MA *(AFRLMA)*

Contract/Grant/Transfer Number: F19628-02-C-0092 *(F1962802C0092)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) High Frequency Magnetic Field Direction Finding Using MGL-S9A B-dot Sensors

PDF URL: (pdf) - 3 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA577289

Accession Number: ADA577289

Personal Author(s): Archer, Michael D

Corporate Author: AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH GRADUATE SCHOOL OF ENGINEERING AND MANAGEMENT

Report Date: 21 Mar 2013

Abstract: (U) Aircraft based direction finding (DF) in the high frequency (HF) band is difficult due to the aircraft?s size with respect to wavelength and limited azimuthal resolution. A B-dot sensor is useful for detection of the time varying magnetic field and offers improved integration into an aircraft. What the B-dot sensor gains in integration it gives up in sensitivity because it is designed for frequencies above 5 GHz. Design of an airborne HFDF array using Bdot sensors is based in maximizing the physical extent of the array and eliminating multiple main beams. The goals of this research are to complete a computational analysis of a B-dot sensor, evaluate a cluster of closely spaced B-dot sensors, and design an array of B-dot sensor clusters on a simulated airborne HFDF platform. The B-dot sensors are simulated to determine the sensitivity of the sensor and sensor cluster. Eight and ten-sensor elements are placed on a simulated airframe to characterize the direction finding capability in the HF band. Additionally, a field test is accomplished to compare the simulated B-dot sensor cluster to an actual cluster of Bdot sensors. The B-dot sensor is inadequate for use in an HFDF array due to a lack of sensitivity, but based on initial simulations a larger B-dot sensor, designed for 700 MHz, offers equivalent sensitivity to previous research. Utilizing a cluster of sensors improves the radiation efficiency by 6 dB. The eight and ten-element arrays offer a limited direction finding capability due limited sidelobe reduction. The addition of two sensors does present sidelobe reduction; therefore, additional sensors will improve the direction finding capability of the airborne HFDF array.

Abstract Classification:Unclassified

Descriptive Note: Master's thesis

Pages:137 Page(s)

Report Number: AFIT-ENG-13-M-02 *(AFITENG13M02)* , XC - AFRL-RY-WP *(XCAFRLRYWP)*

Monitor Series: AFRL-RY-WP *(AFRLRYWP)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Summer 2000 Student/Faculty Science Campaign, July 31-August 8, 2000

PDF URL: (pdf) - 3 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA401940

Accession Number: ADA401940

Personal Author(s): Snyder, Arnold L , Jr

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC BELLEVUE WA

Report Date: 01 Oct 2000

Abstract: (U) The primary objective of the Summer 2000 Student/Faculty Science Campaign was to provide competitively selected university faculty and students with opportunities for upper atmospheric and space physics research involving the HAARP high frequency transmitter and associated diagnostic instrumentation located near Gakona, Alaska. This report documents the technical program and participants and includes a compilation of the Student I Faculty experiment summaries in areas ionospheric generation of ULF/ELF/VLF radiowaves, D-Region diagnostics, SuperDARN observations of HAARP induced ionospheric irregularities, and potential for telescopic assessments of HAARP induced ionospheric airglow.

Abstract Classification:Unclassified

Descriptive Note: Scientific rept. no. 1, 1 Jan-1 Oct 2001

Pages:57 Page(s)

Report Number: AFRL-VS - TR02001-1668 AFRL-VS *(AFRLVSTR020011668 AFRLVS)* , XC - TR02001-1668 AFRL-VS *(XCTR020011668 AFRLVS)*

Monitor Series: TR02001-1668 *(TR020011668)* , AFRL-VS *(AFRLVS)*

Contract/Grant/Transfer Number: F19628-01-C-0005 *(F1962801C0005)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Basis of Ionospheric Modification by High-Frequency Waves

PDF URL: (pdf) - 3 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA470291

Accession Number: ADA470291

Personal Author(s): Kuo, S P

Corporate Author: POLYTECHNIC UNIV BROOKLYN NY DEPT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Report Date: Jun 2007

Abstract: (U) The requirements of achieving ionospheric modification by ground-transmitted HF heating waves are discussed. The directly relevant processes including linear mode conversion and parametric instabilities are explained physically. The nonline & Schrodinger

equation for Langmuir waves is reviewed and the initial conditions of two types of nonlinear solutions are discussed; from which the criterion for Langmuir soliton generation is pointed out.

Abstract Classification:Unclassified

Pages:21 Page(s)

Report Number: AFRL-VS-HA - TR-2007-1061 AFRL-VS-HA *(AFRLVSHATR20071061 AFRLVSHA)* , XC - TR-2007-1061 AFRL-VS-HA *(XCTR20071061 AFRLVSHA)*

Monitor Series: TR-2007-1061 *(TR20071061)* , AFRL-VS-HA *(AFRLVSHA)*

Contract/Grant/Transfer Number: FA8718-04-C-0001 *(FA871804C0001)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Characterization of the Auroral Electrojet and the Ambient and Modified D Region for HAARP Using Long-Path VLF Diagnostics

PDF URL: (pdf) - 5 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA405592

Accession Number: ADA405592

Personal Author(s): Bell, Timothy F

Corporate Author: STANFORD UNIV CA SPACE TELECOMMUNICATIONS AND RADIOSCIENCE LAB

Report Date: 15 Mar 2001

Abstract: (U) During the period of performance a program of instrument construction, technique development, data acquisition, and data analysis was carried out in order to characterize the auroral electrojet and the ambient and modified D-region directly above and near the HAARP (High Frequency Active Auroral Research Program) facility in Alaska. To accomplish this goal, five VLF D-region diagnostic systems were constructed and deployed in five High Schools near the HAARP facility and along the west coast of Alaska. In addition in order to characterize the auroral electrojet on a continental scale and to allow prediction of its location, four VLF D-region diagnostic systems were constructed and deployed in four High Schools on the east coast of the United States and Canada. Data from the complete array of D-region diagnostic systems was acquired during a number of Fall and Spring HAARP campaigns during the period of performance. This data was then used to determine the state of the D-region above HAARP during the campaigns and to provide information on the location of the auroral electrojet. The salient scientific results from the observations were published in the scientific literature and also reported at the annual RF Ionospheric Interactions Workshop in Santa Fe, New Mexico. In addition a portion of this data formed one of the bases of a Ph.D. dissertation completed at Stanford University.

Abstract Classification:Unclassified

Descriptive Note: Final rept. 27 Sep 1998-31 Dec 1999

Pages:127 Page(s)

Report Number: AFRL-VS - TR-2001-1573 AFRL-VS *(AFRLVSTR20011573 AFRLVS)* , XC - TR-2001-1573 AFRL-VS *(XCTR20011573 AFRLVS)*

Monitor Series: TR-2001-1573 *(TR20011573)* , AFRL-VS *(AFRLVS)*

Contract/Grant/Transfer Number: F19628-96-C-0149 *(F1962896C0149)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) The Precision Expandable Radar Calibration Sphere (PERCS) With Applications for Laser Imaging and Ranging

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA532032

Accession Number: ADA532032

Personal Author(s): Bernhardt, Paul A ; Nicholas, Andy ; Thomas, Linda ; Davis, Mark ; Hoberman, Chuck ; Davis, Matt

Corporate Author: NAVAL RESEARCH LAB WASHINGTON DC PLASMA PHYSICS DIV

Report Date: Sep 2008

Abstract: (U) The Naval Research Laboratory will provide an orbiting calibration sphere to be used with ground-based laser imaging telescopes and HF radio systems. The Precision Expandable Radar Calibration Sphere (PERCS) is a practical, reliable, high-performance HF calibration sphere and laser imaging target to orbit at about 600 km altitude. The sphere will be made of a spherical wire frame with aspect independent radar cross section in the 3 to 35 MHz frequency range. The necessary launch vehicle to place the PERCS in orbit will be provided by the Department of Defense Space Test Program. The expandable calibration target has a stowed diameter of 1 meter and a fully deployed diameter of 10.2 meters. A separate deployment mechanism is provided for the sphere. After deployment the Precision Expandable Radar Calibration Sphere (PERCS) with 180 vertices will be in a high inclination orbit to scatter radio pulses from a number of ground systems, including (1) over-the-horizon (OTH) radars operated by the United States and Australia; (2) high power HF facilities such as HAARP in Alaska, EISCAT in Norway, and Arecibo in Puerto Rico; (3) the chain of high latitude SuperDARN radars used for auroral region mapping; and (4) HF direction finding for Navy ships. With the PERCS satellite, the accuracy of HF radars can be periodically checked for range, elevation, and azimuth errors. In addition, each of the 360 vertices on the PERCS sphere will support an optical

retro-reflector for operations with ground laser facilities used to track satellites. The ground laser systems will be used to measure the precise location of the sphere within one cm accuracy and will provide the spatial orientation of the sphere as well as the rotation rate. The Department of Defense facilities that can use the corner-cube reflectors on the PERCS include (1) the Air Force Maui Optical Site (AMOS), (2) the

Abstract Classification:Unclassified

Descriptive Note: Conference paper

Pages:10 Page(s)

Report Number: XD - XD *(XD)*

Monitor Series: XD

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Approved for public release; distribution is unlimited. Available only to DTIC users. U.S. Government or Federal Purpose Rights License.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Cascade of the Parametric Decay Instability in Ionospheric Heating Experiments

PDF URL: (pdf) - 47 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA529654

Accession Number: ADA529654

Personal Author(s): Kuo, S P

Corporate Author: POLYTECHNIC INST OF NEW YORK FARMINGDALE DEPT OF ELECTRICAL ENGINEERING

Report Date: Jan 2001

Abstract: (U) Cascade of Langmuir waves excited by parametric decay instability (PDI) in ionospheric heating experiments is studied. In resonance cascade the mother Langmuir wave has to propagate downward to the resonant location of the daughter line for the resonant decay. To balance the propagation loss of the mother Langmuir wave, a large power ratio (approx. 10 dB) between two consecutive cascade lines in observed HFPLs is required. The nonresonant cascade proceeds at the same location of PDI. The threshold power has a N(2) dependence for V(e) greater than 2NV(i) and a square root of N dependence for V(e) less than 2N(Vi), where N is the cascade step number.

Abstract Classification:Unclassified

Descriptive Note: Research rept.

Pages:5 Page(s)

Report Number: XC - AFRL/MA *(XCAFRLMA)*

Monitor Series: AFRL/MA *(AFRLMA)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) High Frequency Radar Astronomy With HAARP

PDF URL: (pdf) - 318 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA514972

Accession Number: ADA514972

Personal Author(s): Rodriguez, Paul ; Kennedy, Edward ; Kossey, Paul

Corporate Author: NAVAL RESEARCH LAB WASHINGTON DC INFORMATION TECHNOLOGY DIV

Report Date: Jan 2003

Abstract: (U) At high frequency, radio waves will interact with space plasmas and surfaces of local astronomical objects, producing an echo that can provide new diagnostic data. The availability of high power radars operating at high frequencies opens a window for the remote investigation of our surrounding space environment. We discuss and illustrate this technique with some specific examples.

Abstract Classification:Unclassified

Descriptive Note: Conference paper

Pages:7 Page(s)

Report Number: XB - ONR *(XB)*

Monitor Series: ONR

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) The 2010 Polar Aeronomy and Radio Science (PARS) Summer School

PDF URL: (pdf) - 2 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA554880

Accession Number: ADA554880

Personal Author(s): Kennedy, Edward J ; Snyder, A L ; Secan, James A

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC REDMOND WA

Report Date: 30 Dec 2011

Abstract: (U) The Polar Aeronomy and Radio Science (PARS) Summer School offers graduate students the opportunity to participate in a two week program consisting of scientific lectures and tutorials on the earth's upper atmosphere and ionosphere at the University of Alaska, Geophysical Institute, and experimental research at the High frequency Active Auroral Research Program (HAARP) Research Station at Gakona, Alaska. The 2010 PARS Summer School, conducted over the period July 12-22, 2010, included a total of 21 students and 14 advisors or visiting scientists representing 12 universities. During the research period at the HAARP facility, students conducted a wide variety of experiments ranging from the study of methods and generation efficiency for Extremely Low Frequency (ELF) waves, to the study of Field Aligned Irregularities (FAI) and their influence on Global Positioning System (GPS) accuracy. This report discusses the organization and execution of the 2010 PARS Summer School and presents summaries of the research carried out by each of the participating graduate students.

Abstract Classification:Unclassified

Descriptive Note: Interim rept. 1 Aug 2010-31 Jul 2011

Pages:80 Page(s)

Report Number: NWRA-SEA-11-R425 *(NWRASEA11R425)* , AFRL-RV-PS - TR-2011-0170 AFRL-RV-PS *(AFRLRVPSTR20110170 AFRLRVPS)* , XC - TR-2011-0170 AFRL-RV-PS *(XCTR20110170 AFRLRVPS)*

Monitor Series: TR-2011-0170 *(TR20110170)* , AFRL-RV-PS *(AFRLRVPS)*

Contract/Grant/Transfer Number: FA8718-08-C-0049 *(FA871808C0049)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Availability: Pub. in Geophysical Research Letters, v27 n1 p35-88, 1 Jan 2000. Available only to DTIC users. No copies furnished by NTIS.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Stimulated Thermal Instability for ELF and VLF Wave Generation in the Polar Electrojet

PDF URL: (pdf) - 470 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA402361

Accession Number: ADA402361

Personal Author(s): Kuo, S P ; Lee, M C ; Kossey, P ; Groves, K ; Heckscher, J

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA SPACE VEHICLES DIRECTORATE

Report Date: 15 Nov 1999

Abstract: (U) Generation of ELF and VLF waves in the HF heating wave modulated polar electrojet is studied. Through the Ohmic heating by the amplitude-modulated HF heating wave, the conductivity and thus the current of the electrojet is modulated to set up the ionospheric antenna current. However, it is shown that a stimulated thermal instability is also excited by the amplitude-modulated HF heating wave. This instability introduces an electron temperature modulation more effectively than that by the passive Ohmic heating process and is expected to improve considerably the intrinsic efficiency of ELF and VLF wave generation by the amplitude-modulated HF heating wave. Moreover, the generation efficiency and signal quality also depend on the HF wave modulation scheme. Thus, four amplitude-modulation schemes are examined and compared.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:5 Page(s)

Report Number: AFRL-VS-TR-2002-1575 *(AFRLVSTR20021575)* , XC - AFRL-VS-HA *(XCAFRLVSHA)*

Monitor Series: AFRL-VS-HA *(AFRLVSHA)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Department of Defense FY 1995 Small Business Innovation Research Program (SBIR) Program Solicitation 95.1 Closing Date: 13 January 1995.

PDF URL: (pdf) - 20 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA288749

Accession Number: ADA288749

Corporate Author: DEPARTMENT OF DEFENSE WASHINGTON DC

Report Date: Jan 1995

Abstract: (U) The Navy, Air Force, Defense Nuclear Agency, Ballistic Missile Defense Organization, and U.S. Special Operations Command hereafter referred to as DoD Components, invite small business firms to submit proposals under this program solicitation entitled Small Business Innovation Research (SBIR). Firms with strong research and development capabilities

in science or engineering in any of the topic areas described in Section 8.0 are encouraged to participate. Subject to availability of funds, DoD Components will support high quality research or research and development proposals of innovative concepts to solve the listed defense-related scientific or engineering problems, especially those concepts that also have high potential for commercialization in the private sector. Objectives of the DoD SBIR Program include stimulating technological innovation, strengthening the role of small business in meeting DoD research and development needs, fostering and encouraging participation by minority and disadvantaged persons in technological innovation, and increasing the commercial application of DoD-supported research or research and development results. The Federal SBIR Program is mandated by Public Laws PL 97-219, PL 99443, and PL 102-564. The basic design of the DoD SBIR Program is in accordance with the Small Business Administration (SBA) SBIR Policy Directive, January 1993. The DoD Program presented in this solicitation strives to encourage scientific and technical innovation in areas specifically identified by DoD Components.

Abstract Classification:Unclassified

Pages:311 Page(s)

Report Number: XD - DOD *(XD)*

Monitor Series: DOD

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Multisite Optical Imaging of Artificial Ionospheric Plasmas (Postprint)

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA587074

Accession Number: ADA587074

Personal Author(s): Petersen, Todd R ; Holmes, Jeffrey M ; Gustavsson, Bjorn ; Mills, Travis J

Corporate Author: AIR FORCE RESEARCH LAB KIRTLAND AFB NM SPACE VEHICLES DIRECTORATE

Report Date: 09 Nov 2011

Abstract: (U) Artificial ionospheric plasmas are formed on the bottom side of the natural ionospheric F region during high-power high-frequency (HF) heating experiments and descend to altitudes as low as 140 km before disappearing. Optical emissions produced during these events often exhibit bull s-eye structures, where the artificial plasma is thought to form a central spot that diverts or blocks HF waves to form an empty ring of emissions from the natural ionosphere at higher altitudes. We present multisite image data showing that, in some cases, both the spot and rig represent distinct artificial plasma layers.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:8 Page(s)

Report Number: AFRL-RV-PS-TR-2013-0113 *(AFRLRVPSTR20130113)* , XC - AFRL-RV-PS *(XCAFRLRVPS)*

Monitor Series: AFRL-RV-PS *(AFRLRVPS)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Approved for public release; distribution is unlimited. Available only to DTIC users. U.S. Government or Federal Purpose Rights License.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) On the Generation of ELF/VLF Waves for Long-Distance Propagation via Steerable HF Heating of the Lower Ionosphere

PDF URL: (pdf) - 979 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA528497

Accession Number: ADA528497

Personal Author(s): Cohen, M B ; Inan, U S ; Golkowski, M ; Lehtinen, N G

Corporate Author: STANFORD UNIV CA SPACE TELECOMMUNICATIONS AND RADIOSCIENCE LAB (STAR)

Report Date: 29 Jul 2010

Abstract: (U) ELF/VLF radio waves (300 Hz to 30 kHz) have been successfully generated via modulated HF (3-10 MHz) heating of the lower ionosphere in the presence of natural currents, most recently with the HAARP facility in Alaska. Generation is possible via amplitude modulation or via two techniques involving motion of the HF beam during the ELF/VLF cycle, known as beam painting and geometric modulation. In this paper, we describe a theoretical model describing the HF heating and ionospheric responses, followed by a full-wave calculation of ELF/VLF propagation, and utilize this end-to-end model to derive the predicted radiated ELF/VLF pattern up to 1000 km from the HF heater in the Earth-ionosphere waveguide. We quantitatively compare the generated ELF/VLF signals on the ground from various generation techniques and find it to be generally in agreement with earlier measurements. We apply a simplified ELF/VLF propagation model to quantify the contribution of the ELF/VLF phased array in the radiation pattern resulting from geometric modulation and find this contribution to be significant. We also use a limited HF heating model to quantify the degree to which the current power level of HAARP is sufficient for the beam painting technique, since this technique requires high HF power densities at high altitudes.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:15 Page(s)

Report Number: XB - ONR *(XB)*

Monitor Series: ONR

Contract/Grant/Transfer Number: N00014-05-1-0854 *(N000140510854)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Approved for public release; distribution is unlimited. Available only to DTIC users. U.S. Government or Federal Purpose Rights License.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Waves of Progress

PDF URL: (pdf) - 344 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA581568

Accession Number: ADA581568

Personal Author(s): Isham, Brett

Corporate Author: INTER AMERICAN UNIV OF PUERTO RICO SAN JUAN

Report Date: Jan 2011

Abstract: (U) The Ionospheric Interactions project, based at Interamerican University of Puerto Rico, is developing a state-of-the-art multi-point digital radio system which will build on their past research and significantly accelerate the scientific community's understanding of ionospheric turbulence and its impacts.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:6 Page(s)

Report Number: ARO - 58966-EL-REP.3 ARO *(ARO58966ELREP3)* , XA - 58966-EL-REP.3 ARO *(XA58966ELREP3)*

Monitor Series: 58966-EL-REP.3 *(58966ELREP3)* , ARO

Contract/Grant/Transfer Number: W911NF-11-1-0217 *(W911NF1110217)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Approved for public release; distribution is unlimited. Available only to DTIC users. U.S. Government or Federal Purpose Rights License.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Determination of the Height of the Modulated Electrojet Region Generating ELF Radiation

PDF URL: (pdf) - 3 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA464261

Accession Number: ADA464261

Personal Author(s): Kuo, Spencer P ; Greco, Dimitrij

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC BELLEVUE WA

Report Date: 01 Mar 2007

Abstract: (U) A virtual ionospheric antenna to generate ELF (extremely low frequency) waves is achievable by using amplitude modulated HF (high frequency) waves to modulate the electrojet current. The results of the numerical analysis show that the radiation intensities of ELF waves produced by the modulated electrojet vary with the modulation frequency. Moreover, a ratio of two radiation intensities at two frequencies is height dependent. Thus, with the aid of the numerical results, the experimental measurements on the ratios of the radiation intensities of the ELF waves can provide unambiguous information on the height of the electrojet contributing to the ELF radiation. An experiment using the HAARP heating facility has been performed in 2005. The experimental results of three independent intensity ratios (25 Hz/205 Hz, 25 Hz/325 Hz, and 25 Hz/625 Hz) are used to demonstrate this new diagnostic technique. The height of the source region, where the modulated electrojet radiates most effectively, is determined to be between 94 Km and 97 Km.

Abstract Classification:Unclassified

Descriptive Note: Interim rept.

Pages:5 Page(s)

Report Number: AFRL-VS-HA - TR-2007-1023 AFRL-VS-HA *(AFRLVSHATR20071023 AFRLVSHA)* , XC - TR-2007-1023 AFRL-VS-HA *(XCTR20071023 AFRLVSHA)*

Monitor Series: TR-2007-1023 *(TR20071023)* , AFRL-VS-HA *(AFRLVSHA)*

Contract/Grant/Transfer Number: FA8718-04-C-0001 *(FA871804C0001)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Defense Science and Technology Success Stories

PDF URL: (pdf) - 16 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA568949

Accession Number: ADA568949

Corporate Author: OFFICE OF THE DIRECTOR (DEFENSE RESEARCH AND ENGINEERING) WASHINGTON DC

Report Date: Jan 2007

Abstract: (U) The Department of Defense (DoD) Science & Technology (S&T) Program seeks to ensure that United States warfighters have superior and affordable technology to support their missions. To meet this end, DoD implemented Defense Reliance to foster and facilitate collaboration between the Defense Services and Agencies. The overall goal of Reliance has been to provide a forum for Defense S&T Executives to coordinate their individual strategies into one overall Defense S&T Strategy. This process allows the Defense S&T Executives to invest, divest, or collaborate in research, based on the priorities of the other Components, in order to provide the most complete, cost-effective solutions for the warfighter. Technological superiority has been and continues to be a cornerstone of our national military strategy. The Defense S&T Strategy enables the development and transition of capabilities across the full spectrum of challenges inherent in an uncertain future. Several areas play a particularly pivotal role in executing the QDR strategy, and the Department has accepted some risk in countering traditional challenges, while shifting emphasis on enhancing capabilities to combat irregular, catastrophic, and disruptive threats. Providing the warfighter with the tools needed to accomplish the mission is the number one priority of Defense S&T. Continued technology development is fundamental to enabling the warfighter to dominate in the face of a continuously changing world and environment. The DoD S&T successes of today will continue to strengthen the capabilities for the warfighters of tomorrow. This document, the 2007 Defense Science and Technology Success Stories, demonstrates how the Defense Services and Agencies have continued to achieve many goals, such as increasing the efficiency and capability of existing technologies, developing systems that do more with less, and developing stronger and affordable methods of achieving mission success.

