USNC–URSI National Radio Science Meeting

4-7 January 2018

Boulder, Colorado, USA

Sponsored by the US National Committee for the
International Union of Radio Science
and CU Conference Services,

University of Colorado Boulder

www.nrsmboulder.org
# 2018 USNC-URSI National Radio Science Meeting

## Meeting Overview: Technical Program and Commission Business Meetings

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<td>G2 - New RF Data Networks for Global Space Plasma Imaging</td>
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<td>A4 - Random and Complex Media</td>
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<td>B9 - Advanced in Computational Electromagnetics on Modern Computers</td>
<td>H5 - Waves and Turbulence in Space and Laboratory Plasma II</td>
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### Reception
- Reception for all Attendees in Engineering Center Lobby from 18:30 to 21:00

### Plenary Session (Math 100):
- Meeting Highlight Plenary Talks: (1) The Wonderful World of Waves in the Near Earth Environment; (2) Radio Navigation Systems - New Challenges and Opportunities
- January 5
- 08:20-12:00

**Friday 5 January 13:20-17:00**
- K3 - Imaging and Monitoring in Medical Applications
- CDE1 - Spectrum Issues, Developments, and Solutions
- B10 - Nonmagnetic and Nonreciprocal Devices
- B11 - Numerical Methods
- B12 - Microwave and Printed Devices and Antennas
- B13 - Electromagnetic Materials and Devices
- B14 - Antennas for Specialized Platforms, Small Satellites, UAVs, and UAVs
- B15 - Antenna Arrays for Specialized Platforms, Small Satellites, UAVs, and UAVs
- B20 - Millimeter-Wave and 5G Antennas and Systems
- B21 - Antenna Arrays

### Lunch
- Lunch Provided for All Students, USNC Officers and Commission Chairs (Atrium at Koelbel - Business School)

### Saturday 6 January 08:20-12:00
- B16 - Microwave and Printed Devices and Antennas
- B17 - Millimeter-Wave and 5G Antennas and Systems
- B18 - Guided Waves and Wavepropagation

### Saturday 6 January 13:20-17:00
- B19 - Antenna Development using Additive Manufacturing
- B22 - Microwave and Printed Devices and Antennas
- B23 - Millimeter-Wave and 5G Antennas and Systems
- B24 - Guided Waves and Wavepropagation

### Special Event: Fifth Hans Liebe Lecture (Math 100)
- J1 - New Telescopes, Techniques and Technology I
- J2 - New Telescopes, Techniques and Technology II
- J3 - ALMA 2030
- J4 - The VLBA at 25: Recent Accomplishments and Future Directions
- J6 - Spectral Line Cosmology and Low-Frequency Arrays
- B15 - Antenna Arrays
International Union of Radio Science / Union Radio Scientifique Internationale

Founded in 1919, the International Union of Radio Science (URSI) coordinates studies, research, applications, scientific exchange, and communication in all fields of radio science from telecommunications and radio astronomy to medicine (www.ursi.org).

Both URSI and the U.S. National Committee (USNC) of URSI are organized into ten commissions:

- Electromagnetic Metrology (Commission A)
- Fields and Waves (Commission B)
- Radiocommunication Systems and Signal Processing (Commission C)
- Electronics and Photonics (Commission D)
- Electromagnetic Environment and Interference (Commission E)
- Wave Propagation and Remote Sensing (Commission F)
- Ionospheric Radio and Propagation (Commission G)
- Waves in Plasmas (Commission H)
- Radio Astronomy (Commission J)
- Electromagnetics in Biology and Medicine (Commission K)

About the USNC-URSI

The U.S. National Committee for URSI (USNC-URSI) is appointed by the National Academies of Sciences, Engineering, and Medicine, and represents U.S. radio scientists in URSI. It encourages studies in radio science, provides a forum for the dissemination of research findings, and provides an organizational infrastructure for the radio science community in the United States.

The USNC-URSI hosts the National Radio Science Meeting (NRSM) each January in Boulder, Colorado. This meeting is technically co-sponsored by the Antennas and Propagation Society of the Institute of Electrical and Electronics Engineers (IEEE/AP-S). The IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting (RSM), co-sponsored by the IEEE/AP-S and USNC-URSI, is held each summer. Every five to eight years, a North American Radio Science Meeting (NARSM) is organized, co-sponsored by the U.S. and Canadian National Committees for URSI. The last NARSM was held in Vancouver, British Columbia, Canada on July 19-25, 2015.

The international URSI General Assembly and Scientific Symposium is held every three years in locations around the world. The 32nd URSI General Assembly and Scientific Symposium was held in Montreal, Quebec, Canada, on August 19-26, 2017. Over 1300 papers were presented by authors from over 50 countries in technical sessions covering the areas of all ten URSI Commissions. The 33rd URSI General Assembly and Scientific Symposium will be held in Rome, Italy, on August 29 - Sept. 5, 2020.

In addition to the General Assembly and Scientific Symposium, URSI holds two other flagship meetings every three years, the AT-RASC meeting and the AP-RASC meeting. The next AT-RASC meeting will be held May 28 - June 1, 2018 at the ExpoMeloneras Convention Center, Gran Canaria, Spain (www.at-rasc.org). The next AP-RASC meeting will be held March 5-9, 2019 at the India Habitat Centre, New Delhi, India (www.aprasc2019.com).

For further information on USNC-URSI please visit www.usnc-ursi.org.

U.S. National Committee Leadership and Commission Chairs (2018-2020)

(In addition to the individuals listed below, the USNC-URSI includes Members at Large, Society Representatives, and scientists serving in executive roles in international URSI.)

Sembiam Rengarajan
USNC Chair
Professor, Electrical and Computer Engineering, California State University, Northridge
E-mail: srengarajan@csun.edu

Michael H. Newkirk
USNC Secretary and Chair-Elect
Principal Professional Staff, The Johns Hopkins University - Applied Physics Laboratory
E-mail: Michael.Newkirk@jhuapl.edu

David R. Jackson
USNC Immediate Past Chair
Professor, Electrical and Computer Engineering, University of Houston
E-mail: djackson@uh.edu

Gary S. Brown
USNC Accounts Manager
Bradley Distinguished Professor of Electromagnetics, Virginia Polytechnic Institute and State University
E-mail: randem@vt.edu
Authors have the option to have summaries archived in IEEE Xplore (subject to standard IEEE processing) through the technical co-sponsorship of the meeting by the IEEE Antennas and Propagation Society (IEEE/AP-S).
ROOM AND TIME SCHEDULE FOR SESSIONS

WEDNESDAY, 3 January 2018
USNC-URSI Business Meeting
17:00 – 21:00, Marriott Hotel  

THURSDAY, 4 January 2018
MORNING SESSIONS
Session A1 08:20, Room 105  4
Session A2 10:20, Room 105  4
Session B1 08:20, Room 1B40  4
Session B2 10:20, Room 200  5
Session F1 08:20, Room 135  6
Session F2 08:20, Room 155  6
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Session GH1 08:20, Room 151  7
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Session J1 08:20, Room 265  9
Session K1 10:20, Room 150 10

AFTERNOON SESSIONS
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Commission A 18:00, Room 105 18
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Commission J 18:00, Room 265 18

RECEPTION
18:30-21:00, Engineering Center Lobby  18
(Beer and wine provided. Must have government issued ID and conference badge.)

FRIDAY, 5 January 2018
MORNING PLENARY SESSION
Student Paper Competition
08:20, Mathematics Auditorium (Math 100)  19

Meeting Highlight Plenary Talks
10:00, Mathematics Auditorium (Math 100) 19
12:00 Lunch for all Students, USNC Officers and Commission Chairs
Atrium of Koelbel - Business School 19

AFTERNOON SESSIONS
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SUNDAY, 7 January 2018
USNC-URSI Executive Council Meeting
08:00–11:00, Marriott Hotel  39
National Radio Science Meeting
4-6 January 2018
University of Colorado Boulder
Sponsored by USNC-URSI

WEDNESDAY EVENING, 3 January 2018
17:00 – 21:00 USNC-URSI Business Meeting, Marriott Hotel

THURSDAY MORNING, 4 January 2018

Session A1: Antennas
Room 105

08:20 A1-1
A WIDEBAND, BOW-TIE YAGI ANTENNA
Md Rakibul Islam*, Sungkyun Lim
Electrical Engineering, Georgia Southern University, Statesboro, GA

08:40 A1-2
PLANAR UWB MONOPOLE WITH IMPROVED PATTERN SHAPE
Seth A. McCormick*
ARL, Adelphi, MD

09:00 A1-3
A WIDEBAND TIGHTLY COUPLED DIPOLE ARRAY WITH NOVEL DIFFERENTIAL FEEDING NETWORK
Alexander D. Johnson*, Elias A. Alwan¹, John L. Volakis²
¹Florida International University, Miami, FL
²The Ohio State University, Columbus, OH