Abstract Classification:Unclassified

Pages:155 Page(s)

Report Number: XD - DDRE *(XD)*

Monitor Series: DDRE

FOIA U2 Display

Distribution/Classification

Distribution Code:A - UNLIMITED DISTRIBUTION

Secondary Dist:Approved for Public Release; Distribution Unlimited.

Export Control:No

For Pay:No

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Classification:UNCLASSIFIED

Collection: TEMS

Title: Defense Science And Technology: Success Stories 2007.

PDF URL:

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tems&docId=CBRNIAC-CB-065164

Accession Number:CBRNIAC-CB-065164

IAC Report Name:CB-065164 *CB065164*

Performing Organization:DEPARTMENT OF DEFENSE WASHINGTON DC

Date of Publication:01 Jan 2007

Abstract: The Department of Defense (DoD) Science and Technology (S and T) Program seeks to ensure that United States' warfighters have superior and affordable technology to support their missions. To meet this end, DoD implemented Defense Reliance to foster and facilitate collaboration between the Defense Services and Agencies. The overall goal of Reliance has been to provide a forum for Defense S and T Executives to coordinate their individual strategies into one overall Defense S and T Strategy. This process allows the Defense S and T Executives to invest, divest, or collaborate in research, based on the priorities of the other Components, in order to provide the most complete, cost-effective solutions for the warfighter. Technological superiority has been and continues to be a cornerstone of our national military strategy. The Defense S and T Strategy enables the development and transition of capabilities across the full spectrum of challenges inherent in an uncertain future. Several areas play a particularly pivotal role in executing the QDR strategy, and the Department has accepted some risk in countering traditional challenges, while shifting emphasis on enhancing capabilities to combat irregular, catastrophic, and disruptive threats. Providing the warfighter with the tools needed to accomplish the mission is the number one priority of Defense S and T. Continued technology development is fundamental to enabling the warfighter to dominate in the face of a continuously changing world and environment. The DoD S and T successes of today will continue to strengthen the capabilities for the warfighters of tomorrow. This document, the 2007 Defense Science and Technology Success Stories, demonstrates how the Defense Services and Agencies have continued to achieve many goals, such as increasing the efficiency and capability of existing technologies, developing systems that do more with less, and developing stronger and affordable methods of achieving mission success.

Category:Technical Report

Pages:156 Page(s)

Site:CBRNIAC

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Investigation of Plasma Phenomena in the Ionosphere Under Natural Conditions and Under Conditions Artificially Perturbed by HAARP

PDF URL: (pdf) - 51 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA445824

Accession Number: ADA445824

Personal Author(s): Secan, James A ; Fremouw, Edward J ; Mazzella Jr, Andrew J ; Rasmussen, John ; Snyder, A L

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC BELLEVUE WA

Report Date: 17 Aug 2005

Abstract: (U) Under this contract, Northwest Research Associates (NWRA) is performing measurements of the ionosphere in order to investigate plasma phenomena in both the natural ionosphere and in the ionosphere perturbed by the High-frequency Active Auroral Research Program (HAARP) high-frequency heater. The research being conducted falls within Hanscom Technical Areas 3(a), Ionospheric Effects Research and Department of Defense Systems, and 3(b), Ionospheric Research Technology, of the Broad Agency Announcement VS-O3-Ol released by the Air Force Research Laboratory (AFRL). As a contribution to Technical Area 3(b), we are collaborating with scientists and engineers from AFRL, the Naval Research Laboratory (NRL), and other research organizations in the application of diagnostic instrumentation to HAARP. Among the HAARP instruments that we are applying to ionospheric research are three NWRA ITS1OS coherent radio receiving systems for measuring relative Total Electron Content (TEC) and recording scintillation, and an Ashtech Model Z-FX UPS receiver for measuring absolute TEC. We are posting TEC from these instruments, and phase-scintillation records from the ITS10S receivers, on the HAARP Web site (www.haarp.alaska.edu) for telescience applications and for decision-making during active experiments, and we are also focusing on inverting the TEC data tomographically to produce images of the F layer over Alaska. Research topics under the foregoing objectives are reported in Section 2.

Abstract Classification:Unclassified

Descriptive Note: Scientific rept. 17 Feb 2003-17 Aug 2005

Pages:81 Page(s)

Report Number: NWRA-BELL-05-R307 *(NWRABELL05R307)* , AFRL-VS-HA - TR-2005-1207 AFRL/VSBX *(AFRLVSHATR20051207 AFRLVSBX)* , XC - TR-2005-1207 AFRL/VSBX *(XCTR20051207 AFRLVSBX)*

Monitor Series: TR-2005-1207 *(TR20051207)* , AFRL/VSBX *(AFRLVSBX)*

Contract/Grant/Transfer Number: FA8718-04-C-0001 *(FA871804C0001)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) FY 97 Geophysics Technology Area Plan.

PDF URL: (pdf) - 2 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA322831

Accession Number: ADA322831

Corporate Author: AIR MATERIEL COMMAND WRIGHT-PATTERSON AFB OH

Report Date: May 1996

Pages:36 Page(s)

Report Number: XC - AMC-AF *(XCAMCAF)*

Monitor Series: AMC-AF *(AMCAF)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Geophysical Electromagnetic Sounding Using HAARP

PDF URL: (pdf) - 838 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA399992

Accession Number: ADA399992

Personal Author(s): Wescott, Eugene M ; Sentman, Davis D

Corporate Author: ALASKA UNIV FAIRBANKS GEOPHYSICAL INST

Report Date: Mar 2002

Abstract: (U) The electrical resistivity of the ground can be measured by several methods. One, which has proven useful, is the controlled source magnetotelluric method (CSAMT). Current over a wide range of frequencies is introduced into the earth through a grounded dipole. Then the resulting electric and magnetic fields are measured at a distance greater than several skin depths. The apparent resistivity is then calculated by: p = 1/5f E/B(exp 2) The apparent resistivity vs. frequency can be converted into true resistivity vs. depth, This grant involved an investigation into the HAARP virtual antenna pattern out to 200 km, and its use as a CSAMT transmitter.

Abstract Classification:Unclassified

Descriptive Note: Final rept. 1 Sep 1997-30 Aug 2001

Pages:14 Page(s)

Report Number: XB - ONR/SRO/WA *(XBONRSROWA)*

Monitor Series: ONR/SRO/WA *(ONRSROWA)*

Contract/Grant/Transfer Number: N00014-97-1-0995 *(N000149710995)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Geophysics Technology Area Plan. FY96.

PDF URL: (pdf) - 2 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA303761

Accession Number: ADA303761

Corporate Author: PHILLIPS LAB KIRTLAND AFB NM

Report Date: Jan 1996

Abstract: (U) The FY 96 Geophysics Technology Area Plan describes Phillips Laboratory's exploratory and advanced technology development in the field of geophysics. The document addresses user needs, goals, major accomplishments, and changes from last year for each geophysics thrust. Thrust 1 describes geophysics for space operations and communications. Thrust 2 covers geophysics for air and combat operations. Finally, thrust 3 addresses geophysics with corporate applications. (AN)

Abstract Classification:Unclassified

Pages:39 Page(s)

Report Number: PL-TM-96-1001 *(PLTM961001)* , XC - AMC-AF *(XCAMCAF)*

Monitor Series: AMC-AF *(AMCAF)*

FOIA U2 Display

Distribution/Classification

Distribution Code:A - UNLIMITED DISTRIBUTION

Secondary Dist:Approved for Public Release; Distribution Unlimited.

Export Control:No

For Pay:No

Copyrighted - No Govt Rights:No

Classification:UNCLASSIFIED

Collection: TEMS

Title: Department Of Defense Fiscal Year (fy) 2008/2009 Budget Estimates. Research, Development, Test And Evaluation, Defense-wide, Volume 1 -- Defense Advanced Research Projects Agency.

PDF URL:

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tems&docId=CBRNIAC-CB-039689

Accession Number:CBRNIAC-CB-039689

IAC Report Name:CB-039689 *CB039689*

Performing Organization:DEPARTMENT OF DEFENSE WASHINGTON DC

Date of Publication:01 Feb 2007

Abstract: The FY 2008/2009 Budget Estimates for Defense Advanced Research Projects Agency (DARPA) are presented in the following categories (along with Program Element numbers): 0603286E Advanced Aerospace Systems; 0603739E Advanced Electronics Technologies; 0602383E Biological Warfare Defense; 0602304E Cognitive Computing Systems; 0603760E Command, Control and Communications Systems; 0601101E Defense Research Sciences; 0602716E Electronic Technology; 0603768E Guidance Technology; 0603764E Land Warfare Technology; 0605898E Management Headquarters; 0602715E Materials and Biological Technology; 0603766E Network-Centric Warfare Technology; and0602702E Tactical Technology.

Category:Budget Estimates

Pages:445 Page(s)

Site:CBRNIAC

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 53 - NATO FURNISHED

Distribution Statement:Approved for public release; distribution is unlimited. NATO.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Characterising the Ionosphere (La caracterisation de l'ionosphere)

PDF URL: (pdf) - 14 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA496353

Accession Number: ADA496353

Personal Author(s): Wyman, G

Corporate Author: NATO RESEARCH AND TECHNOLOGY ORGANIZATION NEUILLY-SUR-SEINE (FRANCE)

Report Date: Jan 2009

Abstract: (U) This report is a compilation of papers from academic and other research institutes that describe ionospheric phenomena and parameters that affect electromagnetic propagation. The report addresses both mid-latitude and high-latitude effects. The first chapter describes the morphology of the ionosphere, briefly covers the neutral atmosphere and expands on the influence of the geomagnetic field, ionospheric electric field and currents, and particle precipitation at high latitudes. Chapter 2 looks at the instrumentation for obtaining the relevant data. An analysis of the mapping of total electron content in geographic co-ordinates is presented in Chapter 3 with an aim of providing timely information to the users.

Abstract Classification:Unclassified

Descriptive Note: Final rept.

Pages:266 Page(s)

Report Number: AC/323(IST-051)TP/207 *(AC323IST051TP207)* , NATO/RTO - TR-IST-051 NATO/RTO *(NATORTOTRIST051 NATORTO)* , X5 - TR-IST-051 NATO/RTO *(X5TRIST051 NATORTO)*

Monitor Series: TR-IST-051 *(TRIST051)* , NATO/RTO *(NATORTO)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Establishing the National Polar Radio Science Consortium

PDF URL: (pdf) - 224 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA279230

Accession Number: ADA279230

Corporate Author: ALASKA UNIV FAIRBANKS GEOPHYSICAL INST

Report Date: 30 Apr 1994

Abstract: (U) The Geophysical Institute of the University of Alaska Fairbanks (GI- UAF) was designated as the Prime Contractor to represent the NPRSC. Since the HAARP facility will be built in Alaska, the GI-UAF can provide various logistic support activities, in addition to playing the role of coordinating the scientific advisory and support functions for the NPRSC at the request of the ONR/AFPL

Abstract Classification:Unclassified

Descriptive Note: Final rept.

Pages:6 Page(s)

Report Number: XB - ONR *(XB)*

Monitor Series: ONR

Contract/Grant/Transfer Number: N00014-91-C-0017 *(N0001491C0017)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) FY97 Geophysics Technology Area Plan.

PDF URL: (pdf) - 2 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA323635

Accession Number: ADA323635

Corporate Author: PHILLIPS LAB KIRTLAND AFB NM

Report Date: Mar 1997

Abstract: (U) The FY97 Geophysics Technology Area Plan describes Phillips Laboratory's exploratory and advanced technology development strategy to support AF environmental and Army air and combat operations. Systems that sense environmental conditions from space will be increasingly important in providing this support. Objective is to improve the specification and forecasting, for longer periods and more precisely, of performance limiting battlespace conditions wherever our forces operate.

Abstract Classification:Unclassified

Pages:34 Page(s)

Report Number: PL-TM-97-1002 *(PLTM971002)* , XC - PL *(XC)*

Monitor Series: PL

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Bibliography of the Radio Frequency Radiation Branch, Directed Energy Bioeffects Division, Human Effectiveness Directorate, Air Force Research Laboratory: 1997-2003

PDF URL: (pdf) - 322 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA495128

Accession Number: ADA495128

Personal Author(s): Jauchem, James

Corporate Author: AIR FORCE RESEARCH LAB BROOKS AFB TX HUMAN EFFECTIVENESS DIR/RADIOFREQUENCY RADIATION BRANCH

Report Date: Feb 2004

Abstract: (U) The Radio Frequency Radiation (RFR) Branch of the Directed Energy Bioeffects Division, Human Effectiveness Directorate, Air Force Research Laboratory (AFRL/HEDR), has completed work regarding biological effects of exposure to different power densities, specific absorption rates, and unique pulse parameters of RFR. Data to maintain appropriate RFR exposure standards were published in numerous peer-reviewed journal articles. The studies included various levels of organization, including: whole animal, animal systems, cell, sub-cellular, and macromolecular levels. These data will continue to be used to make sound decisions regarding safe exposure of humans in the Air Force workplace. This bibliography is a list of peer-reviewed journal articles, peer-reviewed books, book chapters, and refereed proceedings, non-peer reviewed publications and abstracts, and technical reports, from the period 1997-2003.

Abstract Classification:Unclassified

Descriptive Note: Final rept. Oct 1997-Dec 2003

Pages:32 Page(s)

Report Number: AFRL-HE-BR-TR-2004-0009 *(AFRLHEBRTR20040009)* , XC - AFRL/HEDR *(XCAFRLHEDR)*

Monitor Series: AFRL/HEDR *(AFRLHEDR)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Measuring Electrodynamics of the Ionosphere by Digital Ionosondes and Other Techniques

PDF URL: (pdf) - 2 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA402979

Accession Number: ADA402979

Personal Author(s): Reinisch, Bodo ; Sales, Gary

Corporate Author: MASSACHUSETTS UNIV LOWELL CENTER FOR ATMOSPHERIC RESEARCH

Report Date: Mar 2001

Abstract: (U) Ionospheric sounding in the equatorial and high latitude ionosphere and the development of new analysis techniques shows new ways for ionospheric diagnostics comparison of Digisonde ionograms and drift measurements with optical all sky images provides an explanation of the equatorial anomaly spread F signatures on ionograms, and their relation to satellite scintillation effects. For the auroral and polar cap region the Generalized Digisonde Drift

Analysis (GDDA) program was developed to increase drift velocity fields. This facilitated the monitoring of polar patches. A new ARTIST4 system was developed for the AF Digisondes and the DISS system to strengthen the quality of the data and the station networking. All output data are now in the SAO 4.2 format. ARTIST4 now calculates an estimated topside profile with a scale height derived from the shape of the bottomside profile. Concept and breadboard designs of a topside sounder were developed and tested at the Millstone Hill digisonde site. These tests showed successful implementation of pulse and chirp waveforms for a topside advances sounder (TOPAS).

Abstract Classification:Unclassified

Descriptive Note: Annual rept. 24 Sep 1998-23 Sep 1999

Pages:38 Page(s)

Report Number: AFRL-VS - TR-2001-1557 AFRL-VS *(AFRLVSTR20011557 AFRLVS)* , XC - TR-2001-1557 AFRL-VS *(XCTR20011557 AFRLVS)*

Monitor Series: TR-2001-1557 *(TR20011557)* , AFRL-VS *(AFRLVS)*

Contract/Grant/Transfer Number: F19628-96-C-0159 *(F1962896C0159)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Global Ionospheric Processes

PDF URL: (pdf) - 840 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA515141

Accession Number: ADA515141

Personal Author(s): Pedersen, Todd R ; Mishin, Evgeny ; Beach, Theodore ; Groves, Keith ; Quinn, John ; Mills, Travis ; Esposito, Robert ; Valladares, Cesar ; Basu, Santimay ; Starks, Michael ; MacKenzie, Eileen

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA

Report Date: 29 Oct 2008

Abstract: (U) The Global Ionospheric Processes basic research task has focused on three core areas: the equatorial ionosphere, the polar ionosphere, and active experiments. In equatorial ionospheric research, the group concluded work on previous solar maximum experiments including the Conjugate Points Experiment (COPEX), made preparatory investigations for C/NOFSA satellite mission, and carried out initial research with the satellite after launch. In the high latitudes, a chain of stations across the polar cap was completed with the installation of instruments at Station Nord, Greenland, to observe the formation and evolution of polar cap patches and scintillation-producing irregularities. Significant progress was made in

understanding substorm plasma injections as they relate to subauroral plasma streams and other phenomena near the plasmasphere boundary. A number of advances were made in active experiments, especially with the HAARP facility. This included reproduction of artificial optical emissions from the E layer, quantitative determination of optical emission generation efficiency, and investigations into naturally occurring subauroral precipitation structures that could prove useful for controlled particle precipitation experiments. We also detail a number of technology transitions resulting from this research.

Abstract Classification:Unclassified

Descriptive Note: Final rept.

Pages:33 Page(s)

Report Number: AFRL-RV-HA - TR-2009-1004 AFRL-RV-HA *(AFRLRVHATR20091004 AFRLRVHA)* , XC - TR-2009-1004 AFRL-RV-HA *(XCTR20091004 AFRLRVHA)*

Monitor Series: TR-2009-1004 *(TR20091004)* , AFRL-RV-HA *(AFRLRVHA)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Imaging of Underground Structure Using HAARP

PDF URL: (pdf) - 3 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA398268

Accession Number: ADA398268

Personal Author(s): Mackie, Randall L

Corporate Author: GSY-USA INC SAN FRANCISCO CA

Report Date: Feb 1999

Abstract: (U) Non-invasive imaging of underground structure is important for the detection of hidden tunnels and other hazards, as well as resource exploration, mineral exploration, and environmental contamination problems. We processed and analyzed electromagnetic imaging data sets provided by the Air Force Research Laboratory (AFRL). The main parts of this study included: 1) subsurface imaging using smooth minimum-structure algorithms, 2) adaptation of imaging algorithms for parametric inversions, 3) analysis of the sensitivity and resolution of data to subsurface features and sharp boundaries, and 4) modification of robust processing algorithms for AMT data. Our analysis using synthetic data for simple models indicates the subsurface tunnels can be successfully detected if they are at a depth to diameter ratio of approximately 3:1 or less. Detection of tunnels in actual field conditions is more difficult because of the low signal levels in the AMT frequency range and geologic noise. This was evident in all data sets analyzed under this contract. The HAARP transmitter has the potential to be a valuable exploration tool in that it could generate EM fields that appeared locally as plane waves and could overcome the problems with low AMT signal levels and geologic noise. Our modifications to robust

processing algorithms for AMT data and for controlled source data have proven useful for analyzing data with low signal levels and large amounts of noise.

Abstract Classification:Unclassified

Descriptive Note: Final rept

Pages:48 Page(s)

Report Number: GSY-99/001 *(GSY99001)* , AFRL-VS - TR-1999-1511 AFRL/MA *(AFRLVSTR19991511 AFRLMA)* , XC - TR-1999-1511 AFRL/MA *(XCTR19991511 AFRLMA)*

Monitor Series: TR-1999-1511 *(TR19991511)* , AFRL/MA *(AFRLMA)*

Contract/Grant/Transfer Number: F19628-98-C-0016 *(F1962898C0016)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Report on the HAARP 2008 Winter Campaign Focusing on Artificial Ionospheric Irregularities

PDF URL: (pdf) - 14 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA514970

Accession Number: ADA514970

Personal Author(s): Kennedy, Edward J ; Secan, James A ; Snyder, Arnold L

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC REDMOND WA

Report Date: 31 Jul 2008

Abstract: (U) A research campaign was conducted at the joint US joint Air Force, US Navy, and DARPA High-Latitude Active Auroral Research Program (HAARP) site near Gakona, AK, during the period 21 February through 3 March 2008. The focus of the campaign was on generation of plasma-density irregularities in the ionosphere an optical and RF emissions from the ionosphere as a by-product of the interaction between the HAARP HF heater and the atmosphere and ionosphere above HAARP. This report documents the preliminary results obtained from this campaign through short (two to three page) summaries provided by the Principal Investigators for each of the experiments runs.

Abstract Classification:Unclassified

Descriptive Note: Scientific rept. no. 3, 21 Feb-3 Mar 2008

Pages:110 Page(s)

Report Number: AFRL-RV-HA - TR-2009-1024 AFRL-RV-HA *(AFRLRVHATR20091024 AFRLRVHA)* , XC - TR-2009-1024 AFRL-RV-HA *(XCTR20091024 AFRLRVHA)*

Monitor Series: TR-2009-1024 *(TR20091024)* , AFRL-RV-HA *(AFRLRVHA)*

Contract/Grant/Transfer Number: FA8718-04-C-0001 *(FA871804C0001)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Department of Defense In-House RDT&E Activities Report for Fiscal Year 1998.

PDF URL: (pdf) - 24 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA362634

Accession Number: ADA362634

Personal Author(s): Tangney, John ; Williams, Lorraine ; Darby, Andrew

Corporate Author: OFFICE OF THE DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING WASHINGTON DC

Report Date: 30 Sep 1998

Abstract: (U) The DoD In-House RDT&E Activities Report and Database Project is the DDR&E's central source of information on laboratory status, and serves four essential purposes: (1) Since inception, it has been the only compilation of statistics organized by location on DoD RDT&E activities; (2) It provides the basis for prompt responses to many general queries about DoD RDT&E activities without recourse to special surveys, etc.; (3) It provides a historical database which can be used for tracing consolidations and organizational changes, and for special analyses and trend studies; and, (4) It provides insight into the technical and organizational environment of the DoD laboratories and the financial manpower and facility investments made in them.

Abstract Classification:Unclassified

Descriptive Note: Final rept.,

Pages:387 Page(s)

Report Number: XD - ODDRE *(XD)*

Monitor Series: ODDRE

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 23 - AVAILABILITY: DOCUMENT PARTIALLY ILLEGIBLE

Distribution Statement:Approved for public release; distribution is unlimited. Document partially illegible.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) United States Air Force Summer Research Program -- 1993. Volume 3. Phillips Laboratory

PDF URL: (pdf) - 24 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA278694

Accession Number: ADA278694

Personal Author(s): Moore, Gary ; Friedman, Jeffrey ; Humi, Mayer ; Kuo, S P ; Lee, Tze-San ; Willson, Robert F ; Anderson, Richard ; Carlisle, Gene ; Choate, David B

Corporate Author: RESEARCH AND DEVELOPMENT LABS CULVER CITY CA

Report Date: Dec 1993

Abstract: (U) 1. Ion-Molecule reactions at high temperatures. 2. Optical and atmospheric turbulence. 3. Generation of ELF and VLE waves in the HF heater-modulated Polar electrojet. 4. Incidence rate estimate of elevated pediatric blood lead.

Abstract Classification:Unclassified

Descriptive Note: Final rept.