09:20 A1-4
RECONFIGURABLE INTRA-CHIP ANTENNA FOR FUTURE WIRELESS COMMUNICATIONS
Yashika Sharma*, Junqiang Wu¹, Adnan Kantemur¹, Jinpi Tak¹, Avinash Kodi¹, Savas Kaya¹, Ahmed Louri¹, Hao Xin¹
¹Electrical and Computer Engineering, University of Arizona, Tucson, AZ
²Electrical Engineering and Computer Science, Ohio University, Athens, OH
³Electrical and Computer Engineering, George Washington University, Washington, DC

Session A2: Calibration Techniques
Room 105
Session Co-Chairs: Jeanne Quimby, NIST; Mitchell Gregory, US Army Research Lab

10:20 A2-1
LIMITATIONS OF ELECTRIC FIELD PROBES AND SENSORS: UPDATING CURRENT CALIBRATION METHODS
Ryan T. Jacobs*, Ryan Gillespie, Jason B. Coder, Daniel G. Kuester
Shared Spectrum Metrology, National Institute of Standards and Technology, Boulder, CO

10:40 A2-2
DIGITAL ARRAY PLANAR NEAR-FIELD CALIBRATION USING ELEMENT PLANE WAVE SPECTRA WITH ITERATIVE SEARCH
Nicholas Host*, Kenneth O’Haver
Johns Hopkins University - Applied Physics Laboratory, Laurel, MD

11:00 A2-3
AN AUTOMATIC MEASUREMENT SYSTEM OF ANTENNA PHASE CENTER USING THE BINARY SEARCH ALGORITHM
Yuzo Tamaki*, Takehiko Kobayashi¹, Atsushi Tomiki²
¹Wireless Systems Laboratory, Tokyo Denki University, Adachi-ku, Tokyo, JAPAN
²Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, Sagamihara, Kanagawa, JAPAN

11:20 A2-4
MICROSTRIP CIRCULATOR BANDWIDTH INVESTIGATION
Laila Marzall*, Mauricio Pinto, Andrea Ashley, Dimitra Psychogiou, Zoya Popovic
Electrical Engineering, University of Colorado - Boulder, Boulder, CO

11:40 A2-5
PLASMA CELL LOADED TRANSMISSION LINE TECHNOLOGIES FOR BROADBAND APPLICATIONS
Zach J. Vander Missen*, Abbas Semnani, Dimitrios Peroulis
Electrical and Computer Engineering, Purdue University, West Lafayette, IN

Session B1: Adv. Theory & Applications of Metamaterials
(Special Session)
Room 1B40
Session Co-Chairs: Filippo Capolino, University of California, Irvine; John Volakis, Florida International University

08:20 B1-1
A HUYGENS’ METASURFACE LENS FOR ENHANCING THE GAIN OF FREQUENCY-SCANNED SLOTTED WAVEGUIDE ANTENNAS
Michael Chen*, Ariel Epstein², George V. Eleftheriades¹
¹The Edward S. Rogers Electrical and Computer Engineering, University of Toronto, Toronto, ON, CANADA
²Andrew and Erna Viterbi Faculty of Electrical Engineering, Technion - Israel Institute of Technology, Haifa, ISRAEL
08:40 B1-2
CIRCUIT MODELING OF NANOANTENNA ENABLED DETECTORS
Salvatore Campione*, Larry K. Warne, Michael B. Sinclair, Michael D. Goldflam, David W. Peters
Sandia National Laboratories, Albuquerque NM

09:00 B1-3
GRADIENT METASURFACES AS PERFECT POLARIZATION TRANSFORMER
Hamidreza Kazemi Varnamkhasti *, Mohammad Albooyeh, Filippo Capolino
Electrical Engineering and Computer Science, University of California Irvine, Irvine, CA

09:20 B1-4
ANISOTROPIC METASCREEN: COUPLING BETWEEN TE AND TM MODES
Christopher L. Holloway *, Edward F. Kuester
1 NIST, Boulder, CO
2 University of Colorado, Boulder, CO

09:40 B1-5
ASTERISK-SHAPED-APERTURE ARRAY OPTICAL METASURFACES AT TELECOMMUNICATIONS WAVELENGTHS
Mitchell Semple *, Aaron C. Hryciw1, Ashwin K. Iyer2
1 Electrical and Computer Engineering, University of Alberta, Edmonton, AB, CANADA
2 NanoFAB facility, University of Alberta, Edmonton, AB, CANADA

10:00 Break

10:20 B1-6
USING COMPLEX FREQUENCY-PLANE BRANCH POINTS TO IDENTIFY EXCEPTIONAL POINTS OF DEGENERACY IN PARITY-TIME SYMMETRIC SYSTEMS
George W. Hanson *, Alexander B. Yakovlev1, Alexander Holmes1
1 Electrical Engineering, University of Wisconsin Milwaukee, Milwaukee, WI
2 Electrical Engineering, University of Mississippi, University, MS

10:40 B1-7
PARITY-TIME SYMMETRIC WAVE TUNNELING AND TELEPORTATION USING DISPERSIVE NEGATIVE IMPEDANCE CONVERTERS
Zhicheng Xiao *, Younes Ra’di, Andrea Alu
Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX

11:00 B1-8
TOPOLOGICALLY-PROTECTED LEAKY-WAVE STRUCTURES
Ali Hassani *, Francesco Monticone
Cornell University, Ithaca, NY

11:20 B1-9
UNIVERSAL NEAR-FIELD SPIN PROPERTIES OF POLARIZED AND CHIRAL DIPOLES
Farid Kalhors *, Zubin Jacob
Electrical and Computer Engineering, Purdue University, West Lafayette, IN
Session B2: Scattering
Room 200
Session Co-Chairs: Danilo Erricolo, University of Illinois at Chicago; Marco Poort, University of Illinois at Chicago

10:20 B2-1
ULTIMATE INTRINSIC SIGNAL-TO-NOISE RATIO OF MRI SURFACE COILS FOR A LOSSY DIELECTRIC ELLIPTICAL CYLINDER MODEL
Yangqing Liu *, Danilo Erricolo
Electrical and Computer Engineering, University of Illinois at Chicago, Chicago, IL

10:40 B2-2
SCATTERING BY A HEMISPHERE ON A METALLIC PLATE
Sahitya Singh, Marco D. Poort *, Piergiorgio L. E. Uslenghi
University of Illinois at Chicago, Chicago, Illinois

11:00 B2-3
FULL WAVE ANALYSIS OF TWO-DIMENSIONAL PERIODIC ARRAY OF DIELECTRIC-FILLED RECTANGULAR WINDOWS
Marco D. Poort *
Electrical and Computer Engineering, University of Illinois at Chicago, Chicago, IL

11:20 B2-4
LOW POWER REFLECTION AMPLIFIER USING EXTRACTED S-PARAMETER OF TUNNEL DIODE IN RFID APPLICATION
Pejman Rais *, Farhad Farzami, Seiran Khaledian, Omid Manoochehri, Danilo Erricolo
Electrical and Computer Engineering, University of Illinois at Chicago, Chicago, IL

11:40 B2-5
ELECTROMAGNETIC SCATTERING BY SEVERAL 2-D SINGLE BIOLOGICAL CELL MODELS
Polat Goktas *, Ilya O. Sukharevsky1, Ayhan Altintas2
1 Wellman Center for Photomedicine, Massachusetts General Hospital, Harvard Medical School, Boston, MA
2 Bilkent University, Ankara, TURKEY
3 Technical University of Munich, Munchen, GERMANY
Session F1: Surface and Sub-Surface Sensing
Room 135
Session Co-Chairs: Leung Tsang, University of Michigan; Jiefu Chen, University of Houston
08:20  F1-1  
THE ULTRA-WIDEBAND SOFTWARE-DEFINED RADIOMETER (UWBRAD) FOR ICE SHEET INTERNAL TEMPERATURE SENSING: RESULTS FROM THE SEPTEMBER 2017 CAMPAIGN  
Mark J. Andrews*,1 A., Alexandra Bringer1, Joel T. Johnson1, Kenneth C. Jezek1, Domenic Belgiovane1, Julie Miller2, Michael Durand2, Caglar Yardim1, Chi-Chih Chen1, Leung Tsang1, Shurun Tan1, Mohammedreza Samazadeh3, Vladimir Leuski1, Giovanni Macelloni1, Marco Brogioni1  
1ElectroScience Laboratory, The Ohio State University, Columbus, OH  
2Byrd Polar Research Center, The Ohio State University, Columbus, OH  
3University of Michigan, Ann Arbor, MI  
4Microwave Radiometers and Antennas, Inc., Louisville, CO  
5Institute of Applied Physics, Florence, ITALY  