Pages:646 Page(s)

Report Number: AFOSR - TR-95-0753 AFOSR *(AFOSRTR950753)* , XC - TR-95-0753 AFOSR *(XCTR950753)*

Monitor Series: TR-95-0753 *(TR950753)* , AFOSR

Contract/Grant/Transfer Number: F49620-90-C-0076 *(F4962090C0076)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 23 - AVAILABILITY: DOCUMENT PARTIALLY ILLEGIBLE

Distribution Statement:Availability: Document partially illegible.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Ionospheric Measurements in the Wake of Solar Maximum

PDF URL: (pdf) - 8 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA427533

Accession Number: ADA427533

Personal Author(s): Andreasen, Angela M ; Begenesich, John ; Fremouw, Edward ; Holland, Elizabeth ; Mazzella, Andrew J , Jr

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC BELLEVUE WA

Report Date: 30 Apr 2004

Abstract: (U) During three years following the solar maximum of the year 2000, NorthWest Research Associates (NWRA) conducted ionospheric measurements at several Air Force research and operational locations and analyzed the data collected thereby. The measurements were performed using a variety of radiowave techniques, most involving transionospheric radio propagation, and included observations of ionospheric perturbations via high-power transmissions under the High-frequency Active Auroral Research Program (HRRRP). Notable among the instruments employed were the Air Force Ionospheric Measuring System (AN/GMQ-35) and the NWRA ITS10S coherent radio receiving system. The primary measurements were of ionospheric total electron content (TEC) and radiowave scintillation, for describing the ionosphere and its plasma-density structures during this solar epoch and under the perturbing influence of HAARP. Records of TEC were inverted tomographically to produce two-dimensional (altitude vs. latitude) images of plasma density. By these and other means, ionospheric features such as the main F-layer trough and polar patches were characterized for application to Air Force environmental models.

Abstract Classification:Unclassified

Descriptive Note: Final rept. 1 Jan 2001-31 Mar 2004

Pages:145 Page(s)

Report Number: NWRA-BECR-04-R274 *(NWRABECR04R274)* , AFRL-VS-HA - TR-2004-1125 AFRL-VS-HA *(AFRLVSHATR20041125 AFRLVSHA)* , XC - TR-2004-1125 AFRL-VS-HA *(XCTR20041125 AFRLVSHA)*

Monitor Series: TR-2004-1125 *(TR20041125)* , AFRL-VS-HA *(AFRLVSHA)*

Contract/Grant/Transfer Number: F19628-01-C-0005 *(F1962801C0005)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) AFRL's Demonstration and Science Experiments (DSX) Mission

PDF URL: (pdf) - 573 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA531813

Accession Number: ADA531813

Personal Author(s): Scherbarth, Mark ; Smith, Durand ; Adler, Aaron ; Stuart, Janet ; Ginet, Greg

Corporate Author: AIR FORCE RESEARCH LAB KIRTLAND AFB NM

Report Date: Sep 2009

Abstract: (U) The Air Force Research Laboratory, Space Vehicles Directorate (AFRL/RV) has developed the Demonstration and Science Experiments (DSX) mission to research technologies needed to significantly advance Department of Defense (DoD) capabilities to operate spacecraft in the harsh radiation environment of Medium-Earth Orbits (MEO). The ability to operate effectively in the MEO environment significantly increases the DoD's capability to field space systems that provide persistent global space surveillance and reconnaissance, high-speed satellite-based communication, lower-cost GPS navigation, and protection from space weather and environmental effects on a responsive satellite platform. The three DSX physics-based research/experiment areas are 1. Wave Particle Interaction Experiment (WPIx): Researching the physics of Very-Low-Frequency (VLF) electro-magnetic wave transmissions through the ionosphere and in the magnetosphere and characterizing the feasibility of natural and man-made VLF waves to reduce and precipitate space radiation 2. Space Weather Experiment (SWx): Characterizing, mapping, and modeling the space radiation environment in MEO, an orbital regime attractive for future DoD, Civil, and Commercial missions; and 3. Space Environmental Effects Experiment (SFx): Researching and characterizing the MEO space weather effects on spacecraft electronics and materials. Collectively, thirteen individual payloads are combined together from these three research areas and integrated onto a single platform (DSX) which provides a low-cost opportunity for AFRL due to their common requirements. All three experiments require a 3-axis stabilized spacecraft bus (but no propulsion), a suite of radiation sensors, and extended duration in a low inclination, elliptical, MEO orbit. DSX will be launch-ready in summer 2010 for a likely launch co-manifest with an operational DoD sate

Abstract Classification:Unclassified

Descriptive Note: Conference paper

Pages:12 Page(s)

Report Number: XC - AFRL/NM *(XCAFRLNM)*

Monitor Series: AFRL/NM *(AFRLNM)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Investigation of Plasma Phenomena in the Ionosphere Under Natural Conditions and Under Conditions Artificially Perturbed by HAARP

PDF URL: (pdf) - 6 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA517436

Accession Number: ADA517436

Personal Author(s): Secan, James A ; Nickisch, L J ; Knepp, Dennis L ; Snyder, A L ; Kennedy, Edward J

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC REDMOND WA

Report Date: 31 Aug 2008

Abstract: (U) During the report period, NorthWest Research Associates (NWRA) conducted ionospheric measurements at several Air Force research and operational locations and analyzed the data collected thereby. The measurements were performed using a variety of radiowave techniques, most involving transionospheric radio propagation, and included observations of ionospheric perturbations via high-power transmissions under the High frequency Active Auroral Research Program (HAARP). Total Electron Content (TEC) from a chain of stations in Alaska were inverted tomographically to produce altitude versus latitude images of plasma density. By these and other means, ionospheric features such as the main F-layer trough and polar patches were characterized for application to Air Force environmental models. Studies of ionospheric scintillation focused on the performance of models for scintillation were conducted. A number of studies were undertaken to develop better means of partitioning GPS TEC data in altitude and to assess uncertainties in TEC derived from GPS observations.

Abstract Classification:Unclassified

Descriptive Note: Final rept. 18 Aug 2005-31 Jul 2008

Pages:134 Page(s)

Report Number: NWRA-BELL-05-R376 *(NWRABELL05R376)* , AFRL-RV-HA - TR-2008-1139 AFRL-RV-HA *(AFRLRVHATR20081139 AFRLRVHA)* , XC - TR-2008-1139 AFRL-RV-HA *(XCTR20081139 AFRLRVHA)*

Monitor Series: TR-2008-1139 *(TR20081139)* , AFRL-RV-HA *(AFRLRVHA)*

Contract/Grant/Transfer Number: FA8718-04-C-0001 *(FA871804C0001)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Electromagnetic Interference Impact of the Proposed Emitters for the High Frequency Active Auroral Research Program (HAARP)

PDF URL: (pdf) - 4 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA273401

Accession Number: ADA273401

Personal Author(s): Robertshaw, G A ; Snyder, A L ; Weiner, M M

Corporate Author: MITRE CORP BEDFORD MA

Report Date: 14 May 1993

Abstract: (U) The proposed HAARP emitters at the Gakona (Alaska) preferred site and at the Clear AFS (Alaska) alternative site are the Ionospheric Research Instrument (IRI), the Incoherent Scatter Radar (ISR), and the Vertical Incidence Sounder(VIS). The electromagnetic interference (EMI) impact of those emitters on receiving systems in the vicinity of the sites is estimated in this study. The results are intended for use as an input to the Air Force Environmental Impact Statement as part of the Environmental Impact Analysis Process.

Abstract Classification:Unclassified

Descriptive Note: Interim rept.

Pages:134 Page(s)

Report Number: M93B0000044RI *(M93B0000044RI)* , PL* - TR-93-2114 PL/HANSCOM *(PLTR932114 PLHANSCOM)* , XC - TR-93-2114 PL/HANSCOM *(XCTR932114 PLHANSCOM)*

Monitor Series: TR-93-2114 *(TR932114)* , PL/HANSCOM *(PLHANSCOM)*

Contract/Grant/Transfer Number: F19628-89-C-0001 *(F1962889C0001)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Space Climate and the Military Decision Making Process in Solar Cycle 24

PDF URL: (pdf) - 7 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA517914

Accession Number: ADA517914

Personal Author(s): Godshall, Stacy

Corporate Author: ARMY SPACE AND MISSILE DEFENSE COMMAND REDSTONE ARSENAL AL

Report Date: Jan 2008

Abstract: (U) January 2008 was the beginning of a new solar cycle called solar cycle 24. In this new 11 year cycle, as with all solar cycles, the sun will have an increase in magnetic activity until the maximum is reached in about 2012 or 2013, and then decrease until about 2019 when minimum will be reached. This type of dynamic activity in the sun has been visibly manifested for centuries in the number of sunspots on the sun, with the maximum of the cycle corresponding to the maximum of the number of sunspots. The maximum of solar cycle 24 will possibly have a peak 30-50 percent greater than the peak of solar cycle 23 as depicted in Figure 1 [Dikpati, et al, 2006; Phillips and Hathaway, 2006], and thus it will possibly be an intense cycle for geomagnetic storms. As mentioned, these cycles have been the object of study for scientists for centuries. What has not occurred in centuries past however is the analysis of the solar cycle and

its impact on military operations. This is obvious since no military operations have needed to incorporate the solar cycle and its dynamics into planning since it generally had no effect on operations. Times have changed and the military has extensively utilized Space assets in operations for approximately the last twenty years. Thus for two solar cycles, specifically cycles 22 and 23, we have incorporated Space weather into mission analysis. Weather in general has had significant impact on operations since warfare began; either benefiting one force or the other. The following are just a few examples of such operational impacts created by weather conditions. In 1915, German forces use of poison gas and wind blew the chemicals back onto German lines and destroyed four Prussian regiments. In 1944, the D-Day weather forecast was for conditions favorable to air, sea and ground operations together ? a rare event.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:7 Page(s)

Report Number: XA - SMDC *(XA)*

Monitor Series: SMDC

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Support from the Army Research Office to be Used Towards Student Travel Fellowships for the National Radio Science Meetings in January 2010, 2011, and 2012

PDF URL: (pdf) - 22 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA584031

Accession Number: ADA584031

Personal Author(s): Bailey-Mathae, Katherine

Corporate Author: NATIONAL ACADEMY OF SCIENCES WASHINGTON DC

Report Date: 06 Aug 2012

Abstract: (U) The 2012 USNC-URSI National Radio Science Meeting was held in Boulder, Colorado, 04-07 January 2012. This open science meeting is sponsored by the U.S. National Committee (USNC) of the International Union of Radio Science (URSI), and held in cooperation with the IEEE Antennas and propagation Society, Circuits and Sensing Society, Communications Society, Electromagnetic compatibility Society, Geoscience and Remote Sensing Society, Information Theory Society, Instrumentation and Measurement Society, Microwave Theory and Techniques Society, and Nuclear Science Society. Papers were presented in the interest areas of the URSI Scientific Commissions (c.f. www.ursi.org): Electromagnetic Metrology, Fields and Waves, Signals and Systems, Electronics and Photonics, Electromagnetic

Environment and Interference, Wave Propagation and Remote Sensing, Ionospheric Radio and Propagation, Waves in Plasmas, Radio Astronomy, and Electromagnetics in Biology and Medicine.

Abstract Classification:Unclassified

Descriptive Note: Final rept. 25 May 2009-24 May 2012

Pages:438 Page(s)

Report Number: ARO - 56120-EL-1 ARO *(ARO56120EL1)* , XA - 56120-EL-1 ARO *(XA56120EL1)*

Monitor Series: 56120-EL-1 *(56120EL1)* , ARO

Contract/Grant/Transfer Number: W911NF-09-1-0264 *(W911NF0910264)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) NRL Review, 2004

PDF URL: (pdf) - 26 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA475361

Accession Number: ADA475361

Corporate Author: NAVAL RESEARCH LAB WASHINGTON DC

Report Date: May 2004

Abstract: (U) The mission of the Naval Research Laboratory is to conduct a broadly based multidisciplinary program of scientific and advanced technological development directed toward maritime applications of new and improved materials, techniques, equipment, systems, and ocean, atmospheric, and space sciences and related technologies. Areas covered in this review include acoustics; atmospheric science and technology; chemical/biochemical research; electronics and electromagnetics; information technology and communications; material science and technology; ocean and atmospheric science and technology; optical sciences; remote sensing; simulation, computing, and modelling; and space research and satellite technology.

Abstract Classification:Unclassified

Descriptive Note: Annual rept.

Pages:259 Page(s)

Report Number: NRL/PU/3430--04-471 *(NRLPU343004471)* , XB - NRL *(XB)*

Monitor Series: NRL

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Environmental Impact Statement. Volume 1. Proposed High Frequency Active Auroral Research Program

PDF URL: (pdf) - 20 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA267641

Accession Number: ADA267641

Corporate Author: PHILLIPS LAB HANSCOM AFB MA

Report Date: Jul 1993

Abstract: (U) The FEIS describes the potential environmental impacts of constructing and operating a proposed ionospheric research facility in interior Alaska. The system is referred to as HAARP(High-frequency Active Auroral Research Program), and would be used primarily for conducting pioneering studies of ionospheric properties. This proposed facility would be the most technologically advanced in the world. The program could lead to a better understanding of the ionosphere and enable researchers to develop methods for enhanced communications for both civilian and defense applications. The HAARP system consists of a powerful high frequency radio transmitter, referred to as the ionospheric research instrument, and a number of scientific data gathering (diagnostic) instruments. This document addresses three alternatives associated with the construction of the HAARP facility; namely construction at either Clear or Gakona, and the no action alternative. Issues and resources that were examined for both of the sites include land and minerals, vegetation and wetlands, mammals, birds, aquatics, hydrology and water quality, air quality, socioeconomics, cultural resources, subsistence, recreation, aesthetics, possible bioeffects of radio frequency radiation, electromagnetic environment and radio frequency interference, atmosphere, threatened and endangered species, hazardous materials and wastes, and irretrievable commitment of resources

Abstract Classification:Unclassified

Descriptive Note: Final rept.

Pages:450 Page(s)

Report Number: XC - USAF *(XC)*

Monitor Series: USAF

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) CHRONOLOGY: From the Air Force Geophysics Laboratory to the Geophysics Directorate, Phillips Laboratory, 1985-1995.

PDF URL: (pdf) - 3 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA301134

Accession Number: ADA301134

Personal Author(s): Liebowitz, Ruth P ; Kindler, Evelyn M

Corporate Author: PHILLIPS LAB HANSCOM AFB MA

Report Date: 26 Sep 1995

Abstract: (U) This chronology is a continuation of the 1985 report (AFGL-TR-02O1, Special Reports, No. 252) published under the title Chronology: From the Cambridge Field Station to the Air Force Geophysics Laboratory, 1945-1985. Together, these two chronologies cover the fifty years of research and development undertaken by the Air Force's Geophysics Directorate since its founding shortly after the end of World War II. As did the earlier chronology, this update lists major organizational developments and events relating to the laboratory's scientific programs. It also includes related illustrations and appendices. The work is intended to provide an updated historical reference for staff at the directorate and at related government agencies.

Abstract Classification:Unclassified

Descriptive Note: Special rept.,

Pages:45 Page(s)

Report Number: PL-TR-95-2134 *(PLTR952134)* , SR-275 *(SR275)* , XC - PL/HANSCOM *(XCPLHANSCOM)*

Monitor Series: PL/HANSCOM *(PLHANSCOM)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Availability: Pub. in Jnl. of Geophysical Research, v104 nA9, p19,889-19,1894,1 Sep 1999. Available only to DTIC users. No copies furnished by NTIS.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Excitation of Short-Scale Field-Aligned Electron Density Irregularities by Ionospheric Topside Sounders

PDF URL: (pdf) - 609 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA402322

Accession Number: ADA402322

Personal Author(s): Kuo, S P ; Lee, M C ; Kossey, P

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA

Report Date: 27 May 1999

Abstract: (U) Generation of short-scale field-aligned electron density irregularities on a short timescale (1 s) by ionospheric topside sounder pulse's is studied. It is a four-wave parametric coupling process, in which a sounder-launched Z mode pump wave decays into two electron Bernstein sidebands and a geomagnetic field-aligned density irregularity. The dispersion relation of the parametric coupling process has been derived and analyzed. The results show that meter-scale field-aligned electron density irregularities (FAI) can be excited with growth rates of the order of 10(exp 5)/sec. under the resonance conditions that f(sub o) congruent f(sub p) congruent nf(sub c), where f(sub o), f(sub p) and f(sub c) are the pump wave frequency, electron plasma frequency, and electron cyclotron frequency, respectively, and n is an integer. The excited FAI extend along the magnetic field toward the satellite path, causing the incoherent scattering of the subsequently transmitted sounding pulses. This is suggested to be a possible cause of long-duration Z mode echoes appearing on the Alouette 2 ionograms when f(sub o) congruent f(sub p) congruent nf(sub c), as reported by Benson 1997. It is found that the threshold field of the instability decreases with increased n. It may explain why long-duration Z mode echoes were only observed when n - 4.

Abstract Classification:Unclassified

Pages:7 Page(s)

Report Number: AFRL-VS - TR-2002-1576 AFRL-VS *(AFRLVSTR20021576 AFRLVS)* , XC - TR-2002-1576 AFRL-VS *(XCTR20021576 AFRLVS)*

Monitor Series: TR-2002-1576 *(TR20021576)* , AFRL-VS *(AFRLVS)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Measuring Electrodynamics of the Ionosphere by Digital Ionosondes and Other Techniques

PDF URL: (pdf) - 2 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA401996

Accession Number: ADA401996

Personal Author(s): Reinisch, Bodo ; Sales, Gary

Corporate Author: MASSACHUSETTS UNIV LOWELL CENTER FOR ATMOSPHERIC RESEARCH

Report Date: 20 Jul 2000

Abstract: (U) Extensive modeling of equatorial depletions was carried to compare the Agua Verde, Chile all-sky airglow (630.0 nm) observations with the Digisonde results from the same site. The motion/structure of depletions observed away from the magnetic equator showed west-to-east drift speeds of 80-100 m/s and lifetimes of the order of 2 hrs. On the quiet nights the airglow emission was about a factor of two greater than on nights when depletions were present indicating a lower F-layer altitude on quiet nights. This is consistent with the lack of depletions on the quiet nights as instabilities are more likely to form as altitude of layer increases. Qaanaaq polar Digisonde drift measurements were used to analyze the motion/structure of polar patches as they drifted over the site. A switch in IMF from Bz negative to positive resulted in the absence of patches after the change in field direction. Doppler analysis was used to separate the vertical ionosphere motion resulting from electron-ion recombination from the true vertical plasma drift. Results of this modeling are shown and Digisonde data from Puerto Rico are compared to incoherent scatter radar velocities.

Abstract Classification:Unclassified

Descriptive Note: Scientific rept. no. 1, 24 Sep 1996-23 Sep 1997

Pages:39 Page(s)

Report Number: AFRL-VS - TR-2001-1535 AFRL-VS *(AFRLVSTR20011535 AFRLVS)* , XC - TR-2001-1535 AFRL-VS *(XCTR20011535 AFRLVS)*

Monitor Series: TR-2001-1535 *(TR20011535)* , AFRL-VS *(AFRLVS)*

Contract/Grant/Transfer Number: F19628-96-C-0159 *(F1962896C0159)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) 2010 NRL Review: Power, Energy, Synergy

PDF URL: (pdf) - 19 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA562412

Accession Number: ADA562412

Personal Author(s): Bultman, John D

Corporate Author: NAVAL RESEARCH LAB WASHINGTON DC

Report Date: Jan 2010

Abstract: (U) NRL's mission is to conduct a broadly based multidisciplinary program of scientific research and advanced technological development directed toward maritime applications of new and improved materials, techniques, equipment, systems, and ocean, atmospheric, and space sciences and related technologies. The Naval Research Laboratory provides primary in-house research for the physical, engineering, space, and environmental

sciences; broadly based applied research and advanced technology development programs in response to identified and anticipated Navy and Marine Corps needs; broad multidisciplinary support to the Naval Warfare Centers; and space and space systems technology, development, and support.

Abstract Classification:Unclassified

Pages:286 Page(s)

Report Number: XB - NRL *(XB)*

Monitor Series: NRL

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) AFRL's Demonstration and Science Experiments (DSX) Mission (Postprint)

PDF URL: (pdf) - 2 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA578456

Accession Number: ADA578456

Personal Author(s): Scherbarth, Mark ; Smith, Durand ; Stuart, Janet ; Ginet, Greg ; Adler, Aaron

Corporate Author: AIR FORCE RESEARCH LAB KIRTLAND AFB NM SPACE VEHICLES DIRECTORATE

Report Date: 08 Aug 2009

Abstract: (U) The Air Force Research Laboratory (AFRL) Space Vehicles Directorate has developed the Demonstration and Science Experiments (DSX) mission to research technologies needed to significantly advance Department of Defense (DoD) capabilities to operate spacecraft in the harsh radiation environment of medium-earth orbits (MEO). The ability to operate effectively in the MEO environment significantly increases the DoD s capability to field space systems that provide persistent global targeting-grade space surveillance and reconnaissance, high-speed satellite-based communication, lower-cost GPS navigation, and protection from space weather and environmental effects on a responsive satellite platform. The three DSX physics-based research/experiment areas are: 1. Wave Particle Interaction Experiment (WPIx): Researching the physics of very-low-frequency (VLF) electro-magnetic wave transmissions through the ionosphere and in the magnetosphere and characterizing the feasibility of natural and man-made VLF waves to reduce and precipitate space radiation. 2. Space Weather Experiment (SWx): Characterizing, mapping, and modeling the space radiation environment in MEO, an orbital regime attractive for future DoD, Civil, and Commercial missions. 3. Space Environmental Effects (SFx): Researching and characterizing the MEO space weather effects on spacecraft electronics and materials. Collectively, thirteen individual payloads are synergized

together from these three research areas and integrated onto a single platform (DSX) which provides a low-cost opportunity for AFRL due to their common requirements. All three groups of experiments require a 3-axis stabilized spacecraft bus (but no propulsion), a suite of radiation sensors, and extended duration in a low inclination, elliptical, MEO orbit. DSX will be launch ready in summer 2010 for a likely launch co-manifest with an operational DoD satellite on an EELV (evolved expendable launch vehicle).

Abstract Classification:Unclassified

Descriptive Note: Conference paper

Pages:16 Page(s)

Report Number: AFRL-RV-PS-TP-2009-1004 *(AFRLRVPSTP20091004)* , XC - AFRL-RV-PS *(XCAFRLRVPS)*

Monitor Series: AFRL-RV-PS *(AFRLRVPS)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Electromagnetic Wave Structures Within Subauroral Polarization Streams

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA423050

Accession Number: ADA423050

Personal Author(s): Mishin, E V ; Burke, W J ; Huang, C Y ; Rich, F J

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA SPACE VEHICLES DIRECTORATE

Report Date: 01 Aug 2003

Abstract: (U) We report on oscillations in electric (deltaEy) and magnetic (deltaBz) fields and plasma density (deltaNi) observed by Defense Meteorological Satellite Program (DMSP) satellites within fast subauroral convection streams in the evening sector during the magnetic storm of 6 November 2001. There are two types of wave phenomena. The first and more common is characterized by electromagnetic and plasma density variations that have the same frequency range of 0.15 Hz in the spacecraft frame of reference. The second is characterized by large-amplitude plasma and field oscillations over a broader range of frequencies O.1 to 0.3 Hz. In this case the perturbation densities and fields appear to have different frequency responses. In this and other magnetic storms, strong waves are associated with the precipitation of 30 keV ions. Ratios of deltaEy/deltaBz indicate encounters with mixtures of electromagnetic (in part Alfvenic) and electrostatic modes. Poynting vectors associated with the oscillations can be directed either into or out of the ionosphere. The density perturbations appear to be extended east-west corrugations in the plasma flow streams with north-south wavelengths of 50 km. The deltaEy and deltaNi variations were anticorrelated, as required for current conservation. Our

analysis shows that Alfvenic perturbations arc consistent with expected effects of irregular potential distribution around ionospheric density irregularities mapped to the magnetosphere. Inertial currents act to generate mesoscale field-aligned currents carried by Alfven waves, as was previously discussed with regards to auroral arcs formation. We suggest that deltaNi irregularities observed by DMSP satellites in the evening sector began as striated plasma patches in the polar cap that convected to subauroral latitudes.