08:40  F1-2  
LARGE AREA OBSERVATIONS OF THE OCEAN SURFACE WITH HF RADAR SCATTER TO SATELLITE AND AIRBORNE RECEIVERS  
Paul A. Bernhardt*,1 Carl L. Siefring1, Stan J. Briczinski1, Mike McCarrick2, Andrew Howard3, Gordon James3, Andrew Yau4, William Bristow4  
1Plasma Physics, NRL, Washington, DC  
2Information Technology, NRL, Washington, DC  
3Physics and Astronomy, University of Calgary, Calgary, Alberta, CANADA  
4Physics, University of Alaska, Fairbanks, AK  

09:00  F1-3  
EXPERIMENTAL VALIDATION OF AN ENDFIRE SAR AMBIGUITY FUNCTION  
Omkar Pradhan*, Albin J. Gasiewski  
University of Colorado, Boulder, CO  

09:20  F1-4  
SURFACE CHARACTERIZATION UNCERTAINTY QUANTIFICATION: MONTE CARLO WITH COLLOCATION METHOD AND BAYESIAN INFERENC METHOD  
Quyuan Shen1,2, Zhu Han, Jiefu Chen  
Electrical and Computer Engineering, University of Houston, Houston, TX  

09:40  F1-5  
MCMC FOR LARGE-SCALE GEOSTEERING INVERSION WITH A SCALABLE MPI IMPLEMENTATION  
Han Lu1, Quyuan Shen1, Xuqing Wu1, Jiefu Chen1, Xin Fu1  
1Electrical and Computer Engineering, University of Houston, Houston, TX  
2Information and Logistics Technology, University of Houston, Houston, TX  

Session F2: Atmospheric and Precipitation Sensing  
Room 155  
Session Co-Chairs: Chandrasekar V Chandra, Colorado State University; Kamal Sarabandi, University of Michigan  

08:20  F2-1  
PASSIVE INFRARED RETREIVAL OF TROPOSPHERIC REFRACTIVITY, TEMPERATURE, AND WATER VAPOR PROFILES  
Fredrick S. Solheim*  
Dakota Ridge R & D, Boulder, CO  

08:40  F2-2  
ANALYSIS OF RAIN EFFECT ON WIND RETRIEVALS FROM PASSIVE SATELLITE MICROWAVE RADIOMETERS  
Hamideh Ebrahimi*  
University of Florida, Gainesville, FL  

09:00  F2-3  
ESTIMATION OF BACKGROUND ERROR COVARIANCE MATRIX FOR PRECIPITATION LOCKING FROM PASSIVE MICROWAVE SATELLITE  
Jieying He1,2 Albin J. Gasiewski1, Kun Zhang1  
1Center for Environmental Technology (CET), University of Colorado Boulder, Boulder, CO  
2Key Laboratory of Microwave Remote Sensing, National Space Science Center, Chinese Academy of Sciences, Beijing, CHINA  

09:20  F2-4  
USING GROUND-BASED RADAR OBSERVATIONS TO ESTIMATE PRECIPITATION VARIABILITY ACROSS GPM SATELLITE RADAR FIELD-OF-VIEWS  
Christopher R. Williams*, Walter Petersen2, David Wolff3, V. Chandrasekar4  
1University of Colorado Boulder, Boulder, CO  
2NASA Marshall Space Flight Center, Huntsville, AL  
3NASA Wallops Space Flight Center, Wallops Island, VA  
4Colorado State University, Fort Collins, CO  

09:40  F2-5  
AN ACTIVE SONDE FOR LOCAL REMOTE SENSING OF CLOUD AND PRECIPITATION DYNAMICS  
Soumjoit Bose*, Albin J. Gasiewski  
NOAA-CU Center for Environmental Technology, University of Colorado, Boulder, CO  

10:00  Break  

10:20  F2-6  
NOWCASTING OF AN X-BAND DUAL-POLARIZATION RADAR DURING SOUTHERN CHINA MONSOON RAINFALL FIELD CAMPAIGN  
Zhao Shi1,2 V. Chandrasekar1, Jianxin He1,2, Lijuan Wang1,2  
1Chengdu University of Information Technology, Chengdu, SC, CHINA  
2Key Laboratory of Atmosphere Sounding, CMA, Chengdu, SC, CHINA  
3Colorado State University, Fort Collins, CO  