Abstract Classification:Unclassified

Pages:12 Page(s)

Report Number: AFRL-VS-HA - TR-2004-1079 AFRL-VS-HA *(AFRLVSHATR20041079 AFRLVSHA)* , XC - TR-2004-1079 AFRL-VS-HA *(XCTR20041079 AFRLVSHA)*

Monitor Series: TR-2004-1079 *(TR20041079)* , AFRL-VS-HA *(AFRLVSHA)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Ionospheric Scintillation Effects on a Space-Based, Foliage Penetration, Ground Moving Target Indication Radar

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA407771

Accession Number: ADA407771

Personal Author(s): Tuley, M T ; Miller, T C ; Sullivan, R J

Corporate Author: INSTITUTE FOR DEFENSE ANALYSES ALEXANDRIA VA

Report Date: Aug 2001

Abstract: (U) This report provides the results of a brief study of the possible effects of ionospheric scintillation on a space-based, foliage-penetration (FOPEN), ground moving-target indication (GMTI) radar operating in the ultrahigh-frequency (UHF) band. The results of publicly available data and analyses are applied to a specific strawman FOPEN space-based radar (SBR) system operating from low-Earth orbit. Performance degradations due to ionospheric scintillation and a combination of ionospheric scintillation and internal clutter motion caused by wind are calculated for a 3 m/s target minimum detectable velocity (MDV) at 15-deg grazing, point parameters felt to be minimally acceptable for an operational system. Space-time adaptive processing (STAP) is used to provide the clutter rejection necessary for successful performance. Implications of ionospheric scintillation for synthetic aperture-based GMTI processing are also discussed.

Abstract Classification:Unclassified

Descriptive Note: Final rept. Mar 2000-Feb 2001

Pages:55 Page(s)

Report Number: IDA-D-2579 *(IDAD2579)* , IDA/HQ - 01-000481 DARPA *(IDAHQ01000481)* , XD - 01-000481 DARPA *(XD01000481)*

Monitor Series: 01-000481 *(01000481)* , DARPA

Contract/Grant/Transfer Number: DASW01-98-C-0067 *(DASW0198C0067)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Defense Laboratory Enterprise

PDF URL: (pdf) - 19 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA554678

Accession Number: ADA554678

Corporate Author: OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE (RESEARCH AND ENGINEERING) WASHINGTON DC

Report Date: Jul 2011

Abstract: (U) As globalization and technological change continue at ever increasing rates, the need for a strong technical base also increases for the Department of Defense (DoD). The core of this DoD technical base is the Defense Laboratory Enterprise, which provides a cadre of highly skilled scientists and engineers and the infrastructure required to remain at the forefront of technology development and awareness. Defense laboratories, operated by the, Army, Navy, and Air Force are recognized as Department assets and are a vital element of the interconnected academic and industrial base credited with keeping our military the most technologically advanced in the world. The Defense Laboratory Enterprise is comprised of organizations across 22 states employing over 38,000 scientists and engineers performing, overseeing and participating in over $30B of work per year. The enterprise provides world leading competencies across a broad research and development portfolio advancing basic sciences with horizon potential, developing militarily relevant technology which transitions to industry, providing quick response and prototyping capability for emerging threats and unmatched support and focus to warfighters in any contingency. In challenging times, a deep understanding of our complex and diverse Defense Laboratory Enterprise system and workforce is needed to ensure the Department can maintain this world class technical capability. This document provides an introduction to each laboratory, their core technical competencies and focus areas in order to provide the military community, senior leaders, and the American public with a better understanding of the potent capabilities resident therein.

Abstract Classification:Unclassified

Pages:51 Page(s)

Report Number: XD - ASD(R&E) *(XDASDRE)*

Monitor Series: ASD(R&E) *(ASDRE)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) IRIS Diagnoses of Man-Made and Naturally-Occurring Ionospheric Plasma Turbulence

PDF URL: (pdf) - 12 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA440043

Accession Number: ADA440043

Personal Author(s): Lee, Min-Chang

Corporate Author: MASSACHUSETTS INST OF TECH CAMBRIDGE PLASMA FUSION CENTER

Report Date: 01 Mar 2005

Abstract: (U) Radio wave experiments have been conducted at Arecibo, Puerto Rico and Gakona, Alaska together with numerical analyses aimed at investigating man-made and naturally-occurring ionospheric plasma turbulence. Research progress and results reported include the following. (1) Ionospheric ELF and VLF experiments in Alaska discover that a horizontal Hertzian magnetic dipole (HMD)) with a radius of about 7 km at an altitude around 70 km is responsible for the generation of ELF/VLF waves. (2) Numerical analyses of ELF and VLF wave generation show that the modulation scheme using the half-wave rectified wave is the most efficient one to generate signals at the modulation frequency and second harmonic, confirming our theoretical predictions. (3) Theoretical study of ionospheric HF heating experiments finds that the dominant factors, determining the number of cascade lines in the radar-detected spectrum of HF enhanced plasma lines (HFPLs), include the ion-to-electron temperature ratio, Ti/Te, the background plasma inhomogeneity scale length, and the heating wave field intensity. (4) The very intense ionospheric plasma turbulence observed over Arecibo, Puerto Rico on December 26, 2004 was possibly triggered by the tsunami-induced gravity waves propagating from Sumatra, Indonesia to Puerto Rico about 23 hours after the occurrence of a Mw = 9.2 earthquake.

Abstract Classification:Unclassified

Descriptive Note: Final rept., 1 Aug 2002-28 Feb 2005

Pages:22 Page(s)

Report Number: AFRL-SR-AR - TR-05-0442 AFRL-SR-AR *(AFRLSRARTR050442 AFRLSRAR)* , XC - TR-05-0442 AFRL-SR-AR *(XCTR050442 AFRLSRAR)*

Monitor Series: TR-05-0442 *(TR050442)* , AFRL-SR-AR *(AFRLSRAR)*

Contract/Grant/Transfer Number: F49620-01-1-0481 *(F496200110481)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Summer Research Program (1992). Summer Faculty Research Program (SFRP) Reports. Volume 3. Phillips Laboratory.

PDF URL: (pdf) - 22 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA261990

Accession Number: ADA261990

Personal Author(s): Moore, Gary

Corporate Author: RESEARCH AND DEVELOPMENT LABS CULVER CITY CA

Report Date: 28 Dec 1992

Abstract: (U) The following reports were submitted during the 1992 Summer Faculty Research Program: Coherent Heterodyne Array Doppler Imaging; Calibration Techniques for a Low Energy X-Ray Irradiation Chamber; Ultrawideband Antennas with Low Dispersion; Optical Angle-Angle Doppler Imaging; Second-Harmonic Generation in Corona-Poled Materials.

Abstract Classification:Unclassified

Descriptive Note: Annual rept. 1 Sep 91-31 Aug 92,

Pages:558 Page(s)

Report Number: AFOSR - TR-93-0112 AFOSR *(AFOSRTR930112)* , XC - TR-93-0112 AFOSR *(XCTR930112)*

Monitor Series: TR-93-0112 *(TR930112)* , AFOSR

Contract/Grant/Transfer Number: F49620-90-C-0076 *(F4962090C0076)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Approved for public release; distribution is unlimited. Available only to DTIC users. U.S. Government or Federal Purpose Rights License.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) On the Oscillating Two Stream Instability in Ionospheric Heating Experiments

PDF URL: (pdf) - 57 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA514623

Accession Number: ADA514623

Personal Author(s): Kuo, S P

Corporate Author: POLYTECHNIC UNIV FARMINGDALE NY

Report Date: Jan 2009

Abstract: (U) It is shown that oscillating two-stream instability (OTSI) can be excited in sizable spatial region below the reflection height of the O-mode HF heating wave in mid-latitude ionospheric heating experiments. Near the reflection height, the threshold field of OTSI increases drastically with the oblique propagation angles of its Langmuir sidebands whose angular distribution is thus confined in narrow cones around the geomagnetic field. Therefore, obliquely propagating Langmuir sidebands of OTSI prefer to be excited in their matching height regions, where sidebands satisfy local dispersion relation. Their matching heights move downward from the reflection height as oblique propagation angles increase.

Abstract Classification:Unclassified

Pages:5 Page(s)

Report Number: XB - ONR *(XB)*

Monitor Series: ONR

Contract/Grant/Transfer Number: N00014-00-1-0938 *(N000140010938)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Approved for public release; distribution is unlimited. Available only to DTIC users. U.S. Government or Federal Purpose Rights License.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) 2005 IEEE International Conference on Plasma Science, held in Monterey, California, on 20-23 June 2005

PDF URL: (pdf) - 66 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA474317

Accession Number: ADA474317

Personal Author(s): Cauble, Robert C

Corporate Author: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS INC PISCATAWAY NJ

Report Date: Jun 2005

Abstract: (U) The 32nd Annual IEEE International Conference on Plasma Science (ICOPS) was successfully held 20-23 June 2005 at the Portola Plaza Hotel by Fisherman's Wharf in Monterey, California. A total of 467 technical papers were presented by 438 registrants from 32 countries around the globe.

Abstract Classification:Unclassified

Descriptive Note: Final rept.

Pages:381 Page(s)

Report Number: AFRL-SR-AR - TR-07-0453 AFOSR/VA *(AFRLSRARTR070453 AFOSRVA)* , XC - TR-07-0453 AFOSR/VA *(XCTR070453 AFOSRVA)*

Monitor Series: TR-07-0453 *(TR070453)* , AFOSR/VA *(AFOSRVA)*

Contract/Grant/Transfer Number: FA9550-05-1-0376 *(FA95500510376)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) High-Resolution Structural Monitoring of Ionospheric Absorption Events

PDF URL: (pdf) - 2 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA581050

Accession Number: ADA581050

Personal Author(s): Rickard, Lee J

Corporate Author: NEW MEXICO UNIV ALBUQUERQUE OFFICE OF THE VICE PROVOST FOR RESEARCH

Report Date: Jul 2013

Abstract: (U) Under this task, we have augmented the hardware of the Long Wavelength Array (LWA) to provide a significant riometric capability, in order to search for anomalous absorption events that are associated with radiation belt precipitation events. Although limitations arising from initial data quality and radio frequency interference (RFI) have slowed implementation, the DTRA-supported augmentations are being incorporated into the standard data flow of the Prototype All-Sky Imager (PASI), in order to give real-time, 24/7 riometry. Incorporation of an outrigger site, to enable treatment of the unknown structure of the celestial background and the effects of confusion noise, was completed. However, RFI issues have prevented combination of outrigger data with LWA1.

Abstract Classification:Unclassified

Descriptive Note: Technical rept. 21 Jul 2010-30 Apr 2012

Pages:21 Page(s)

Report Number: DTRA-TR-13-43 *(DTRATR1343)* , 798B *(798B)* , XD - DTRA/FB *(XDDTRAFB)*

Monitor Series: DTRA/FB *(DTRAFB)*

Contract/Grant/Transfer Number: HDTRA1-03-D-0009 *(HDTRA103D0009)* , DTRA01-03-D-0009-0026 *(DTRA0103D00090026)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Analysis of the Potential for Radiofrequency Radiation Bioeffects to Result from Operation of the Proposed ONR and Air Force High-Frequency Active Auroral Research Program Ionospheric Research Instrument (HAARP IRI): General Analysis

PDF URL: (pdf) - 16 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA379626

Accession Number: ADA379626

Personal Author(s): Polson, Peter ; Heynick, Louis N

Corporate Author: AUSA CUPERTINO CA

Report Date: May 2000

Abstract: (U) RFR is an acronym for radiofrequency radiation, which refers to the emission and propagation of electromagnetic waves in the frequency range nominally from 3 kHz to 300 GHz. Such waves are characterized as nonionizing radiation because the intrinsic (quantum) electromagnetic energy absorbed by a body at any frequency within this range is much too low to ionize (eject electrons) from molecules of the body. Equivalent terms in the literature on RFR bioeffects include electromagnetic radiation (EMR), nonionizing radiation (NIR), nonionizing radiofrequency electromagnetic (RFEM) fields, and electromagnetic fields (EMF). It should be noted, however, that the acronym EMF has lately become associated primarily with possible bioeffects of 50-Hz and 60-Hz electric and magnetic fields from powerlines.

Abstract Classification:Unclassified

Descriptive Note: Final rept. for 1992

Pages:229 Page(s)

Report Number: AFRL-HE-BR - TR-2000-0060 AFRL-HE-BR *(AFRLHEBRTR20000060 AFRLHEBR)* , XC - TR-2000-0060 AFRL-HE-BR *(XCTR20000060 AFRLHEBR)*

Monitor Series: TR-2000-0060 *(TR20000060)* , AFRL-HE-BR *(AFRLHEBR)*

Contract/Grant/Transfer Number: F33615-90-D-0606 *(F3361590D0606)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Detection of Underground Tunnels with a Synchronized Electromagnetic Wave Gradiometer

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA434554

Accession Number: ADA434554

Personal Author(s): Stolarczyk, Larry G ; Troublefield, Robert ; Battis, James

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA SPACE VEHICLES DIRECTORATE

Report Date: May 2005

Abstract: (U) Cross-border tunnels have been used by drug, people smugglers and terrorist organizations for clandestine entry or exit and transportation of contraband materials under the borders. The ability to detect these tunnels is paramount to successful border control. The Synchronized Electromagnetic Gradiometer uses the enhanced conductivity associated with tunnels, as compared to the surrounding medium, to detect the tunnels. A low-frequency electromagnetic (EM) signal is used to illuminate the area of interest. This signal in turn, induces current flow in any conductors within the tunnel that generate secondary EM fields observable at a distance from the tunnel. The magnitude of the secondary wave can be orders of magnitude less than the illuminating signal. An efficient detection system has been achieved by using a gradiometer design that suppresses the illuminating signal by more than 70 dB while maximizing the secondary signal with a narrow bandwidth (BW = 1Hz) synchronized receiver. This paper describes the performance of the Synchronized Electromagnetic Wave Gradiometer during several field studies and demonstration including the Otay Mesa cross-border tunnel near San Diego, California.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:10 Page(s)

Report Number: AFRL-VS-HA-TR-2005-1066 *(AFRLVSHATR20051066)* , XC - AFRL-VS-HA *(XCAFRLVSHA)*

Monitor Series: AFRL-VS-HA *(AFRLVSHA)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 53 - NATO FURNISHED

Distribution Statement:Approved for public release; distribution is unlimited. NATO.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) What Can We Learn About the Ionosphere Using the EISCAT Heating Facility?

PDF URL: (pdf) - 4 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA477112

Accession Number: ADA477112

Personal Author(s): Rietveld, Michael T

Corporate Author: EISCAT SCIENTIFIC ASSOCIATION RAMFJORDBOTN (NORWAY)

Report Date: Jun 2006

Abstract: (U) Apart from being used for plasma physics, the HF facility near Tromsoe, Norway, can be used to perturb the ionosphere at various heights in different ways, thereby giving information about the ionosphere. The co-located incoherent scatter radars are probably the most powerful instrument for probing the ionosphere, but HF techniques can complement the radars and even have some advantages. The principal perturbation method is to increase the electron temperature in a controlled way, some examples of which are presented here. Artificial electron heating in the E and F regions is useful for testing aeronomical models. More recently it has been discovered that electron heating can dramatically affect polar mesospheric echoes observed by VHF and UHF radars. Particularly the overshoot effect promises to be a powerful diagnostic of the physics and chemistry related to the formation of these layers, which are thought to involve dust, ice particles and aerosols. Radio induced optical emissions provide a way of measuring the lifetimes of excited species at different heights in the ionosphere, thereby providing a way of measuring the neutral density which is one of the most important parameters determining the lifetime. The technique of creating artificial periodic irregularities set up in the standing wave pattern of the upgoing and ionospherically reflected HF wave provides valuable information all heights below reflection. One particular feature of this method is that it can detect the presence of layers around 50 km and measure vertical winds, and electron densities and temperatures at various heights.

Abstract Classification:Unclassified

Descriptive Note: Conference paper with briefing charts

Pages:41 Page(s)

Report Number: X5 - X5 *(X5)*

Monitor Series: X5

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Information Technology Division Technical Paper Abstracts 1998

PDF URL: (pdf) - 4 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA386688

Accession Number: ADA386688

Personal Author(s): Stroup, Janet L

Corporate Author: NAVAL RESEARCH LAB WASHINGTON DC CENTER FOR APPLIED RESEARCH AND ARTIFICIAL INTELLIGENCE

Report Date: 29 Dec 2000

Abstract: (U) This report provides abstracts for technical publications produced during 1998 by personnel of the Information Technology Division (ITD), one of the largest research and development collectives at the Naval Research Laboratory (NRL). The abstracts are organized into sections that represent the six branches within ITD: the Navy Center for Applied Research in Artificial Intelligence, Communication Systems, the Center for High Assurance Computer Systems, Transmission Technology, Advanced Information Technology, and the Center for Computational Science. Within each section. a list of branch papers published in 1997 has been included; abstracts for these papers may be found in prior-year editions of this report. Information on obtaining a copy of one or more of the abstracted or listed publications is also provided.

Abstract Classification:Unclassified

Descriptive Note: Final rept.

Pages:87 Page(s)

Report Number: NRL/MR/5513--00-8527 *(NRLMR5513008527)* , XB - ONR *(XB)*

Monitor Series: ONR

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) AU-18 Space Primer

PDF URL: (pdf) - 18 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA511972

Accession Number: ADA511972

Corporate Author: AIR COMMAND AND STAFF COLL MAXWELL AFB AL

Report Date: Sep 2009

Abstract: (U) The purpose of this AU-18 Space Primer is to provide an unclassified one-stop shopping resource for the space professional and the joint war fighter to better understand the capabilities, organizations, and operations of space forces.

Abstract Classification:Unclassified

Pages:353 Page(s)

Report Number: XC - ACSC *(XC)*

Monitor Series: ACSC

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) VHF-UHF Noise Surveys at Gulkana, Elmendorf AFB, Galena AFB, Kotzebue and Cape Lisburne, Alaska and NRL, Pomonkey, Maryland

PDF URL: (pdf) - 4 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA270107

Accession Number: ADA270107

Personal Author(s): Ostergaard, Jens C

Corporate Author: MASSACHUSETTS UNIV LOWELL

Report Date: Feb 1993

Abstract: (U) This report presents results of a series of site and noise surveys performed in Alaska. Surveys were performed at the former OTH-B site at Gulkana with the aim of determining the spectrum occupancy and background noise level at nominally 38 MHz, 420 MHz and 440 MHz. Three site surveys were performed at Elmendorf AFB near Anchorage, aimed at determining the spectrum occupancy and background noise levels at 40 to 50 MHz. Noise surveys were also performed at three existing radar sites, Galena, Kotzebue and Cape Lisburne at 40 to 50 MHz. This report contains a presentation of the survey and measurement methodology, including antenna patterns, absolute noise level calibrations, and noise level predictions. The features of the individual sites are presented with a discussion of the data collected.... Noise, HF and VHF frequency range, Interference, Spectral occupancy

Abstract Classification:Unclassified

Descriptive Note: Technical rept.

Pages:105 Page(s)

Report Number: SCIENTIFIC-4 *(SCIENTIFIC4)* , PL* - TR-93-2136 PL/HANSCOM *(PLTR932136 PLHANSCOM)* , XC - TR-93-2136 PL/HANSCOM *(XCTR932136 PLHANSCOM)*

Monitor Series: TR-93-2136 *(TR932136)* , PL/HANSCOM *(PLHANSCOM)*

Contract/Grant/Transfer Number: F19628-90-K-0039 *(F1962890K0039)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Overview of the Equatorial Electrojet and Related Ionospheric Current Systems

PDF URL: (pdf) - 3 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA436210

Accession Number: ADA436210

Personal Author(s): Casey, John P

Corporate Author: NAVAL UNDERSEA WARFARE CENTER DIV NEWPORT RI

Report Date: 25 Apr 2005

Abstract: (U) The equatorial electrojet (EEJ) is an intense electric current that flows in the ionosphere in a narrow zone above the magnetic dip equator during the daytime. The electrojet current produces a large enhancement of the surface component of the geomagnetic field at and in the vicinity of the dip equator. The EEJ is most intense around local noontime and appears to be more stable than other ionospheric current systems. This report presents a brief overview of the characteristics of the EEJ, including its location, electron density profile, current distribution, and magnetic field. In addition, the diurnal and seasonal variations of the EEJ are discussed. The relationship of the EEJ to the worldwide dynamo current system is discussed, in addition to a comparison with the aurora electrojet (AEJ). A derivation of the EEJ current distribution is presented that is based on an anisotropic conductivity model of the ionosphere. A summary of several experiments involving the generation of low4requency signals from a heated and modulated EEJ is also given. It is anticipated that this report will provide helpful background information to scientists and engineers engaged in the development of future experiments that involve the transmission of signals in the ELF and VLF frequency bands from a heated and modulated EEJ.

Abstract Classification:Unclassified

Descriptive Note: Technical rept.

Pages:75 Page(s)

Report Number: NUWC-NPT-TR-11 *(NUWCNPTTR11)* , 676 *(676)* , XB - ONR *(XB)*

Monitor Series: ONR

Contract/Grant/Transfer Number: PR A590045 *(PRA590045)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Information Technology Division's Technical Paper Abstracts

PDF URL: (pdf) - 6 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA282882

Accession Number: ADA282882

Personal Author(s): Wiley, Cathy J

Corporate Author: NAVAL RESEARCH LAB WASHINGTON DC

Report Date: 05 Jul 1994

Abstract: (U) Information Technology Division's Technical Paper Abstracts 1993 documents the accomplishments of projects at the seven branches of the Information Technology Division. The seven branches are: Navy Center for Applied Research in Artificial Intelligence (NCARAI) including: machine learning, intelligent decision aids, interactive systems, sensor-based systems, and neural networks; Communications Systems; Human-Computer Interaction; Center for Computer High Assurance Systems; Transmission Technology; Advanced Information Technology; and Center for Computational Sciences. Points of contact are indicated for acquiring additional technical information about the projects, and an order form is provided for obtaining copies of the publications abstracted.

Abstract Classification:Unclassified

Pages:105 Page(s)

Report Number: NRL/MR/5510--94-7497 *(NRLMR5510947497)* , XB - ONR *(XB)*

Monitor Series: ONR

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Department of Defense Extract of the Budget of the United States Government for Fiscal Years 1992 and 1993

PDF URL: (pdf) - 37 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA240106

Accession Number: ADA240106

Corporate Author: DEPARTMENT OF DEFENSE WASHINGTON DC

Report Date: 04 Feb 1991

Pages:419 Page(s)

Report Number: XD - DOD *(XD)*

Monitor Series: DOD

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Information Technology Division's Technical Paper Abstracts

PDF URL: (pdf) - 5 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA283150

Accession Number: ADA283150

Personal Author(s): Wiley, Cathy J

Corporate Author: NAVAL RESEARCH LAB WASHINGTON DC

Report Date: 05 Jul 1994

Abstract: (U) 'Information Technology Division's Technical Paper Abstracts 1993' documents the accomplishments of projects at the seven branches of the Information Technology Division. The seven branches are: Navy Center for Applied Research in Artificial Intelligence (NCARAI) including: machine learning, intelligent decision aids, interactive systems, sensor-based system, and neural networks; Communications Systems; Human-Computer Interaction; Center for Computer High Assurance Systems; Transmission Technology; Advanced Information Technology; and Center for Computational Sciences. Points of contact are indicated for acquiring additional technical information about the projects, and an order form is provided for obtaining copies of the publications abstracted.