10:40  F2-7  
NEURAL NETWORK RAINFALL ESTIMATION BASED ON GPM DUAL-FREQUENCY PRECIPITATION RADAR MEASUREMENTS  
Haming Tan*, V. Chandrasekar, Haonan Chen  
Colorado State University, Fort Collins, CO  

Session F2: Atmospheric and Precipitation Sensing  
Room 155  
Session Co-Chairs: Chandrasekar V Chandra, Colorado State University; Kamal Sarabandi, University of Michigan  

08:20  F2-1  
PASSIVE INFRARED RETREIVAL OF TROPOSPHERIC REFRACTIVITY, TEMPERATURE, AND WATER VAPOR PROFILES  
Fredrick S. Solheim*  
Dakota Ridge R & D, Boulder, CO  

08:40  F2-2  
ANALYSIS OF RAIN EFFECT ON WIND RETRIEVALS FROM PASSIVE SATELLITE MICROWAVE RADIOMETERS  
Hamideh Ebrahimi*  
University of Florida, Gainesville, FL  

09:00  F2-3  
ESTIMATION OF BACKGROUND ERROR COVARIANCE MATRIX FOR PRECIPITATION LOCKING FROM PASSIVE MICROWAVE SATELLITE  
Jieying He1,2 Albin J. Gasiewski1, Kun Zhang1  
1Center for Environmental Technology (CET), University of Colorado Boulder, Boulder, CO  
2Key Laboratory of Microwave Remote Sensing, National Space Science Center, Chinese Academy of Sciences, Beijing, CHINA  

09:20  F2-4  
USING GROUND-BASED RADAR OBSERVATIONS TO ESTIMATE PRECIPITATION VARIABILITY ACROSS GPM SATELLITE RADAR FIELD-OF-VIEWS  
Christopher R. Williams*, Walter Petersen2, David Wolff3, V. Chandrasekar4  
1University of Colorado Boulder, Boulder, CO  
2NASA Marshall Space Flight Center, Huntsville, AL  
3NASA Wallops Space Flight Center, Wallops Island, VA  
4Colorado State University, Fort Collins, CO  

09:40  F2-5  
AN ACTIVE SONDE FOR LOCAL REMOTE SENSING OF CLOUD AND PRECIPITATION DYNAMICS  
Soumjoit Bose*, Albin J. Gasiewski  
NOAA-CU Center for Environmental Technology, University of Colorado, Boulder, CO  

10:00  Break  

10:20  F2-6  
NOWCASTING OF AN X-BAND DUAL-POLARIZATION RADAR DURING SOUTHERN CHINA MONSOON RAINFALL FIELD CAMPAIGN  
Zhao Shi1,2 V. Chandrasekar1, Jianxin He1,2, Lijuan Wang1,2  
1Chengdu University of Information Technology, Chengdu, SC, CHINA  
2Key Laboratory of Atmosphere Sounding, CMA, Chengdu, SC, CHINA  
3Colorado State University, Fort Collins, CO  

10:40  F2-7  
NEURAL NETWORK RAINFALL ESTIMATION BASED ON GPM DUAL-FREQUENCY PRECIPITATION RADAR MEASUREMENTS  
Haming Tan*, V. Chandrasekar, Haonan Chen  
Colorado State University, Fort Collins, CO
11:00  F2-8
EVALUATION OF A KU-BAND RADAR HYDROMETEOR CLASSIFIER BY COMPARISON WITH S-BAND RADAR AND AIRCRAFT DATA
Haonan Chen*, V. Chandrasekar
Colorado State University, Fort Collins, CO

11:20  F2-9
3D SHAPE RECONSTRUCTION OF WINTER PRECIPITATION PARTICLES BASED ON MULTI-ANGLE IMAGES OBTAINED BY TWO ADVANCED OPTICAL DISRDOMETERS
Adam C. Hicks*, Marcus Benzel, V.N. Bringi, Branislav Notaros
Electrical and Computer Engineering, Colorado State University, Fort Collins, CO

11:40  F2-10
SIMULATIONS OF MULTI-STREAM POLARIMETRIC MICROWAVE RADIANCE USING THE UMRT MODEL BASED ON DDSCAT NONSpherical HYDROMETEOR DATABASE
Kun Zhang*, Albin J. Gasiewski
ECEE, University of Colorado Boulder, Boulder, CO

Session F3: Soil Moisture and Land Cover Sensing
Room 135
Session Co-Chairs: Mehmet Kurum, Mississippi State University; Roger Lang, George Washington University

10:20  F3-1
COULD GNSS-REFLECTOMETRY SENSE CORN GROWTH STAGES?
Orhan Eroglu*, Mehmet Kurum
Electrical and Computer Engineering, Mississippi State University, Mississippi State, MS

10:40  F3-2
A SUPERVISED MACHINE LEARNING APPROACH FOR THE INVERSION PROCESS TO RETRIEVE SOIL MOISTURE
Himangi Srivastava*, Mehmet Kurum
Electrical and Computer Engineering, Mississippi State University, Mississippi State, MS

11:00  F3-3
L-BAND HIGH SPATIAL RESOLUTION SOIL MOISTURE MAPPING USING SMALL UNMANNED AERIAL SYSTEMS
Eryan Dai¹, Aravind Venkitasubramony*¹, Albin J. Gasiewski¹, Maciej Stachura², Jack Elston²
¹ECEE, University of Colorado Boulder, Boulder, CO
²Black Swift Technologies (BST) LLC, Boulder, CO

11:20  F3-4
QUANTIFYING COLLABORATION IN THE EARTH SCIENCES AS A RESULT OF THE EARTHCUBE PROJECT
Ryan Goosh*¹, V Chandrasekar¹, Simon Goring²
¹Colorado State University, Fort Collins, CO
²University of Wisconsin, Madison, WI
11:00 GH1-8
AMBIPOLAR ELECTRIC FIELD AND DIFFUSIVE COLDING OF ELECTRONS IN METEOR TRAILS
Victor P. Pasko*, Michael C. Kelley1
1Penn State University, University Park, PA

11:20 GH1-9
DEVELOPMENT OF AN ALL-SKY METEOR TRAIL INPUT FUNCTION
Freddy Galindo, Julio Urbina*
Electrical Engineering, Penn State University, University Park, PA

Session H1: Physics of the Radiation Belts I
(Special Session)
Room 245
Session Co-Chairs: Christopher Crabtree, Naval Research Laboratory;
Craig Kletzing, University of Iowa

08:20 H1-1
SYSTEMATIC EVALUATION OF LOW-FREQUENCY PLASMASPHERIC HISS WAVE GENERATION AND ITS EFFECTS ON RADIATION BELT ELECTRON DYNAMICS
Wen Li*, Run Shi1, Qianli Ma2
1Boston University, Boston, MA
2University of California, Los Angeles, Los Angeles, CA

08:40 H1-2
STATISTICAL PROPERTIES OF PLASMASPHERIC HISS FROM VAN ALLEN PROBES
David P. Hartley*, Craig A. Kletzing1, Ondrej Santolik2,3,
Lunjin Chen4, Richard B. Horne5
1University of Iowa, Iowa City, IA
2Institute of Atmospheric Physics, Prague, CZECH REPUBLIC
3Charles University, Prague, CZECH REPUBLIC
4University of Texas at Dallas, Dallas, TX
5British Antarctic Survey, Cambridge, UNITED KINGDOM

09:00 H1-3
LANDAU DAMPING AND LINEAR GROWTH OF WHISTLER MODE WAVES WITH THE INCLUSION OF FINITE ELECTRON AND ION TEMPERATURE
Ashanthis S. Maxworth*, Mark Golkowski1, David Malaspina2,
Allison Jaynes3
1Electrical Engineering, University of Colorado Denver, Denver, CO
2Laboratory for Atmospheric and Space Physics, University of Colorado Boulder, Boulder, CO

09:20 H1-4
A STATISTICAL ANALYSIS OF CONJUGATE LIGHTNING-INDUCED ELECTRON PRECIPITATION EVENTS
Dooyoung Kim*, Robert C. Moore
Electrical and Computer Engineering, University of Florida, Gainesville, FL

09:40 H1-5
OBSERVATIONS OF LIGHTNING INDUCED WHISTLER TRIGGERED UPPER BAND CHORUS
Poorya Hosseini, Mark Golkowski*
Electrical Engineering, University of Colorado Denver, Denver, CO

10:00 Break

10:20 H1-6
DUCTING OF THE WHISTLER-MODE WAVES BY MAGNETIC FIELD-ALIGNED DENSITY ENHANCEMENTS IN THE MAGNETOSPHERE
Anatoly V. Streltsov*, Miles Bengtson1, Dylan English1,
Maxx Miller1, Logan Turco2
1Space Vehicles Directorate, Air Force Research Laboratory/RVBXC, Albuquerque, NM
2Physical Sciences, Embry-Riddle Aeronautical University, Daytona Beach, FL