Abstract Classification:Unclassified

Pages:105 Page(s)

Report Number: NRL/MR/5510--94-7497 *(NRLMR5510947497)* , XB - ONR *(XB)*

Monitor Series: ONR

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Information Technology Division's Technical Paper Abstracts,

PDF URL: (pdf) - 4 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA298067

Accession Number: ADA298067

Personal Author(s): Wiley, Cathy J

Corporate Author: NAVAL RESEARCH LAB WASHINGTON DC

Report Date: 10 Aug 1995

Abstract: (U) Information Technology Division Technical Paper Abstracts 1994 documents the accomplishments of projects at the six branches of the Information Technology Division. The six branches are: Navy Center for Applied Research in Artificial Intelligence (NCARAI) including: computational reasoning for intelligent decision aids, intelligent M4 (multi-media, multi-modal) systems, interface design and evaluation, machine learning, and sensor-based systems; Communication Systems, Center for Computer High Assurance Systems, Transmission Technology, Advanced Information Technology, and Center for Computational Science. Points of contact are indicated for acquiring additional technical information about the projects, and an order form is provided for obtaining copies of the publications abstracted.

Abstract Classification:Unclassified

Pages:82 Page(s)

Report Number: NRL/MR/5510--95-7764 *(NRLMR5510957764)* , XB - ONR *(XB)*

Monitor Series: ONR

FOIA U2 Display

Distribution/Classification

Distribution Code:A - UNLIMITED DISTRIBUTION

Secondary Dist:Approved For Public Release; Distribution Unlimited. Availability: Office of the Deputy Secretary of Defense, Washington, DC 20301-1000.

Export Control:No

For Pay:No

Copyrighted - No Govt Rights:No

Classification:UNCLASSIFIED

Collection: TEMS

Title: Report On Activities And Programs For Countering Proliferation And Nbc Terrorism. May 1998.

PDF URL:

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tems&docId=CBRNIAC-CB-175776

Accession Number:CBRNIAC-CB-175776

IAC Report Name:CB-175776 *CB175776*

Performing Organization:PROGRAM REVIEW COMMITTEE WASHINGTON DC

Date of Publication:01 May 1998

Abstract: Congress directed, in the 1994 National Defense Authorization Act (NDAA), that the Counterproliferation Program Review Committee (CPRC) be established to review activities and programs related to countering proliferation within the Office of the Secretary of Defense (OSD), Department of Energy (DOE), US Intelligence, and the Joint Chiefs of Staff (JCS). The high level national commitment to counter proliferation threats is reflected in the CPRC's membership. It is chaired by the Secretary of Defense, and composed of the Secretary of Energy (as Vice Chair), the Director of Central Intelligence (DCI), and the Chairman of the Joint Chiefs of Staff (CJCS). The CPRC is chartered to make and implement recommendations regarding interdepartmental activities and programs to address shortfalls in existing and programmed capabilities to counter the proliferation of nuclear, biological, and chemical (NBC) weapons of mass destruction (WMD) and their means of delivery. In the 1997 NDAA, Congress broadened the CPRC's responsibilities and specified that the CPRC also review activities and programs of the CPRC-represented organizations related to countering paramilitary and terrorist NBC threats. The findings and recommendations of the CPRC's annual review for 1998 are presented in this, its fifth annual report to Congress.

Category:Congressional Report

Pages:396 Page(s)

Site:CBRNIAC

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Approved for public release; distribution is unlimited. Available only to DTIC users. U.S. Government or Federal Purpose Rights License.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Free-Running Ground-Based Photometric Array Imaging of Transient Luminous Events

PDF URL: (pdf) - 607 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA528243

Accession Number: ADA528243

Personal Author(s): Newsome, R T ; Inan, U S

Corporate Author: STANFORD UNIV CA

Report Date: Jan 2010

Abstract: (U) We present observations of transient luminous events (TLEs) recorded during a summer TLE observation campaign in 2008 at Langmuir Laboratory near Socorro, New Mexico. The campaign featured observations made by a free-running, ground-based multianode photometric array called the Photometric Imager of Precipitated Electron Radiation (PIPER). As a photometric array, PIPER has high (40 ms) temporal resolution and enough spatial resolution (16 anodes per photometer) to make it particularly useful in the study of fast TLEs like elves and halos. As a free-running instrument, there are no missed detections and no unwanted sampling bias introduced by triggering. As a ground-based instrument, it can follow individual storms over the course of their lifetime rather than randomly sampling over large numbers of storms as required by space-based instruments. During the campaign, 143 sprites, 803 elves, and 166 halos were observed over six storms, resulting in averaged elve-to-sprite and halo-to-sprite occurrence ratios of 5.6:1 and 1.2:1, respectively. There was considerable variability in the elve-to-sprite occurrence ratio from storm to storm, ranging from a low of 3.7:1 to a high of 13.4:1. Overall, 78.2% of the elves and 55.4% of the halos were associated with negative cloud-to-ground lightning strikes (-CGs); no sprites associated with ?-CGs were observed. Additionally, 40 events in which pairs of elves occur in rapid succession, events we refer to as elve doublets, were observed in several storms. The duration between elves in the elve doublet events was typically 120 ms. The causative mechanism for these events is still under deliberation.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:11 Page(s)

Report Number: XB - ONR *(XB)*

Monitor Series: ONR

Contract/Grant/Transfer Number: N00014-03-1-0333 *(N000140310333)* , N00014-00-1-643 *(N00014001643)*

FOIA U2 Display

Distribution/Classification

Distribution Code:A - UNLIMITED DISTRIBUTION

Secondary Dist:Approved for Public Release; Distribution Unlimited. Availability: Office of the Deputy Secretary of Defense, Washington, DC 20301-1000.

Export Control:No

For Pay:No

Copyrighted - No Govt Rights:No

Classification:UNCLASSIFIED

Collection: TEMS

Title: Report On Activities And Programs For Countering Proliferation. May 1996.

PDF URL:

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tems&docId=CBRNIAC-CB-175720

Accession Number:CBRNIAC-CB-175720

IAC Report Name:CB-175720 *CB175720*

Performing Organization:PROGRAM REVIEW COMMITTEE WASHINGTON DC

Date of Publication:01 May 1996

Abstract: Congress directed, in the 1995 National Defense Authorization Act, that the CPRC be established to review activities and programs related to countering proliferation within the Department of Defense (DoD), Department of Energy (DOE), US Intelligence, and the Joint Chiefs of Staff (JCS). This high level national commitment to counter proliferation threats is reflected in the CPRC's membership. It is chaired by the Secretary of Defense, and composed of the Secretary of Energy (as Vice Chairman), the Director of Central Intelligence (DCI), and the Chairman of the Joint Chiefs of Staff (CJCS). The CPRC is chartered to make recommendations relative to modifications in programs required to address shortfalls in existing and programmed capabilities to counter the proliferation of weapons of mass destruction (WMD). The CPRC is also tasked to assess progress toward implementing its previous recommendations and the recommendations of its predecessor, the Nonproliferation Program Review Committee (NPRC). This report presents the findings and recommendations of the CPRC's annual review for 1996.

Category:Congressional Report

Pages:137 Page(s)

Site:CBRNIAC

FOIA U2 Display

Distribution/Classification

Distribution Code:A - UNLIMITED DISTRIBUTION

Secondary Dist:Approved for Public Release; Distribution Unlimited.

Export Control:No

For Pay:No

Copyrighted - No Govt Rights:No

Classification:UNCLASSIFIED

Collection: TEMS

Title: Modeling The Spread Of Anthrax In Buildings.

PDF URL:

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tems&docId=CBRNIAC-CB-029750

Accession Number:CBRNIAC-CB-029750

IAC Report Name:CB-029750 *CB029750*

Performing Organization:CALIFORNIA UNIV BERKELEY LAWRENCE BERKELEY LAB

Date of Publication:01 Jan 2002

Abstract: The recent contamination of several US buildings by letters containing anthrax demonstrates the need to understand better the transport and fate of anthrax spores within buildings. We modeled the spread of anthrax for a hypothetical office suite and estimated the distribution of mass and resulting occupant exposures. Based on our modeling assumptions, more than 90% of the anthrax released remains in the building during the first 48 hours, with the largest fraction of the mass accumulating on floor surfaces where it is subject to tracking and resuspension. Although tracking and resuspension account for only a small amount of mass transfer, the model results suggests they can have an important effect on subsequent exposures. Additional research is necessary to understand and quantify these processes.

Category:Conference Paper

Pages:139 Page(s)

Site:CBRNIAC

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 23 - AVAILABILITY: DOCUMENT PARTIALLY ILLEGIBLE

Distribution Statement:Availability: Document partially illegible.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Activities and Programs for Countering Proliferation.

PDF URL: (pdf) - 9 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA310250

Accession Number: ADA310250

Corporate Author: COUNTERPROLIFERATION PROGRAM REVIEW COMMITTEE WASHINGTON DC

Report Date: May 1996

Abstract: (U) Congress directed, in the 1995 National Defense Authorization Act, that the CPRC be established to review activities and programs related to countering proliferation within the Department of Defense (DoD), Department of Energy (DOE), U.S. Intelligence, and the Joint Chiefs of Staff(JCS). This high level national commitment to counter proliferation threats is reflected in the CPRC's membership. It is chaired by the Secretary of Defense, and composed of the Secretary of Energy (as Vice Chairman), the Director of Central Intelligence (DCI), and the Chairman of the Joint Chiefs of Staff(CJCS). The CPRC is chartered to make recommendations relative to modifications in programs required to address shortfalls in existing and programmed capabilities to counter the proliferation of weapons of mass destruction (WMD). The CPRC is also tasked to assess progress toward implementing its previous recommendations and the

recommendations of its predecessor, the Nonproliferation Program Review Committee (NPRC). This report presents the findings and recommendations of the CPRC's annual review for 1996.

Abstract Classification:Unclassified

Pages:139 Page(s)

Report Number: XD - DOD *(XD)*

Monitor Series: DOD

FOIA U2 Display

Distribution/Classification

Distribution Code:A - UNLIMITED DISTRIBUTION

Secondary Dist:Approved for Public Release; Distribution Unlimited.

Export Control:No

For Pay:No

Copyrighted - No Govt Rights:No

Classification:UNCLASSIFIED

Collection: TEMS

Title: Activities And Programs For Countering Proliferation.

PDF URL:

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tems&docId=CBRNIAC-CB-030274

Accession Number:CBRNIAC-CB-030274

IAC Report Name:CB-030274 *CB030274*

Performing Organization:COUNTERPROLIFERATION PROGRAM REVIEW COMMITTEE WASHINGTON DC

Date of Publication:01 May 1996

Abstract: Congress directed, in the 1995 National Defense Authorization Act, that the CPRC be established to review activities and programs related to countering proliferation within the Department of Defense (DoD), Department of Energy (DOE), US Intelligence, and the Joint Chiefs of Staff(JCS). This high level national commitment to counter proliferation threats is reflected in the CPRC's membership. It is chaired by the Secretary of Defense, and composed of the Secretary of Energy (as Vice Chairman), the Director of Central Intelligence (DCI), and the Chairman of the Joint Chiefs of Staff(CJCS). The CPRC is chartered to make recommendations relative to modifications in programs required to address shortfalls in existing and programmed capabilities to counter the proliferation of weapons of mass destruction (WMD). The CPRC is also tasked to assess progress toward implementing its previous recommendations and the recommendations of its predecessor, the Nonproliferation Program Review Committee (NPRC). This report presents the findings and recommendations of the CPRC's annual review for 1996.

Category:Annual Reveiw

Pages:133 Page(s)

Site:CBRNIAC

DTIC AD Number:A310250

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Approved for public release; distribution is unlimited. Available only to DTIC users. U.S. Government or Federal Purpose Rights License.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) International Ionospheric Effects Symposium (13th) (IES2011) Held in Alexandria, Virginia on 17-19 May 2011

PDF URL: (pdf) - 45 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA554206

Accession Number: ADA554206

Personal Author(s): Goodman, John M ; McCoy, Robert ; Goodman-Hansen, Jenny R

Corporate Author: JMG ASSOCIATES LTD ALEXANDRIA VA

Report Date: May 2011

Abstract: (U) The 13th International Ionospheric Effects Symposium (IES2011) was held at the Crowne Plaza Hotel, Old Town, Alexandria, Virginia on May 17-19, 2011. The sponsors were the Office of Naval Research (ONR), the Air Force Office of Scientific Research (AFOSR), and URSI (Commission G). Cooperating agencies included: NRL, AFRL, AFWA, NOAA-SWPC, FAA, and FCC. Approximately 160 papers and posters were presented. Details of IES2011 are found in the proceedings document. Topics generally represented a range of ionospheric and space weather areas, emphasizing the impacts on various civilian and military systems associated with communication, navigation, and surveillance mission areas. The symposium was organized into an opening plenary, an awards luncheon, twenty-six (26) technical sessions for oral presentation and one (1) poster session.

Abstract Classification:Unclassified

Descriptive Note: Conference proceedings

Pages:724 Page(s)

Report Number: XB - ONR *(XB)*

Monitor Series: ONR

Contract/Grant/Transfer Number: N00014-11-01-0209 *(N0001411010209)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) USAF Summer Research Program - 1993 Summer Faculty Research Program Final Reports, Volume 3, Phillips Laboratory.

PDF URL: (pdf) - 23 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA356738

Accession Number: ADA356738

Personal Author(s): Moore, Gary

Corporate Author: RESEARCH AND DEVELOPMENT LABS CULVER CITY CA

Report Date: Dec 1993

Abstract: (U) The United States Air Force Summer Faculty Research Program (USAF- SFRP) is designed to introduce university, college, and technical institute faculty members to Air Force research. This is accomplished by the faculty members being selected on a nationally advertised competitive basis during the summer intersession period to perform research at Air Force Research Laboratory Technical Directorates and Air Force Air Logistics Centers. Each participant provided a report of their research, and these reports are consolidated into this annual report.

Abstract Classification:Unclassified

Descriptive Note: Final rept.,

Pages:645 Page(s)

Report Number: AFRL-SR-BL - TR-98-0763 AFRL-SR-BL *(AFRLSRBLTR980763 AFRLSRBL)* , XC - TR-98-0763 AFRL-SR-BL *(XCTR980763 AFRLSRBL)*

Monitor Series: TR-98-0763 *(TR980763)* , AFRL-SR-BL *(AFRLSRBL)*

FOIA U2 Display

Distribution/Classification

Distribution Code:A - UNLIMITED DISTRIBUTION

Secondary Dist:Unlimited Distribution

Export Control:No

For Pay:No

Copyrighted - No Govt Rights:No

Classification:Unclassified

Collection: TEMS

Title: Leading Edge, November 1995

PDF URL:

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tems&docId=RIAC-RIAC-33321-000

Accession Number:RIAC-RIAC-33321-000

IAC Report Name:33321-000 *33321000*

Monitoring Organization:AFMC

Performing Organization:Air Force Materials Lab./WPAFB

Date of Publication:01 Nov 1995

Abstract: This funded Air Force newspaper is an authorized publication published monthly for the people of the Air Force Materiel Command. Contents of the LEADING EDGE are not necessarily the official views of, or endorsed by, the U.S. Government, the Department of Defense or the Department of the Air Force. The editorial content is edited prepared and provided by the Public Affairs Office of Headquarters Air Force Materiel Commdnd, 4375 Chidlaw Rd., Suite 6, Wright-Pcitterson AFB, Ohio 45433-5006. Photographs are official US. Air Force photos unless ofh&rwlse indicated. Distribution ratio is 4:] . For submission and witters' guidelines, contact the editor at the above address or DSN 787-1203 or (513) 257-1203 (FAX: DSN 787-2558), Internet address LEADEDGE@wpgatel .wpafb.af.mil

Pages:24 Page(s)

Site:RIAC

Contract / Grant ID:N/A *NA*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Approved for public release; distribution is unlimited. Available only to DTIC users. U.S. Government or Federal Purpose Rights License.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Full-Wave Modeling of Early VLF Perturbations Caused by Lightning Electromagnetic Pulses

PDF URL: (pdf) - 302 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA528205

Accession Number: ADA528205

Personal Author(s): Lehtinen, Nikolai G ; Marshall, Robert A ; Inan, Umran S

Corporate Author: STANFORD UNIV CA DEPT OF ELECTRICAL ENGINEERING

Report Date: Jan 2010

Abstract: (U) We use the three-dimensional full-wave method and Born approximation technique to calculate the scattered VLF field in the near zone of ionospheric disturbances created by lightning electromagnetic pulses. The method fully accounts for the anisotropicity of the ionosphere magnetized by a nonvertical geomagnetic field. We calculate the VLF amplitude perturbation on the ground for vertical and horizontal lightning discharge configurations. The results show that the magnitude of the scattered signal is strongly dependent on the direction of the incident VLF wave.

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:8 Page(s)

Report Number: XB - ONR *(XB)*

Monitor Series: ONR

Contract/Grant/Transfer Number: N00014-05-1-0854 *(N000140510854)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Development of a Space Flight Prototype Doppler Asymmetric Spatial Heterodyne (DASH) Spectrometer for the Measurement of Upper Atmospheric Winds

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA554423

Accession Number: ADA554423

Personal Author(s): Babcock, David D

Corporate Author: ARTEP INC ELLICOTT CITY MD

Report Date: 31 Oct 2011

Abstract: (U) This report provides a summary of the progress in developing and testing a space flight prototype Doppler Asymmetric Spatial Heterodyne (DASH) interferometer, for the purposes of measuring winds in the Mesosphere and Lower Thermosphere/Ionosphere (MLTI). The motivation behind developing a prototype instrument during this SBIR Phase II is to raise the technical readiness level (TRL).

Abstract Classification:Unclassified

Descriptive Note: Final rept. 1 Apr 2009-31 Jul 2011

Pages:60 Page(s)

Report Number: AFRL-RV-PS - TR-2011-0163 AFRL-RV-PS *(AFRLRVPSTR20110163 AFRLRVPS)* , XC - TR-2011-0163 AFRL-RV-PS *(XCTR20110163 AFRLRVPS)*

Monitor Series: TR-2011-0163 *(TR20110163)* , AFRL-RV-PS *(AFRLRVPS)*

Contract/Grant/Transfer Number: FA8718-09-C-0011 *(FA871809C0011)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Final Technical Report for ELF/VLF Electromagnetic Detection and Characterization of Deeply Buried Targets

PDF URL: (pdf) - 2 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA349208

Accession Number: ADA349208

Corporate Author: ARMY AVIATION AND MISSILE COMMAND REDSTONE ARSENAL AL

Report Date: 22 Jun 1998

Abstract: (U) In the light of the current and ongoing needs of DoD and other agencies for detection of subsurface structures and monitoring of activities within those structures there is a crucial need for tools that allow one to evaluate the myriad of proposed VLF/ELF sensor systems. The overall objective of this effort is to develop analytical tools to model and assess proposed ELF/VLF sensor systems for detection of underground structures. The approach taken is to: (a) model the primary electric and magnetic fields generated by local (e.g. current loops or electric dipoles), remote (e.g. HAARF/HIPAS), and natural sources (e.g. external noise); (b) model the perturbed fields due to the specified underground structures; (c) combine the primary and perturbed fields along with the external noise for an effective field at the sensor; (d) model the sensor (the GEM-2 from Geophex, Ltd.) given the manufacturer's specifications and then using these results; and (e) evaluate the response of the sensor system to the specified underground structure.

Abstract Classification:Unclassified

Descriptive Note: Final techincal rept.

Pages:64 Page(s)

Report Number: XT - DARPA *(XT)*

Monitor Series: DARPA

Contract/Grant/Transfer Number: DAAH01-97-C-R032 *(DAAH0197CR032)* , ARPA ORDER-D611 *(ARPAORDERD611)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Optical Diagnostics of Ionospheric Structures and Dynamics

PDF URL: (pdf) - 5 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA329158

Accession Number: ADA329158

Personal Author(s): Eather, Robert H ; Ning, Peter

Corporate Author: KEO CONSULTANTS BROOKLINE MA

Report Date: 07 Feb 1997

Abstract: (U) Keo Consultants participated in the research of the Ionospheric Applications Branch at Phillips Laboratory, by implementing improvements in research optical instrumentation (imagers and photometers). This research involved numerous field trips to study aurora, airglow, ionospheric scintillations, barium releases, and heater experiments. Keo customized instrument control software for each application, and developed software to display the resultant images and compared with other data sets.

Abstract Classification:Unclassified

Descriptive Note: Final rept. 1 Apr 93-30 Sep 96

Pages:114 Page(s)

Report Number: PL* - TR-97-2024 PL* *(PLTR972024 PL)* , XC - TR-97-2024 PL* *(XCTR972024 PL)*

Monitor Series: TR-97-2024 *(TR972024)* , PL* *(PL)*

Contract/Grant/Transfer Number: F19628-93-C-0053 *(F1962893C0053)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Conference Proceedings: 13th Annual Review of Progress in Applied Computational Electromagnetics of the Naval Postgraduate School, Monterey, CA March 17-21, 1997. Volume I,

PDF URL: (pdf) - 32 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA329119

Accession Number: ADA329119

Personal Author(s): Michielssen, Eric C

Corporate Author: NAVAL POSTGRADUATE SCHOOL MONTEREY CA

Report Date: Mar 1997

Abstract: (U) MAJOR TOPICS OF THIS CONFERENCE INCLUDE: (1) VISUALIZATION; (2) ADVANCED TIME-DOMAIN METHODS; (3) MODEL REDUCTION METHODS FOR COMPUTATIONAL ELECTROMAGNETICS; (4) COMPUTER SIMULATION OF ANTENNAS; (5) RADIATION PHYSICS; (6) COMPUTATIONAL METHODS FOR INVERSE SCATTERING; (7) WAVELETS AND FRACTALS; (8) FDTD AND FVTD; (9) INTEGRATED CIRCUITS AND PHOTONICS; (10) SIGNAL PROCESSING TECHNIQUES FOR CEM; (11) ANTENNA APPLICATIONS; (12) SCATTERING AND DIFFRACTION; (13) FINITE ELEMENT ANALYSIS; (14) ADVANCES IN TRANSMISSION LINE MATRIX (TLM) MODELING.

Abstract Classification:Unclassified

Pages:796 Page(s)

Report Number: XB - NPS *(XB)*

Monitor Series: NPS

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Availability: Pub. in Jnl. of Geophysical Research, v106 nA2, p1795-1801, 1 Feb 2001. Available only to DTIC users. No copies furnished by NTIS.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Ionospher-Magnetosphere Simulation of Small-Scale Structure and Dynamics

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA399770

Accession Number: ADA399770

Personal Author(s): Zhu, H ; Otto, A ; Lummerzheim, D ; Rees, M H ; Lanchester, B S

Corporate Author: ALASKA UNIV FAIRBANKS GEOPHYSICAL INST

Report Date: Feb 2001

Abstract: (U) This work presents first results and the numerical methods of a highly improved two-dimensional three-fluid simulation model of the ionosphere-magnetosphere system. The model considers ionization and recombination, ion-neutral friction, the Hall term in Ohm's law, and various heat sources in the energy equations. The electrodynamic response and the evolution of the collision frequencies are treated self-consistently in the height-resolved ionosphere. This

model is the first and to our knowledge the only simulation model that can resolve the dynamic and nonlinear electromagnetic interaction between the ionosphere and the magnetosphere. The simulation is aimed at modeling fast temporal and small spatial scale ionospheric structures associated, for instance, with filamentary aurora and ionospheric heating experiments. The results presented in this paper focus on ion and electron heating by different sources, i.e., ion heating due to plasma-neutral friction, electron heating resulting from energetic particle precipitation and by ohmic dissipation in strong field-aligned currents. This work is motivated by a specific auroral event that was observed simultaneously with optical and radar instruments. A consistent explanation of this event is possible in the presence of ohmic heating of electrons in a strong field-aligned electric current layer.

Abstract Classification:Unclassified

Descriptive Note: Final rept.

Pages:13 Page(s)

Report Number: AFRL-VS - TR-2002-1526 AFRL-VS *(AFRLVSTR20021526 AFRLVS)* , XC - TR-2002-1526 AFRL-VS *(XCTR20021526 AFRLVS)*

Monitor Series: TR-2002-1526 *(TR20021526)* , AFRL-VS *(AFRLVS)*

Contract/Grant/Transfer Number: F19628-96-C-0011 *(F1962896C0011)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE , 20 - JOURNAL ARTICLES; DTIC USERS ONLY

Distribution Statement:Approved for public release; distribution is unlimited. Available only to DTIC users. U.S. Government or Federal Purpose Rights License.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Mitigation of Energetic Electrons in the Magnetosphere by Amplified Whistler Wave Under Double Cyclotron Resonances

PDF URL: (pdf) - 2 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA493078

Accession Number: ADA493078

Personal Author(s): Kuo, S P

Corporate Author: POLYTECHNIC INST OF NEW YORK BROOKLYN

Report Date: 22 Oct 2008

Abstract: (U) An optimal approach reducing the population of MeV electrons in the magnetosphere is presented. Under a double resonance condition whistler wave is simultaneously in cyclotron resonance with deV and MeV electrons. The injected whistler waves is first amplified by the background keV electrons via loss-cone negative mass instability to become effective in precipitating MeV electrons via cyclotron resonance elevated chaotic

scattering. The numerical results show that a small amplitude whistler wave can be amplified by more than 25 dB. The amplification factor reduces only about 10 dB with a 30 dB increase of the initial wave intensity. Use of an amplified whistler wave to scatter 1.5 MeV electrons from an initial pitch angle of 86.5 deg to a pitch angle 50 deg is demonstrated. The ratio of the required wave magnetic field to the background magnetic field is calculated to be about 8 x 10(-4). An optimal approach reducing the population of MeV electrons in the magnetosphere is presented. Under a double resonance condition whistler wave is simultaneously in cyclotron resonance with deV and MeV electrons. The injected whistler waves is first amplified by the background keV electrons via loss-cone negative mass instability to become effective in precipitating MeV electrons via cyclotron resonance elevated chaotic scattering. The numerical results show that a small amplitude whistler wave can be amplified by more than 25 dB. The amplification factor reduces only about 10 dB with a 30 dB increase of the initial wave intensity. Use of an amplified whistler wave to scatter Is MeY electrons from an initial pitch angle of 86.50 to a pitch angle 50% is demonstrated. The ratio of the required wave magnetic field to the background magnetic field is calculated to be about 8 x 10(-4).

Abstract Classification:Unclassified

Descriptive Note: Journal article

Pages:11 Page(s)

Report Number: AFRL-RV-HA - TR-2009-1001 AFRL-RV-HA *(AFRLRVHATR20091001 AFRLRVHA)* , XC - TR-2009-1001 AFRL-RV-HA *(XCTR20091001 AFRLRVHA)*

Monitor Series: TR-2009-1001 *(TR20091001)* , AFRL-RV-HA *(AFRLRVHA)*

Contract/Grant/Transfer Number: FA8718-08-C-0049 *(FA871808C0049)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Environmental Impact Analysis Process. Environmental Assessment for NAVSTAR Global Positioning System, Block IIR, and Medium Launch Vehicle III, Cape Canaveral Air Station, Florida

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA413147

Accession Number: ADA413147

Corporate Author: SPACE AND MISSILE SYSTEMS CENTER LOS ANGELES AFB CA

Report Date: Nov 1994

Abstract: (U) Pursuant to the National Environmental Policy Act, the Council on Environmental Quality regulations implementing the Act (40 CFR 1500-1508), Department of Defense Directive 6050.1, Air Force Regulation 19-2, which implements these regulations in the Environmental Impact Analysis Process (EIAP), Air Force Regulation 19-9 regarding

interagency coordination, and other applicable federal and local regulations, the US Air Force has conducted an assessment of the potential environmental consequences of the NAVSTAR Global Positioning System (GPS) Block IIR satellite constellation and the Medium Launch Vehicle III (MLV III) program. Proposed Action: The Air Force proposes to transport, process, launch, operate, and ultimately dispose of 21 NAVSTAR GPS Block IIR Space Vehicles (SV) using the 21 Delta II Launch Vehicles (LV) proposed for acquisition under the MLV III program from Cape Canaveral Air Station (AS), Florida. The Block IIR SVs will replenish the current Block II/IIA SVs as their operational life ends.

Abstract Classification:Unclassified

Pages:171 Page(s)

Report Number: XC - SMC/CA *(XCSMCCA)*

Monitor Series: SMC/CA *(SMCCA)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) 8TH Annual Review of Progress in Applied Computational Electromagnetics at the Naval Postgraduate School, Monterey, CA, March 16-20, 1992.

PDF URL: (pdf) - 24 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA329076

Accession Number: ADA329076

Corporate Author: NAVAL POSTGRADUATE SCHOOL MONTEREY CA

Report Date: Mar 1992

Descriptive Note: Conference proceedings,

Pages:661 Page(s)

Report Number: XB - NPS *(XB)*

Monitor Series: NPS

FOIA U2 Display

Distribution/Classification

Distribution Code:A - UNLIMITED DISTRIBUTION

Secondary Dist:Distribution Statement A: Approved for public release; distribution is unlimited.

Export Control:No

For Pay:No

Copyrighted - No Govt Rights:No

Classification:UNCLASSIFIED

Collection: TEMS

Title: Lidar Measurement Of Rocket Exhaust Plume Dispersion And Layering In Thestratosphere

PDF URL:

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tems&docId=CPIAC-2000-0690

Accession Number:CPIAC-2000-0690

IAC Report Name:2000-0690 *20000690*

Personal Author(s): Dao, P. D. Dentamaro, A.

Date of Publication:16 Sep 1999

Abstract: The Mobile Lidar Trailer (MLT) measures backscattering returns fromsolid rocket booster exhaust plumes in the stratosphere. A worst-caseassessment of the stratospheric ozone depletion, often associated with the useof Solid Rocket Motors such as the TITAN IV and the Space Shuttle, is provided. The study is based on the measurement of more than 1500 layers of plume sampledin the altitudes between 15 and 55 km. The results show that less than 2percent of the ozone column is destroyed in the lidar line-of-sight as a resultof the launch. Results are also presented on the fading of the plume returnassociated with the dispersion of the plume for times between 30 minutes and 3hours after launch. A comparison with current dispersion models is provided. The measurement and analysis are based on the lidar backscattering signal fromthe rocket exhaust plume measured at the wavelengths of 308, 355, 532, and 1064nm for times between 5 and 200 minute4s after launch. (Author)

Pages:24 Page(s)

Site:CPIAC

DTIC AD Number:AD A382 952 *ADA382952*

FOIA U2 Display

Distribution/Classification

Distribution Code:A - UNLIMITED DISTRIBUTION

Secondary Dist: Approved for Public Release; Distribution Unlimited

Export Control:No

Copyrighted - No Govt Rights:No

Classification:UNCLASSIFIED

Collection: TEMS

Title: Lidar Measurement Of Rocket Exhaust Plume Dispersion And Layering In The Stratosphere.

PDF URL:

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tems&docId=SENSIAC-SENS-IRIA-71453

Accession Number:SENSIAC-SENS-IRIA-71453

IAC Report Name:IRIA-71453 *IRIA71453*

Personal Author(s): DAO, PHAN D.; DENTAMARO, ANTHONY

Performing Organization: Air Force Research Laboratory/VSBC

Date of Publication:16 Sep 1999

Abstract: (u) THIS REPORT PRESENTS THE RESULTS OF A STUDY OF THE EFFECT OF THE LAUNCHING OF SOLID ROCKET MOTORS ON POSSIBLE OZONE DEPLETION.THE STUDY IS BASED ON THE MEASUREMENT OF MORE THAN 1500 LAYERS OF PLUME SAMPLED IN THE ALTITUDES BETWEEN 15 AND 55 KM. RESULTS SHOW THAT LESS THAN 2 PERCENT OF THE OZONE COLUMN IS DESTROYED IN THE LIDAR LINE OF SIGHT AS A RESULT OF THE LAUNCH. RESULTS ARE ALSO PRESENTED ON THE FADING OF THE PLUME RETURN ASSOCIATED WITH THE DISPERSION OF THE PLUME FOR TIMES BETWEEN 30 MINUTES AND 3 HOURS AFTER LAUNCH. A COMPARISON WITH CURRENT DISPERSION MODELS IS PROVIDED. THE MEASUREMENT AND ANALYSIS ARE BASED ON THE LIDAR BACKSCATTERING SIGNAL FROM THE ROCKET EXHAUST PLUME MEASURED AT THE WAVELENGTHS OF 308, 355, 532, AND 1064 NM FOR TIMES BETWEEN 5 AND 200 MINUTES AFTER LAUNCH.

Category:Scientific Report

Pages:24 Page(s)

Site:SENSIAC

Report ID - Performing Org.:AFRL-VS-TR-1999-1532, ERP-NO. 1225
AFRLVSTR19991532ERPNO1225

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Lidar Measurement of Rocket Exhaust Plume Dispersion and Layering in the Stratosphere

PDF URL: (pdf) - 783 KB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA382952

Accession Number: ADA382952

Personal Author(s): Dao, Phan D ; Dentamaro, Anthony

Corporate Author: AIR FORCE RESEARCH LAB KIRTLAND AFB NMSPACE VEHICLES DIRECTORATE

Report Date: 16 Sep 1999

Abstract: (U) The Mobile Lidar Trailer (MLT) measures backscattering returns from solid rocket booster exhaust plumes in the stratosphere. A worst-case assessment of the stratospheric ozone depletion, often associated with the use of Solid Rocket Motors such as the TITAN IV and the Space Shuttle, is provided. The study is based on the measurement of more than 150 layers of plume sampled in the altitudes between 15 and 55 km. The results show that less than 2 percent of the ozone column is destroyed in the lidar line-of-sight as a result of the launch. Results are also presented on the fading of the plume return associated with the dispersion of the plume for times between 30 minutes and 3 hours after launch. A comparison with current dispersion models is provided. The measurement and analysis are based on the lidar backscattering signal from the rocket exhaust plume measured at the wavelengths of 308, 355, 532, and 1064 nm for times between 5 and 200 minutes after launch. 14. SUBJECT TERMS 15. NUMBER OF PAGES Lidar, Launch vehicle, Exhaust plume, Backscattering, Ozone depletion 22

Abstract Classification:Unclassified

Descriptive Note: Final rept

Pages:18 Page(s)

Report Number: AFRL-VS-TR-1999-1532 *(AFRLVSTR19991532)* , ERP-1225 *(ERP1225)* , XC - AFRL-VS *(XCAFRLVS)*

Monitor Series: AFRL-VS *(AFRLVS)*

FOIA U2 Display

Distribution/Classification

Distribution Code:A - UNLIMITED DISTRIBUTION

Secondary Dist:Unlimited Distribution

Export Control:No

For Pay:No

Copyrighted - No Govt Rights:No

Classification:Unclassified

Collection: TEMS

Title: Crosstalk

PDF URL:

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tems&docId=RIAC-RIAC-241727-000

Accession Number:RIAC-RIAC-241727-000

IAC Report Name:241727-000 *241727000*

Monitoring Organization:Department of Defense

Performing Organization:USAF Software Technology Support Center (STSC)

Date of Publication:01 Mar 2009

Abstract: CROSSTALKThe Journal of Defense Software EngineeringMar/Apr 2009Vol.22 No.3

Pages:32 Page(s)

Site:RIAC

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Crosstalk: The Journal of Defense Software Engineering. Volume 22, Number 3

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA499157

Accession Number: ADA499157

Personal Author(s): Thompson, Kasey ; Mead, Nancy R ; Shoemaker, Dan ; Ingalsbe, Jeffrey A ; Rao, D T ; Gagliardi, Michael ; Wood, William G ; Klein, John ; Morley, John ; Black, Paul E ; Stewart, Roger ; Priven, Lew ; Minkiewicz, Arlene F ; Baxter, Katherine

Corporate Author: SOFTWARE TECHNOLOGY SUPPORT CENTER HILL AFB UT

Report Date: Apr 2009

Abstract: (U) We all have been taught sound practices since childhood. Remember the ol' dental mantra of don't forget to brush your teeth after each meal? Those instructions were soon augmented with a warning that brushing alone was not enough, and that flossing and regular check-ups were needed to reinforce brushing and prevent the development of dental maladies. Our experience with these routines over our lifetime confirms the worth of reinforcing good, basic practices. Even armed with this knowledge, many of us at some point ignored the act of reinforcement and suffered the occasional, painful cavity. Software practices are similar because we understand the value of implementing well-defined best practices, code reviews, and well-structured architectural design in combination with the basics. Even with that understanding, the drive for on-time delivery or budget and time constraints hampers the opportunity to perform the reinforcing actions that prevent future problems -- and we suffer the software equivalent consequence, otherwise known as software defects.

Abstract Classification:Unclassified

Pages:33 Page(s)

Report Number: XC - OO-ALC *(XCOOALC)*

Monitor Series: OO-ALC *(OOALC)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) High Frequency Active Auroral Research Program (HAARP) Imager

PDF URL: (pdf) - 10 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA277469

Accession Number: ADA277469

Personal Author(s): Lance, Cyril ; Eather, Robert

Corporate Author: PHILLIPS LAB HANSCOM AFB MA

Report Date: 30 Sep 1993

Abstract: (U) A low-light-level monochromatic imaging system was designed and fabricated which was optimized to detect and record optical emissions associated with high-power rf heating of the ionosphere. The instrument is capable of detecting very low intensities, of the order of 1 Rayleigh, from typical ionospheric atomic and molecular emissions. This is achieved through co-adding of ON images during heater pulses and subtraction of OFF (background) images between pulses. Images can be displayed and analyzed in real time and stored in optical disc for later analysis. Full image processing software is provided which was customized for this application and uses menu or mouse user interaction.

Abstract Classification:Unclassified

Descriptive Note: Final rept. 29 Aug 1991-29 Aug 1993

Pages:322 Page(s)

Report Number: PL* - TR-93-2219 PL/HANSCOM *(PLTR932219 PLHANSCOM)* , XC - TR-93-2219 PL/HANSCOM *(XCTR932219 PLHANSCOM)*

Monitor Series: TR-93-2219 *(TR932219)* , PL/HANSCOM *(PLHANSCOM)*

Contract/Grant/Transfer Number: F19628-91-C-0141 *(F1962891C0141)*

FOIA U2 Display

Distribution/Classification

Distribution Code:01 - APPROVED FOR PUBLIC RELEASE

Distribution Statement:Approved for public release; distribution is unlimited.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Strategic Studies Quarterly. Volume 5, Number 3. Fall 2011

PDF URL: (pdf) - 1 MB -

https://www.dtic.mil/DTICOnline/downloadPdf.search?collectionId=tr&docId=ADA550397

Accession Number: ADA550397

Corporate Author: AIR UNIV MAXWELL AFB AL STRATEGIC STUDIES QUARTERLY

Report Date: Jan 2011

Abstract: (U) COMMENTARIES: Remarks of the Honorable Michael B. Donley, Secretary of the Air Force, Class 201 I Graduation, School of Advanced Air and Space Studies, Maxwell AFB on 15 June 201 I; Preparing to Lead with a Compelling Narrative: If You Don't Frame the Narrative, Someone Else Will by Mary Crannell and Ben Sheppard. FEATURED ARTICLE: Transitions in the Arab World: Spring or Fall? by David S. Sorenson. PERSPECTIVES: To Deter or Not to Deter: Applying Historical Lessons to the Iranian Nuclear Challenge by Cheryl M. Graham; Hegemonic Disruption: The Asymmetric Challenge to US Leadership by William W. Newmann; The Past as Prologue: Realist Thought and the Future of American Security Policy by James Wood Forsyth Jr.; Zero Nuclear Weapons and Nuclear Security Enterprise Modernization by Maj D'Anne E. Spence, USAF.

Abstract Classification:Unclassified

Descriptive Note: Journal

Pages:156 Page(s)

Report Number: XC - AU/SSQ *(XCAUSSQ)*

Monitor Series: AU/SSQ *(AUSSQ)*

Highest Classification: Unclassified

Highest Classification: Unclassified

DTIC Bibliography

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Number of Citations: 53

Format: FOIA UL Display

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FOIA UL Display

Distribution/Classification

Distribution Code:02 - U.S. GOVT. AND THEIR CONTRACTORS

Distribution Statement:Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative or Operational Use; Jul 2003. Other requests shall be referred to Air Force Research Laboratory/VSBX, 29 Randolph Road, Hanscom AFB, MA 01731-3010

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) HAARP Overview; High Frequency Active Auroral Research Program

PDF URL: (pdf) - 2 MB -

Accession Number: ADB302122

Personal Author(s): Kossey, Paul A ; Battis, James C

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA

Report Date: Dec 2001

Descriptive Note: Interim technical rept. 1 Oct 2000-30 Sep 2001

Pages:64 Page(s)

Report Number: AFRL-VS-TR-2003-1569; ERP-1248 *(AFRLVSTR20031569ERP1248)* , XC - AFRL/VSBX *(XCAFRLVSBX)*

Monitor Series: AFRL/VSBX *(AFRLVSBX)*

FOIA UL Display

Distribution/Classification

Distribution Code:02 - U.S. GOVT. AND THEIR CONTRACTORS , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to U.S. Gov't. agencies and their contractors; Critical Technology; Administrative/Operational Use; 30 SEP 2013. Other requests shall be referred to Air Force Research Laboratory, ATTN: AFRL/RVBXI, 3550 Aberdeen Ave. SE, Kirtland AFB, NM 87117-5776. This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) HAARP Research Station Gakona: FY2009-FY2012 Summary of Research and Other Program Activities

PDF URL: (pdf) - 1 MB -

Accession Number: ADB395686

Personal Author(s): Selcher, Craig A

Corporate Author: AIR FORCE RESEARCH LAB KIRTLAND AFB NM SPACE VEHICLES DIRECTORATE

Report Date: 30 Sep 2013

Descriptive Note: Final rept. 1 Oct 2008-30 Sep 2012

Pages:33 Page(s)

Report Number: AFRL-RV-PS-TR-2-13-178 *(AFRLRVPSTR213178)* , XC - AFRL-RV-PS *(XCAFRLRVPS)*

Monitor Series: AFRL-RV-PS *(AFRLRVPS)*

FOIA UL Display

Distribution/Classification

Distribution Code:02 - U.S. GOVT. AND THEIR CONTRACTORS

Distribution Statement:Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative/Operational Use; 04 NOV 2008. Other requests shall be referred to Air Force Research Lab., Attn: AFRL/RVBXI, 29 Randolph Rd., Hanscom AFB, MA 01731-3010.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) HAARP Research Station Gakona: Completion of the 3600 kW Facility and Recent Program Activities

PDF URL: (pdf) - 13 MB -

Accession Number: ADB346884

Personal Author(s): Battis, James C ; Kossey, Paul A

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA SPACE VEHICLES DIRECTORATE

Report Date: 30 Sep 2008

Descriptive Note: Final rept. 1 Oct 2003-30 Sep 2008

Pages:79 Page(s)

Report Number: AFRL-RV-HA-TR-2009-1005 *(AFRLRVHATR20091005)* , XC - AFRL-RV-HA *(XCAFRLRVHA)*

Monitor Series: AFRL-RV-HA *(AFRLRVHA)*

FOIA UL Display

Distribution/Classification

Distribution Code:05 - CONTROLLED; DOD CONTROLLED

Distribution Statement:Distribution: Further dissemination only as directed by Office of Naval Research, ATTN: Code 312, 875 North Randolph St., Suite 1425, Arlington, VA 22203-1997, JAN 2007, or higher DoD authority.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Remote Sensing of Lower Ionosphere - HAARP Gakona, Alaska Facility

Accession Number: ADB325051

Personal Author(s): Kendall, Elizabeth

Corporate Author: SRI INTERNATIONAL MENLO PARK CA

Report Date: 31 Jan 2007

Descriptive Note: Final rept. 1 Jan 2006-31 Jan 2007

Pages:6 Page(s)

Report Number: ESD-17083-FR-07-004 *(ESD17083FR07004)* , XB - ONR *(XB)*

Monitor Series: ONR

Contract/Grant/Transfer Number: N00014-05-C-0369 *(N0001405C0369)*

FOIA UL Display

Distribution/Classification

Distribution Code:16 - DOD AND THEIR CONTRACTORS , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to DoD and DoD contractors only; Critical Technology; 18 JUN 2012. Other requests shall be referred to Air Force Research Laboratory, ATTN: AFRL/RVBXI, 3550 Aberdeen Ave. SE, Kirtland AFB, NM 87117-5776. This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) Equator and High-Latitude Ionosphere-to-Magnetosphere Research. Addendum

PDF URL: (pdf) - 1 MB -

Accession Number: ADB383861

Personal Author(s): Reinisch, Bodo W ; Kitrosser, David ; Hamel, Ryan ; Galkin, Ivan A

Corporate Author: MASSACHUSETTS UNIV LOWELL CENTER FOR ATMOSPHERIC RESEARCH

Report Date: 18 Jun 2012

Descriptive Note: Final rept. 1 Nov 2011-18 Jun 2012

Pages:15 Page(s)

Report Number: AFRL-RV-PS - TR-2011-0166 AFRL-RV-PS *(AFRLRVPSTR20110166 AFRLRVPS)* , XC - TR-2011-0166 AFRL-RV-PS *(XCTR20110166 AFRLRVPS)*

Monitor Series: TR-2011-0166 *(TR20110166)* , AFRL-RV-PS *(AFRLRVPS)*

Contract/Grant/Transfer Number: FA8718-06-C-0072 *(FA871806C0072)*

FOIA UL Display

Distribution/Classification

Distribution Code:02 - U.S. GOVT. AND THEIR CONTRACTORS

Distribution Statement:Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative/Operational Use; Apr 99. Other requests shall be referred to 738 EIS/EEE, Keesler AFB, MS 39534-2633.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) 738 EIS Engineering Report. Radio Frequency Interference Measurements, AN/FLR-9 Antenna System, Elmendorf AFB, AK, 7 - 26 February 1999

PDF URL: (pdf) - 922 KB -

Accession Number: ADB244635

Personal Author(s): Ketchum, Kelly D

Corporate Author: ENGINEERING INSTALLATION SQUADRON (738TH) KEESLER AFB MS ELECTRO- MAGNETIC ENVIRONMENTAL EFFECTS SECTION

Report Date: 27 Apr 1999

Descriptive Note: Final rept. 7-26 Feb 99

Pages:25 Page(s)

Report Number: 738EIS-FMEA-99-07 *(738EISFMEA9907)* , XC - 738EIS *(XC)*

Monitor Series: 738EIS

FOIA UL Display

Distribution/Classification

Distribution Code:02 - U.S. GOVT. AND THEIR CONTRACTORS , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to U.S. Gov't. agencies and their contractors; Critical Technology; 02 FEB 2010. Other requests shall be referred to Air Force Research Laboratory, ATTN: RVBXI, 29 Randolph Rd.,Hanscom AFB, MA 01731-3010. This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) Ionospheric Impacts on Radio Frequency Systems

PDF URL: (pdf) - 1 MB -

Accession Number: ADB358366

Personal Author(s): Groves, Keith M ; Cicale, Randy S

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA SPACE VEHICLES DIRECTORATE

Report Date: 27 Jan 2010

Descriptive Note: Research rept. 1 Oct 2000-30 Sep 2008

Pages:42 Page(s)

Report Number: AFRL-RV-HA-TR-2009-1134 *(AFRLRVHATR20091134)* , XC - AFRL-RV-HA *(XCAFRLRVHA)*

Monitor Series: AFRL-RV-HA *(AFRLRVHA)*

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Proprietary Information; JAN 2010. Other requests shall be referred to Defense Advanced Research Projects Agency, Strategic Technology Office, 3701 N. Fairfax Dr., Arlington, VA 22203-1714.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Generation & Global Propagation of ULF Waves

PDF URL: (pdf) - 3 MB -

Accession Number: ADB356974

Personal Author(s): Chang, Chia-Lie

Corporate Author: BAE SYSTEMS ARLINGTON VA TECHNOLOGY SOLUTIONS

Report Date: 31 Jan 2010

Descriptive Note: Final technical rept. 7 Jan 2008-7 Jan 2010

Pages:33 Page(s)

Report Number: XD - DARPA/STO *(XDDARPASTO)*

Monitor Series: DARPA/STO *(DARPASTO)*

Contract/Grant/Transfer Number: HR0011-08-C-0009 *(HR001108C0009)* , ARPA ORDER-X126/00 *(ARPAORDERX12600)*

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED , 26 - NOT AVAILABLE IN MICROFICHE

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Administrative or Operational Use; Mar 2005. Other requests shall be referred to Office of Naval Research, 800 N. Quincy St., Arlington, VA 22217., Availability: This document is not available from DTIC in microfiche.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) ELF/VLF Ionospheric Heating Research

PDF URL: (pdf) - 44 KB -

Accession Number: ADB307479

Corporate Author: BAE SYSTEMS NORTH AMERICA INC ROCKVILLEMD

Report Date: Mar 2005

Descriptive Note: Quarterly rept. Jan-Mar 2005

Pages:3 Page(s)

Report Number: XB - ONR *(XB)*

Monitor Series: ONR

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Proprietary Info.; Apr 2000. Other requests shall be referred to AFRL/VSBI, 29 Randolph Rd., Hanscom AFB, MA 01731-3010., This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) Transformation of the HAARP HF Facility into an HF Radar: New Diagnostics for the Natural and Perturbed Environment

PDF URL: (pdf) - 2 MB -

Accession Number: ADB258742

Personal Author(s): Djuth, Frank T ; Elder, John H

Corporate Author: GEOSPACE RESEARCH INC EL SEGUNDO CA

Report Date: 13 Mar 2000

Descriptive Note: Phase 1 of Final rept. 5 May 1999-5 Feb 2000

Pages:34 Page(s)

Report Number: GRI-SB-00-7500 *(GRISB007500)* , AFRL-VS - TR-2000-1529 AFRL-VS *(AFRLVSTR20001529 AFRLVS)* , XC - TR-2000-1529 AFRL-VS *(XCTR20001529 AFRLVS)*

Monitor Series: TR-2000-1529 *(TR20001529)* , AFRL-VS *(AFRLVS)*

Contract/Grant/Transfer Number: F19628-99-C-0045 *(F1962899C0045)*

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Administrative/Operational Use; Sep 2003. Other requests shall be referred to the Naval Research Lab., ATTN: Code 5550, 4555 Overlook Avenue SW, Washington, DC 20375.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Final Thermopile Specification and Manufacturing Drawing Package

PDF URL: (pdf) - 732 KB -

Accession Number: ADB306139

Personal Author(s): Yamzon, Kristen

Corporate Author: ADVANCED POWER TECHNOLOGIES INC WASHINGTON DC

Report Date: 17 Sep 2003

Descriptive Note: Drawings

Pages:23 Page(s)

Report Number: XB - NRL *(XB)*

Monitor Series: NRL

Contract/Grant/Transfer Number: N00014-02-D-0479 *(N0001402D0479)*

FOIA UL Display

Distribution/Classification

Distribution Code:02 - U.S. GOVT. AND THEIR CONTRACTORS

Distribution Statement:Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative/Operational Use; JUL 2003. Other requests shall be referred to Air Force Research Laboratory, ATTN: AFRL/RVBXI, 29 Randolph Road, Hanscom AFB, MA 01731-3010.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) HAARP Research Station Gakona: FY2009-FY2010 Summary of Research and Other Program Activities

PDF URL: (pdf) - 4 MB -

Accession Number: ADB372447

Personal Author(s): Battis, James C ; Kossey, Paul A

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA

Report Date: 30 Sep 2010

Descriptive Note: Interim scientific rept., 1 Oct 2009-30 Sep 2010

Pages:70 Page(s)

Report Number: AFRL-RV-HA-TR-2011-1033 *(AFRLRVHATR20111033)* , XC - AFRL/MA *(XCAFRLMA)*

Monitor Series: AFRL/MA *(AFRLMA)*

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED , 26 - NOT AVAILABLE IN MICROFICHE

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Administrative/Operational Use; 01 JAN 2004. Other requests shall be referred to Office of Naval Research, Ballston Tower One, 800 N. Quincy St., Arlington, VA 22217-5660., Availability: This document is not available from DTIC in microfiche.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) ELF/VLF Ionospheric Heating Research

PDF URL: (pdf) - 92 KB -

Accession Number: ADB309821

Corporate Author: BAE SYSTEMS ADVANCED TECHNOLOGIES INC WASHINGTON DC

Report Date: Jun 2005

Descriptive Note: Quarterly technical rept., Apr-Jun 2005

Pages:14 Page(s)

Report Number: XB - ONR *(XB)*

Monitor Series: ONR

FOIA UL Display

Distribution/Classification

Distribution Code:C - U.S. GOVT. AGENCIES & THEIR CONTRACTORS

Secondary Dist:Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors; Export Control. Other requests for this document shall be referred to the controlling government authority.

Export Control:Yes

For Pay:Yes

Copyrighted - No Govt Rights:No

Classification:UNCLASSIFIED

Collection: TEMS

EXPORT CONTROL

Title: Vhf Radar Signatures Of Theater Ballistic Missiles

PDF URL:

Accession Number: CPIAC-2004-0216AI

IAC Report Name:2004-0216AI *20040216AI*

Personal Author(s): Groves, K. M. Quinn, J. M. Taliaferro, B. Williams, S.

Date of Publication:05 Nov 2004

Pages:13 Page(s)

Site:CPIAC

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Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED , 26 - NOT AVAILABLE IN MICROFICHE

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Proprietary Information; JAN 2005. Other requests shall be referred to Air Force Research Lab., ATTN: VSBXI, 29 Randolph Rd., Hanscom AFB, MA 01731-3010. This document is not available from DTIC in microfiche.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Global Ionospheric Diagnostics: Advanced Hardware, Software, and Networking

PDF URL: (pdf) - 19 MB -

Accession Number: ADB308921

Personal Author(s): Livingston, Robert C ; Ning, Peter

Corporate Author: SCION ASSOCIATES TOWNSEND WA

Report Date: 18 Dec 2004

Descriptive Note: Final technical rept. 14 Sep 2000-30 Sep 2004

Pages:38 Page(s)

Report Number: AFRL-VS-HA - TR-2005-1007 AFRL-VS-HA *(AFRLVSHATR20051007 AFRLVSHA)* , XC - TR-2005-1007 AFRL-VS-HA *(XCTR20051007 AFRLVSHA)*

Monitor Series: TR-2005-1007 *(TR20051007)* , AFRL-VS-HA *(AFRLVSHA)*

Contract/Grant/Transfer Number: F19628-00-C-0071 *(F1962800C0071)*

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Distribution/Classification

Distribution Code:02 - U.S. GOVT. AND THEIR CONTRACTORS

Distribution Statement:Distribution authorized to U.S. Gov't. agencies and their contractors; Foreign Government Information; 16 OCT 2000. Other requests shall be referred to Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, ATTN: OUSD(AT&L)/DDR&E/ITP, 3080 Defense Pentagon, Washington, DC 20301-3080. TTCP MOU Amendment One.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) TTCP WPN Action Group 25 Novel Weapons Technologies

PDF URL: (pdf) - 2 MB -

Accession Number: ADB397830

Corporate Author: DEFENCE SCIENCE AND TECHNOLOGY ORGANISATION EDINBURGH (AUSTRALIA)

Report Date: 27 Feb 2012

Descriptive Note: Briefing charts

Pages:40 Page(s)

Report Number: X5 - DSTO/E *(X5DSTOE)*

Monitor Series: DSTO/E *(DSTOE)*

FOIA UL Display

Distribution/Classification

Distribution Code:F - FURTHER DISSEMINATION ONLY AS DIRECTED

Secondary Dist:Distribution Approval Required

Export Control:No

For Pay:No

Copyrighted - No Govt Rights:No

Classification:Unclassified

Collection: TEMS

Title: Fy 96 Geophysics Technology Area Plan - Headquarters Air Force Material Command; Wright Patterson Air Force Base

Accession Number: RIAC-RIAC-223443-000

IAC Report Name:223443-000 *223443000*

Personal Author(s): N/A

Performing Organization:RIAC

Date of Publication:01 Jan 1996

Pages:39 Page(s)

Site:RIAC

Contract / Grant ID:N/A *NA*

FOIA UL Display

Distribution/Classification

Distribution Code:16 - DOD AND THEIR CONTRACTORS , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to DoD and DoD contractors only; Critical Technology; SEP 2010. Other requests shall be referred to Director, U.S. Army Research Lab., Attn: RDRL-SES-S, 2800 Powder Mill Rd., Adelphi, MD 20783-1198. This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) Results of ELF and MI-RAMS Experiment

PDF URL: (pdf) - 357 KB -

Accession Number: ADB364623

Personal Author(s): DeLuca, Clyde ; Chopack, James

Corporate Author: ARMY RESEARCH LAB ADELPHI MD SENSORS AND ELECTRON DEVICES DIRECTORATE

Report Date: Sep 2010

Descriptive Note: Final rept. Feb-Mar 2007

Pages:23 Page(s)

Report Number: ARL-TR-5321 *(ARLTR5321)* , XA - ARL** *(XAARL)*

Monitor Series: ARL** *(ARL)*

FOIA UL Display

Distribution/Classification

Distribution Code:C - U.S. GOVT. AGENCIES & THEIR CONTRACTORS

Secondary Dist:Distribution authorized to U.S. Government Agencies and their contractors because contents are strictly for administrative/operational use January 2007. Other requests for this document shall be referred to Jack Blackhurst, AFRL/XP, Wright Patterson Air Force Base, Ohio.

Export Control:No

For Pay:No

Copyrighted - No Govt Rights:No

Classification:UNCLASSIFIED

Collection: TEMS

Title: Space Technology Guide 2004

PDF URL:

Accession Number: SURVIAC-SV-22763

IAC Report Name:22763

Personal Author(s): Williams,J.; O'kane, M.; Yoho,R.

Monitoring Organization:AFRL/XP

Performing Organization:SURVIAC

Date of Publication:30 Sep 2004

Pages:87 Page(s)

Site:SURVIAC

Contract / Grant ID:SP0700-03-D-1380 DO# 0071 *SP070003D1380DO0071*

Report ID - Performing Org.:SURVIAC-TR-07-229 *SURVIACTR07229*

Report ID - Monitoring Org.:NA

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Critical Technology; 25 JAN 2008. Other requests shall be referred to Air Force Research Lab., Attn: AFRL/RVBXP, 29 Randolph Rd., Hanscom AFB, MA 01731-3010. This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) Radiation Belt Remediation

PDF URL: (pdf) - 1 MB -

Accession Number: ADB341051

Personal Author(s): Ginet, Gregory P ; Starks, Michael ; Albert, Jay M

Corporate Author: AIR FORCE RESEARCH LAB HANSCOM AFB MA SPACE VEHICLES DIRECTORATE

Report Date: 08 Jan 2008

Descriptive Note: Final rept. 1 Oct 2002-30 Sep 2007

Pages:31 Page(s)

Report Number: AFRL-VS-HA - TR-2007-1152 AFRL-VS-HA *(AFRLVSHATR20071152 AFRLVSHA)* , XC - TR-2007-1152 AFRL-VS-HA *(XCTR20071152 AFRLVSHA)*

Monitor Series: TR-2007-1152 *(TR20071152)* , AFRL-VS-HA *(AFRLVSHA)*

FOIA UL Display

Distribution/Classification

Distribution Code:16 - DOD AND THEIR CONTRACTORS

Distribution Statement:Distribution authorized to DoD and DoD contractors only; Administrative/Operational Use; 01 MAR 2012. Other requests shall be referred to Air Force Research Lab., Attn: AFRL/RVBXT, 3550 Aberdeen Ave. SE, Kirtland AFB, NM 87117-5776.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) The Influence of Terrestrial ELF/VLF Waves on Radiation Belt Energetic Electron Dynamics

PDF URL: (pdf) - 7 MB -

Accession Number: ADB378174

Personal Author(s): Cohen, Morris B ; Gill, John T ; Inan, Umran S

Corporate Author: STANFORD UNIV CA DEPT OF ELECTRICAL ENGINEERING

Report Date: 01 Mar 2012

Descriptive Note: Technical paper 17 Feb-17 Aug 2011

Pages:26 Page(s)

Report Number: AFRL-RV-PS - TP-2011-0006 AFRL-RV-PS *(AFRLRVPSTP20110006 AFRLRVPS)* , XC - TP-2011-0006 AFRL-RV-PS *(XCTP20110006 AFRLRVPS)*

Monitor Series: TP-2011-0006 *(TP20110006)* , AFRL-RV-PS *(AFRLRVPS)*

Contract/Grant/Transfer Number: FA9453-11-C-0011 *(FA945311C0011)*

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Administrative/Operational Use; Jun 2003. Other requests shall be referred to Naval Research Lab., ATTN: Code 5550, 4555 Overlook Ave., SW, Washington, DC 20375.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) HAARP Preliminary Report and Design Review for the Power Plant and Electrical Distribution

PDF URL: (pdf) - 4 MB -

Accession Number: ADB306280

Personal Author(s): Yamzon, Kristen

Corporate Author: BAE SYSTEMS ADVANCED TECHNOLOGIES INC WASHINGTON DC

Report Date: 16 Jun 2003

Pages:99 Page(s)

Report Number: XB - NRL *(XB)*

Monitor Series: NRL

Contract/Grant/Transfer Number: N00014-02-D-0479 *(N0001402D0479)*

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to U.S. Gov't agencies only; Proprietary Info.; May 94. Other requests shall be referred to Phillips Lab., 29 Randolph Road, Hanscom, MA 01731-3010. This document contains export-controlled technical data.,

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) New Methods for C3I and Surveillance Using Ionospheric Modification.

PDF URL: (pdf) - 2 MB -

Accession Number: ADB195017

Personal Author(s): Skrivanek, R A ; Carpenter, J W ; Rieder, R J ; Shepherd, O

Corporate Author: VISIDYNE INC BURLINGTON MA

Report Date: 27 Apr 1994

Descriptive Note: Final rept. 20 Aug 93-20 Feb 94,

Pages:57 Page(s)

Report Number: VI-2247 *(VI2247)* , PL* - TR-94-2138 PL* *(PLTR942138 PL)* , XC - TR-94-2138 PL* *(XCTR942138 PL)*

Monitor Series: TR-94-2138 *(TR942138)* , PL* *(PL)*

Contract/Grant/Transfer Number: F19628-93-C-0184 *(F1962893C0184)*

FOIA UL Display

Distribution/Classification

Distribution Code:16 - DOD AND THEIR CONTRACTORS , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to DoD and DoD contractors only; Critical Technology; 30 SEP 2011. Other requests shall be referred to Air Force Research Lab., Attn: AFRL/RVBXI, 3550 Aberdeen Ave. SE, Kirtland AFB, NM 87117-5776. This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) Equator and High-Latitude Ionosphere-to-Magnetosphere Research

PDF URL: (pdf) - 9 MB -

Accession Number: ADB375675

Personal Author(s): Reinisch, Bodo W ; Galkin, Ivan A ; Sales, Gary S ; Song, Paul ; Paznukhov, Vadym V ; Khmyrov, Grigori M ; Altadill, David F ; Zong, Quigang ; Galushko, Vladimir V ; Yampolski, Yuri

Corporate Author: MASSACHUSETTS UNIV LOWELL CENTER FOR ATMOSPHERIC RESEARCH

Report Date: 30 Sep 2011

Descriptive Note: Final rept. 25 Aug 2006-30 Sep 2011

Pages:171 Page(s)

Report Number: AFRL-RV-PS - TR-2011-0166 AFRL-RV-PS *(AFRLRVPSTR20110166 AFRLRVPS)* , XC - TR-2011-0166 AFRL-RV-PS *(XCTR20110166 AFRLRVPS)*

Monitor Series: TR-2011-0166 *(TR20110166)* , AFRL-RV-PS *(AFRLRVPS)*

Contract/Grant/Transfer Number: FA8718-06-C-0072 *(FA871806C0072)*

FOIA UL Display

Distribution/Classification

Distribution Code:16 - DOD AND THEIR CONTRACTORS , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to DoD and DoD contractors only; Critical Technology; JUL 2010. Other requests shall be referred to U.S. Army Research Laboratory, ATTN: RDRL-WMM-G, Aberdeen Proving Ground, MD 21005-5069. This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) (U/FOUO) ARL Materials Research Deep Dives: Electro-Optic Materials

PDF URL: (pdf) - 59 MB -

Accession Number: ADB362215

Personal Author(s): Rawlett, Adam ; Nothwang, William ; Wildman, Ray ; Gazonas, George ; Cornelison, Steve ; Mallick, Govind ; Maher, Mick

Corporate Author: ARMY RESEARCH LAB ABERDEEN PROVING GROUND MD WEAPONS AND MATERIALS RESEARCH DIRECTORATE

Report Date: Jul 2010

Descriptive Note: Final rept. Oct 2008-Dec 2009

Pages:303 Page(s)

Report Number: ARL-SR-202 *(ARLSR202)* , XA - ARL/WM *(XAARLWM)*

Monitor Series: ARL/WM *(ARLWM)*

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Proprietary Info.; Dec 95. Other requests shall be referred to Phillips Lab., 29 Randolph Road, Hanscom AFB, MA 01731-3010., This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) Low-Cost, High-Performance VHF/UHF Radars for Military, Scientific, and Commercial Applications.

PDF URL: (pdf) - 3 MB -

Accession Number: ADB208251

Personal Author(s): Djuth, Frank T ; Williams, Kenneth L ; Elder, John H

Corporate Author: GEOSPACE RESEARCH INC EL SEGUNDO CA

Report Date: 29 Nov 1995

Descriptive Note: Final rept. 2 May-2 Dec 95,

Pages:61 Page(s)

Report Number: GRI-SB-95-7270 *(GRISB957270)* , PL* - TR-95-2160 PL/HANSCOM *(PLTR952160 PLHANSCOM)* , XC - TR-95-2160 PL/HANSCOM *(XCTR952160 PLHANSCOM)*

Monitor Series: TR-95-2160 *(TR952160)* , PL/HANSCOM *(PLHANSCOM)*

Contract/Grant/Transfer Number: F19628-95-C-0066 *(F1962895C0066)*

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Proprietary Info.; 19 May 2000. Other requests shall be referred to AFRL/HEOA, Brooks AFB, TX 78235-5324.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) In Situ Biological Remediation of Dydrazine Spills Using Gel Encapsulated Enzymes.

PDF URL: (pdf) - 4 MB -

Accession Number: ADB255797

Personal Author(s): McCoy, J ; Mendum, T ; Gold, H ; Willis, M ; Bryant, J

Corporate Author: FOSTER-MILLER INC WALTHAM MA

Report Date: May 2000

Descriptive Note: Final rept. Jul 96-Mar 00

Pages:83 Page(s)

Report Number: AFRL-96198-1348 *(AFRL961981348)* , AFRL-HE-BR - TR-2000-0059 AFRL-HE-BR *(AFRLHEBRTR20000059 AFRLHEBR)* , XC - TR-2000-0059 AFRL-HE-BR *(XCTR20000059 AFRLHEBR)*

Monitor Series: TR-2000-0059 *(TR20000059)* , AFRL-HE-BR *(AFRLHEBR)*

Contract/Grant/Transfer Number: F41624-96-C-9011 *(F4162496C9011)*

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Test and Evaluation; 16 Jul 98. Other requests shall be referred to Defense Advanced Research Projects Agency, 3701 N. Fairfax Dr., Arlington, VA 22203-1714.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Autonomous Underground Microborer for Characterization of Deeply Buried Underground Facilities

PDF URL: (pdf) - 5 MB -

Accession Number: ADB237411

Corporate Author: ORINCON CORP LA JOLLA CA

Report Date: 16 Jul 1998

Pages:85 Page(s)

Report Number: OC-98-4320-U-0295 *(OC984320U0295)* , XA - AMSAM *(XA)*

Monitor Series: AMSAM

Contract/Grant/Transfer Number: DAAH01-98-C-R026 *(DAAH0198CR026)*

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Proprietary Information; 04 DEC 2006. Other requests shall be referred to Air Force Research Laboratory, ATTN: VSBXP, 29 Randolph Rd., Hanscom AFB, MA 01731-3010. This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) Ionospheric Effects Mitigation for Radar Systems Using GPS Ionospheric Inversion (GPSII)

PDF URL: (pdf) - 2 MB -

Accession Number: ADB330134

Personal Author(s): Nickisch, L J ; Fridman, Sergey V ; Hausman, Mark A ; Secan, James A

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC BELLEVUE WA

Report Date: 01 Dec 2006

Descriptive Note: Final rept. 5 May-30 Nov 2006

Pages:46 Page(s)

Report Number: NWRA-BELL-06-R345 *(NWRABELL06R345)* , AFRL-VS-HA - TR-2007-1064 AFRL-VS-HA *(AFRLVSHATR20071064 AFRLVSHA)* , XC - TR-2007-1064 AFRL-VS-HA *(XCTR20071064 AFRLVSHA)*

Monitor Series: TR-2007-1064 *(TR20071064)* , AFRL-VS-HA *(AFRLVSHA)*

Contract/Grant/Transfer Number: FA8718-06-C-0034 *(FA871806C0034)*

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Critical Technology; Proprietary Information; 18 MAY 2010. Other requests shall be referred to Air Force Research Laboratory, ATTN: RVBXI, 29 Randolph Rd., Hanscom AFB, MA 01731-3010. This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) Radar Ionospheric Impact Mitigation

PDF URL: (pdf) - 8 MB -

Accession Number: ADB363159

Personal Author(s): Fridman, Sergey V ; Hausman, Mark A ; Nickisch, L J ; Aiello, Mark ; Robins, Bob

Corporate Author: NORTHWEST RESEARCH ASSOCIATES INC REDMOND WA

Report Date: 22 Apr 2009

Descriptive Note: Final rept. 16 Feb 2007-15 Feb 2009

Pages:64 Page(s)

Report Number: NWRA-SEA-09-R382 *(NWRASEA09R382)* , AFRL-RV-HA - TR-2009-1088 AFRL-RV-HA *(AFRLRVHATR20091088 AFRLRVHA)* , XC - TR-2009-1088 AFRL-RV-HA *(XCTR20091088 AFRLRVHA)*

Monitor Series: TR-2009-1088 *(TR20091088)* , AFRL-RV-HA *(AFRLRVHA)*

Contract/Grant/Transfer Number: FA8718-07-C-0015 *(FA871807C0015)*

FOIA UL Display

Distribution/Classification

Distribution Code:16 - DOD AND THEIR CONTRACTORS

Distribution Statement:Distribution authorized to DoD and DoD contractors only; Administrative/Operational Use; 17 FEB 2012. Other requests shall be referred to Air Force Research Laboratory, ATTN: AFRL/RVBXT, 3550 Aberdeen Ave. SE, Kirtland AFB, NM 87117-5776.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) The Influence of Terrestrial ELF/VLF Waves on Radiation Belt Energetic Electronic Dynamics. Interim S&T Report #2

PDF URL: (pdf) - 3 MB -

Accession Number: ADB383484

Personal Author(s): Cohen, Morris B ; Gill III, John T ; Inan, Umran S

Corporate Author: STANFORD UNIV CA DEPT OF ELECTRICAL ENGINEERING

Report Date: 17 Feb 2012

Descriptive Note: Interim S/T rept. no. 2, 17 Feb 2011-17 Feb 2012

Pages:32 Page(s)

Report Number: AFRL-RV-PS - TP-2012-0011 AFRL-RV-PS *(AFRLRVPSTP20120011 AFRLRVPS)* , XC - TP-2012-0011 AFRL-RV-PS *(XCTP20120011 AFRLRVPS)*

Monitor Series: TP-2012-0011 *(TP20120011)* , AFRL-RV-PS *(AFRLRVPS)*

Contract/Grant/Transfer Number: FA9453-11-C-0011 *(FA945311C0011)*

FOIA UL Display

Distribution/Classification

Distribution Code:F - FURTHER DISSEMINATION ONLY AS DIRECTED

Secondary Dist:Distribution Approval Required

Export Control:No

For Pay:No

Copyrighted - No Govt Rights:No

Classification:Unclassified

Collection: TEMS

Title: Sidac Data/model Catalog Annual List Of Sidac Documentation

PDF URL:
Accession Number: RIAC-RIAC-227285-000
IAC Report Name:227285-000 *227285000*
Monitoring Organization:HQ AFMC/CIXR
Performing Organization:SIDAC
Date of Publication:06 Jun 1995
Pages:403 Page(s)
Site:RIAC
Contract / Grant ID:F33657-92-D-2055 *F3365792D2055*

FOIA UL Display
Distribution/Classification
Distribution Code:F - FURTHER DISSEMINATION ONLY AS DIRECTED
Secondary Dist:Distribution Approval Required
Export Control:No
For Pay:No
Copyrighted - No Govt Rights:No
Classification:UNCLASSIFIED
Collection: TEMS
Title: Annual List Of Sidac Documentation
PDF URL:
Accession Number: RIAC-RIAC-223518-000
IAC Report Name:223518-000 *223518000*
Monitoring Organization:HQ AFMC/CIXR
Performing Organization:SIDAC
Date of Publication:01 Jun 1964
Pages:349 Page(s)
Site:RIAC
Contract / Grant ID:F33657-92-D-2055 *F3365792D2055*

FOIA UL Display
Distribution/Classification
Distribution Code:02 - U.S. GOVT. AND THEIR CONTRACTORS , 57 - EXPORT CONTROL
Distribution Statement:Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative or Operational Use; 6 Jun 2003. Other requests shall be referred to Air Force

Research Lab., Attn: VSSS, 3550 Aberdeen Ave. SE, Kirtland AFB, NM 87117-5776., This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) Space Situation Awareness AFRL Technology Investment Recommendations

PDF URL: (pdf) - 1 MB -

Accession Number: ADB294263

Personal Author(s): Parker, Steven L ; Ryan, Philip A ; Kalma, Arne H

Corporate Author: SCIENCE APPLICATIONS INTERNATIONAL CORP ALBUQUERQUE NM

Report Date: 06 Jun 2003

Descriptive Note: Final rept. 7 Oct 2002-Jun 2003

Pages:99 Page(s)

Report Number: AFRL-VS - TR-2003-1128 AFRL-VS-NM *(AFRLVSTR20031128 AFRLVSNM)* , XC - TR-2003-1128 AFRL-VS-NM *(XCTR20031128 AFRLVSNM)*

Monitor Series: TR-2003-1128 *(TR20031128)* , AFRL-VS-NM *(AFRLVSNM)*

Contract/Grant/Transfer Number: F29601-02-D-0042 *(F2960102D0042)*

FOIA UL Display

Distribution/Classification

Distribution Code:F - FURTHER DISSEMINATION ONLY AS DIRECTED

Secondary Dist:Distribution Approval Required

Export Control:No

For Pay:No

Copyrighted - No Govt Rights:No

Classification:Unclassified

Collection: TEMS

Title: Catalog Of Computer Program And Documentation: Sidac Data/model Catalog, Third Edition, Volume 1 Of 2

PDF URL:

Accession Number: RIAC-RIAC-227980-000

IAC Report Name:227980-000 *227980000*

Monitoring Organization:SIDAC

Date of Publication:01 Aug 1995

Pages:473 Page(s)

Site:RIAC

Contract / Grant ID:F33657-92-D-2055 *F3365792D2055*

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Proprietary Information; 18 DEC 2009. Other requests shall be referred to Air Force Research Lab., Attn: AFRL/RVEP, 3550 Aberdeen Ave. SE, Kirtland AFB, NM 87117-5776. This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) Deployable Antennas for VLF Transmission and Space-Based Radiation Belt Remediation

PDF URL: (pdf) - 9 MB -

Accession Number: ADB357376

Personal Author(s): Denoyer, Keith K ; Inan, Umran ; Stuart, Janet

Corporate Author: SEQUOIA TECHNOLOGIES ALBUQUERQUE NM

Report Date: 18 Dec 2009

Descriptive Note: Final rept. 19 Mar 2007-15 Sep 2009

Pages:157 Page(s)

Report Number: AFRL-RV-PS - TR-2009-1101 AFRL-RV-PS *(AFRLRVPSTR20091101 AFRLRVPS)* , XC - TR-2009-1101 AFRL-RV-PS *(XCTR20091101 AFRLRVPS)*

Monitor Series: TR-2009-1101 *(TR20091101)* , AFRL-RV-PS *(AFRLRVPS)*

Contract/Grant/Transfer Number: FA9453-07-C-0059 *(FA945307C0059)*

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Critical Technology; JAN 2010. Other requests shall be referred to Air Force Research Laboratory, ATTN: RIEA, Rome, NY 13441-4505. This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) Next-Generation Space-Based Radar Analysis and Testing

PDF URL: (pdf) - 4 MB -

Accession Number: ADB356847

Personal Author(s): Anderson, Stanley

Corporate Author: SCIENCE APPLICATIONS INTERNATIONAL CORP SAN DIEGO CA

Report Date: Jan 2010

Descriptive Note: Final technical rept. Apr 2004-Sep 2009

Pages:128 Page(s)

Report Number: AFRL-RI-RS - TR-2010-26 AFRL-RI-RS *(AFRLRIRSTR201026 AFRLRIRS)* , XC - TR-2010-26 AFRL-RI-RS *(XCTR201026 AFRLRIRS)*

Monitor Series: TR-2010-26 *(TR201026)* , AFRL-RI-RS *(AFRLRIRS)*

Contract/Grant/Transfer Number: FA8750-04-C-0031 *(FA875004C0031)*

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Critical Technology; DEC 2009. Other requests shall be referred to Air Force Research Laboratory, ATTN: RYAA, Wright-Patterson AFB, OH 45433-7320. This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) Data Integration and Visualization for Automatic Target Recognition (ATR) Systems (DIVAS). Task Order 0010: Performance for Sensor Exploitation

PDF URL: (pdf) - 429 KB -

Accession Number: ADB357873

Personal Author(s): Doty, J D

Corporate Author: GENERAL DYNAMICS ADVANCED INFORMATION SYSTEMS DAYTON OH

Report Date: Dec 2009

Descriptive Note: Final rept. 28 Feb 2008-3 Dec 2009

Pages:57 Page(s)

Report Number: AFRL-RY-WP - TR-2010-1021 AFRL-RY-WP *(AFRLRYWPTR20101021 AFRLRYWP)* , XC - TR-2010-1021 AFRL-RY-WP *(XCTR20101021 AFRLRYWP)*

Monitor Series: TR-2010-1021 *(TR20101021)* , AFRL-RY-WP *(AFRLRYWP)*

Contract/Grant/Transfer Number: F33615-03-D-1405-0010 *(F3361503D14050010)*

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED , 26 - NOT AVAILABLE IN MICROFICHE

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Administrative/Operational Use; Apr 2004. Other requests shall be referred to the Naval Research Lab., ATTN: Code 5550, 4555 Overlook Avenue SW, Washington, DC 20375., Availability: This document is not available from DTIC in microfiche.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Geotechnical Investigation: HAARP IRI Final Design

PDF URL: (pdf) - 39 MB -

Accession Number: ADB306549

Personal Author(s): Shumaker, Brian R ; Miller, Duane L

Corporate Author: ADVANCED POWER TECHNOLOGIES INC WASHINGTON DC

Report Date: 15 Apr 2004

Descriptive Note: Final rept.

Pages:117 Page(s)

Report Number: XB - NRL *(XB)*

Monitor Series: NRL

Contract/Grant/Transfer Number: N00014-02-D-0479 *(N0001402D0479)*

FOIA UL Display

Distribution/Classification

Distribution Code:B - U.S. GOVT. AGENCIES ONLY

Secondary Dist:Distribution Statement B: Distribution authorized to U.S. Government agencies only; contractor performance evaluation; Feb 1991. Other requests for this document shall be referred to the Department of the Air Force, HQ Space Systems Division, PKR, P. O. Box 92960, Worldway Postal Center, Los Angeles, CA 90019.

Export Control:Yes

For Pay:No

Copyrighted - No Govt Rights:No

Classification:UNCLASSIFIED

Collection: TEMS

EXPORT CONTROL

Title: Technical Report To The Board Of Trustees (1 April - 30 September 1992)

PDF URL:

Accession Number: CPIAC-1993-1598

IAC Report Name:1993-1598 *19931598*

Date of Publication:01 Dec 1992

Pages:292 Page(s)

Site:CPIAC

DTIC AD Number:No. Unknown *NoUnknown*

FOIA UL Display

Distribution/Classification

Distribution Code:16 - DOD AND THEIR CONTRACTORS , 26 - NOT AVAILABLE IN MICROFICHE , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to DoD and DoD contractors only; Critical Technology; 15 Mar 2004. Other requests shall be referred to Air Force Research Lab., ATTN: VSES, 3550 Aberdeen Ave., SE, Kirtland AFB, NM 87117-5776., Availability: This document is not available from DTIC in microfiche., This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) Military Utility Analysis Radiation Belt Remediation Technology

PDF URL: (pdf) - 536 KB -

Accession Number: ADB297454

Personal Author(s): Metz, Aaron P ; Babcock, Richard R

Corporate Author: AIR FORCE RESEARCH LAB KIRTLAND AFB NMSPACE VEHICLES DIRECTORATE

Report Date: 15 Mar 2004

Descriptive Note: Final technical rept.

Pages:74 Page(s)

Report Number: AFRL-VS-PS - TR-2004-1033 AFRL-VS-PS *(AFRLVSPSTR20041033 AFRLVSPS)* , XC - TR-2004-1033 AFRL-VS-PS *(XCTR20041033 AFRLVSPS)*

Monitor Series: TR-2004-1033 *(TR20041033)* , AFRL-VS-PS *(AFRLVSPS)*

FOIA UL Display

Distribution/Classification

Distribution Code:D - DOD AND DOD CONTRACTORS ONLY

Secondary Dist:Distribution authorized to DoD and DoD contractors only; Critical Technology; 15 Mar 2004. Other requests shall be referred to Air Force Research Lab., ATTN: VSES, 3550 Aberdeen Ave., SE, Kirtland AFB, NM 87117-5776. This document contains export-controlled technical data.

Export Control:Yes

For Pay:No

Copyrighted - No Govt Rights:No

Classification:UNCLASSIFIED

Collection: TEMS

EXPORT CONTROL

Title: Military Utility Analysis Radiation Belt Remediation Technology

PDF URL:

Accession Number: WSTIAC-ADB297454

IAC Report Name:GC-030551 *GC030551*

Personal Author(s): Metz, Aaron P.; Babcock, Richard R.;

Monitoring Organization:AFRL-VS-PS

Performing Organization:AIR FORCE RESEARCH LAB KIRTLAND AFB NMSPACE VEHICLES DIRECTORATE

Date of Publication:15 Mar 2004

Pages:73 Page(s)

Site:WSTIAC

Report ID - Performing Org.:AFRL-VS-PS-TR-2004-1033 *AFRLVSPSTR20041033*

Report ID - Monitoring Org.:TR-2004-1033 *TR20041033*

FOIA UL Display

Distribution/Classification

Distribution Code:D - DOD AND DOD CONTRACTORS ONLY

Secondary Dist:Distribution authorized to DoD and DoD contractors only. This document contains export-controlled technical data.

Export Control:Yes

For Pay:No

Copyrighted - No Govt Rights:No

Classification:UNCLASSIFIED

Collection: TEMS

EXPORT CONTROL

Title: Military Utility Analysis Radiation Belt Remediation Technology

PDF URL:

Accession Number: WSTIAC-GC-030551

IAC Report Name:GC-030551 *GC030551*

Personal Author(s): Metz, Aaron P.; Babcock, Richard R.;

Monitoring Organization:AFRL-VS-PS

Performing Organization:AIR FORCE RESEARCH LAB KIRTLAND AFB NMSPACE VEHICLES DIRECTORATE

Date of Publication:15 Mar 2004

Pages:73 Page(s)

Site:WSTIAC

DTIC AD Number:ADB297454 *ADB297454*

Report ID - Performing Org.:AFRL-VS-PS-TR-2004-1033 *AFRLVSPSTR20041033*

Report ID - Monitoring Org.:TR-2004-1033 *TR20041033*

FOIA UL Display

Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Administrative/Operational Use; Sep 2003. Other requests shall be referred to Naval Research Lab., ATTN: Code 5550, 4555 Overlook Ave., SW, Washington, DC 20375.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) HAARP Electric Distribution Expansion Technical Construction Specifications

PDF URL: (pdf) - 6 MB -

Accession Number: ADB306363

Personal Author(s): Yamzon, Kristen

Corporate Author: BAE SYSTEMS ADVANCED TECHNOLOGIES INC WASHINGTON DC

Report Date: Sep 2003

Descriptive Note: Preliminary rept.

Pages:117 Page(s)

Report Number: XB - NRL *(XB)*

Monitor Series: NRL

Contract/Grant/Transfer Number: N00014-02-D-0479 *(N0001402D0479)*

FOIA UL Display

Distribution/Classification

Distribution Code:16 - DOD AND THEIR CONTRACTORS , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to DoD and DoD contractors only; Critical Technology; 01 NOV 2012. Other requests shall be referred to Air Force Research Lab., Attn: AFRL/RVBXR, 3550 Aberdeen Ave. SE, Kirtland AFB, NM 87117-5776. This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) Radiation Belt Remediation Model Development and Validation

PDF URL: (pdf) - 4 MB -

Accession Number: ADB392211

Personal Author(s): Quinn, Richard A ; Ascani, Dean ; Ashton, Peter C ; Bonito, Nelson A ; Drummond, Brandon W ; Ford, Matt ; Griffin, James ; Khagashvili, Edisher ; Krastev, Plamen I ; Liang, Pan

Corporate Author: ATMOSPHERIC AND ENVIRONMENTAL RESEARCH INC LEXINGTON MA

Report Date: 01 Nov 2012

Descriptive Note: Final rept. 27 Jun 2005-30 Sep 2012

Pages:249 Page(s)

Report Number: X0014 *(X0014)* , AFRL-RV-PS - TR-2012-0236 AFRL-RV-PS *(AFRLRVPSTR20120236 AFRLRVPS)* , XC - TR-2012-0236 AFRL-RV-PS *(XCTR20120236 AFRLRVPS)*

Monitor Series: TR-2012-0236 *(TR20120236)* , AFRL-RV-PS *(AFRLRVPS)*

Contract/Grant/Transfer Number: FA8718-05-C-0036 *(FA871805C0036)*

FOIA UL Display

Distribution/Classification

Distribution Code:02 - U.S. GOVT. AND THEIR CONTRACTORS , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to U.S. Gov't. agencies and their contractors; Specific Auth'ty; Sep 18, 1998. Other requests referred to Phillips Lab., Attn: GPSI, 29 Randolph Rd., Hanscom AFB, MA 01731-3010., This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) Proceedings of the Longwave Electromagnetic Imaging of Underground Structures Workshop, 6-7 May 1997

PDF URL: (pdf) - 23 MB -

Accession Number: ADB235216

Personal Author(s): Battis, James C ; Banacos, Suzanne M

Corporate Author: PHILLIPS LAB HANSCOM AFB MA

Report Date: 25 Sep 1997

Descriptive Note: Scientific rept. 6-7 May 97

Pages:419 Page(s)

Report Number: PL-TR-97-2122 *(PLTR972122)* , XC - PL* *(XCPL)*

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FOIA UL Display

Distribution/Classification

Distribution Code:02 - U.S. GOVT. AND THEIR CONTRACTORS , 57 - EXPORT CONTROL

Distribution Statement:Distribution authorized to U.S. Gov't. agencies and their contractors; Critical Technology; 30 JUN 2011. Other requests shall be referred to Air Force Research Laboratory, ATTN: AFRL/RVBX, 3550 Aberdeen Avenue SE, Kirtland AFB, NM 87117-5776. This document contains export-controlled technical data.

Report Classification: Unclassified

Collection: Technical Reports

EXPORT CONTROL

Title: (U) Fusion of Multiple Measurements of Ionospheric Disturbances for Robust Now-Casting and Predictive Modeling

PDF URL: (pdf) - 3 MB -

Accession Number: ADB372729

Personal Author(s): Quinn, Richard A ; Alcala, C ; Ashton, Peter C ; Bonito, Nelson A ; Bridgwood, C ; Carrano, Charles S ; Caton, R ; Courtney, E ; DeBenedictis, D ; Dery, M

Corporate Author: ATMOSPHERIC AND ENVIRONMENTAL RESEARCH INC LEXINGTON MA

Report Date: 30 Jun 2011

Descriptive Note: Final rept. 4 Apr 2006-4 Apr 2011

Pages:173 Page(s)

Report Number: X0011 *(X0011)* , AFRL-RV-PS - TR-2011-0126 AFRL-RV-PS *(AFRLRVPSTR20110126 AFRLRVPS)* , XC - TR-2011-0126 AFRL-RV-PS *(XCTR20110126 AFRLRVPS)*

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Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED

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Report Classification: Unclassified

Collection: Technical Reports

Title: (U) HAARP, IRI Refrigerated Steel Pile Installation and Exclusion Fence

PDF URL: (pdf) - 4 MB -

Accession Number: ADB306526

Corporate Author: BAE SYSTEMS ADVANCED TECHNOLOGIES INC WASHINGTON DC

Report Date: 30 Jun 2004

Pages:95 Page(s)

Report Number: XB - NRL *(XB)*

Monitor Series: NRL

Contract/Grant/Transfer Number: N00014-02-D-0479 *(N0001402D0479)*

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Collection: TEMS

Title: United States Army (usarnorth) North Provost Marshal Office (pmo) Law Enforcement Intelligence Branch (leib) Weekly Criminal Terrorist Threat Awareness Report

PDF URL:

Accession Number: SURVIAC-1954019

IAC Report Name:Ready for COR *ReadyforCOR*

Personal Author(s): Provost, Michael; Evans, Randall; Wells, Jeffrey;

Performing Organization:SURVIAC

Date of Publication:26 Jan 2011

Pages:27 Page(s)

Site:SURVIAC

Contract / Grant ID:SP0700-03-D-1380 *SP070003D1380*

Report ID - Performing Org.:SURVIAC-TR-11-1755 *SURVIACTR111755*

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Distribution/Classification

Distribution Code:03 - U.S. GOVT. ONLY; DOD CONTROLLED

Distribution Statement:Distribution authorized to U.S. Gov't. agencies only; Administrative/Operational Use; Sep 2003. Other requests shall be referred to Naval Research Lab., ATTN: Code 5550, 4555 Overlook Ave., SW, Washington, DC 20375.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) HAARP Power House Expansion

PDF URL: (pdf) - 9 MB -

Accession Number: ADB306527

Corporate Author: ADVANCED POWER TECHNOLOGIES INC WASHINGTON DC

Report Date: 26 Sep 2003

Pages:233 Page(s)

Report Number: KLY-2005-H0026 *(KLY2005H0026)* , XB - NRL *(XB)*

Monitor Series: NRL

Contract/Grant/Transfer Number: N00014-02-D-0479 *(N0001402D0479)*

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Secondary Dist:Distribution Statement F - Further dissemination only as directed by USARNORTH PMO/LEIB 1400 East Grayson Street, Fort Sam Houston, TX 78234 (January 26, 2011) or higher DoD authority.

Export Control:No

For Pay:No

Copyrighted - No Govt Rights:No

Classification:Unclassified

Collection: TEMS

Title: Weekly Criminal And Terrorist Threat Awareness Report Samples

PDF URL:

Accession Number: SURVIAC-1954352

IAC Report Name:Ready for COR *ReadyforCOR*

Personal Author(s): Provost,Michael; Evans,Randall; Wells,Jeffrey; Garcia,Benny; Akers,Gaylon; Ludwig,Robert; Rodriguez,Christopher; Nielsen,Bernie;

Performing Organization:SURVIAC

Date of Publication:26 Jan 2011

Pages:39 Page(s)

Site:SURVIAC

Contract / Grant ID:SP0700-03-D-1380 *SP070003D1380*

Report ID - Performing Org.:SURVIAC-TR-11-2540 *SURVIACTR112540*

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Distribution Code:04 - DOD ONLY; DOD CONTROLLED

Distribution Statement:Distribution authorized to DoD only; Foreign Gov't. Info.; 12 Jul 1995. Other requests shall be referred to Embassy of France, Office of Defense Cooperation Attache, 4101 Reservoir Rd., N.W., Washington, DC 20007.

Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Environnement et Defense (Environment and Defense)

PDF URL: (pdf) - 4 MB -

Accession Number: ADB283458

Personal Author(s): Bonnefoi, S ; Dron, D ; Schmitt, M ; Gaunet, F ; Guillaude, E

Corporate Author: CENTRE DE DOCUMENTATION DE L'ARMEMENT PARIS (FRANCE)

Report Date: Mar 2000

Pages:35 Page(s)

Report Number: CEDOCAR-C-01-F00723 *(CEDOCARC01F00723)* , X5 - CEDOCAR *(X5)*

Monitor Series: CEDOCAR

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Report Classification: Unclassified

Collection: Technical Reports

Title: (U) Environment and Defense(environment et defense)

PDF URL: (pdf) - 4 MB -

Accession Number: ADB265441

Corporate Author: CENTRE DE DOCUMENTATION DE L'ARMEMENT PARIS (FRANCE)

Report Date: Mar 2000

Pages:35 Page(s)

Report Number: X5 - X5 *(X5)*

Monitor Series: X5

Highest Classification: Unclassified