09:00 H1-8
NONLINEAR WAVE-PARTICLE AND WAVE-WAVE INTERACTIONS IN THE OUTER RADIATION BELT: PHYSICAL MECHANISMS AND OBSERVATIONAL EFFECTS
Oleksiy Agapitov*, Anton Artemyev1, Ivan Vasko2,
Didier Mourenas1, James Drake3, Forrest S. Mozer3
1Space Science Laboratory, University of California, Berkeley, CA
2University of California, Los Angeles, Los Angeles, CA
3CEA, DAM, DIF, Arpajon, FRANCE

Session H2: Non-Earth Magnetospheres
(Special Session)
Room 1B51
Session Co-Chairs: William Kurth, University of Iowa; George Hospodarsky, University of Iowa

08:20 H2-1
THE INTERPRETATION OF ~1 HZ WAVES IN MERCURY’S MAGNETOSPHERE AS DOPPLER SHIFTED ION BERNSTEIN MODE WAVES?
Scott A. Boardsen*, Daniel J. Gershman1, James M. Raines3,
Eun-Hwa Kim4, James A. Slavin5
1Goddard Planetary and Heliophysics Institute, University of Maryland, Baltimore County, Greenbelt, MD
2Heliophysics, NASA/GSFC, Greenbelt, MD
3Atmospheric, Oceanic and Space Sciences, University of Michigan, Ann Arbor, MI
4Princeton Plasma Physics Laboratory, Princeton University, Princeton, NJ
09:00 H2-3
LIGHTNING HUNT IN VENUS WITH LAC ONBOARD AKATSUKI SPACECRAFT
Yukihiro Takahashi*, Mitsuteru Sato, Masataka Imai
Hokkaido University, Sapporo, JAPAN

09:20 H2-4
IMPACT OF IONOSPHERIC CHEMISTRY IN THE MARTIAN DYNAMO REGION USING MULTI FLUID MHD MODELING
Morgan M. Matheny*, Jeremy Riouset, Heidi K. Nykyri
1Physical Sciences, Embry-Riddle Aeronautical University, Daytona Beach, FL
2Physical Sciences, Florida Institute of Technology, Melbourne, FL

09:40 H2-5
JUNO WAVES INVESTIGATION OBSERVATIONS AT JUPITER
1Physics and Astronomy, University of Iowa, Iowa City, IA
2LESIA, Observatoire de Paris, Meudon, FRANCE
3Upper Atmosphere, Institute of Atmospheric Physics CAS, Prague, CZECH REPUBLIC
4Faculty of Mathematics and Physics, Charles University, Prague, CZECH REPUBLIC
5IRAP, Toulouse, FRANCE
6Southwest Research Institute, San Antonio, TX
7Applied Physics Laboratory Johns Hopkins, Laurel, MD
8NASA Goddard Space Flight Center, Greenbelt, MD
9Space Research Corporation, Annapolis, MD
10Jet Propulsion Laboratory, Pasadena, CA

10:00 Break

10:20 H2-6
PITCH ANGLE SCATTERING OF ENERGETIC ELECTRONS BY WHISTLER-MODE HISS IN THE JOVIAN POLAR CAP REGIONS: OBSERVATIONS FROM THE JUNO SPACECRAFT
Sadie S. Tetrick, Donald A. Gurnett, William S. Kurth, George Clark, Barry H. Mauk, Scott J. Bolton, Jack Connerney, Steven M. Levin
1Physics and Astronomy, University of Iowa, Iowa City, IA
2The Johns Hopkins University Applied Physics Laboratory, Laurel, MD
3Southwest Research Institute, San Antonio, TX
4Goddard Space Flight Center, Greenbelt, MD
5Jet Propulsion Laboratory, Pasadena, CA

10:40 H2-7
JUNO DIRECTION-FINDING MEASUREMENTS OF JUPITER'S NARROWBAND KILOMETRIC RADIATION
Masafumi Imai*, William S. Kurth, George B. Hospodarsky, Scott J. Bolton, John E. P. Connerney, Steven M. Levin
1University of Iowa, Iowa City, IA
2Southwest Research Institute, San Antonio, TX
3NASA Goddard Space Flight Center, Greenbelt, MD
4Jet Propulsion Laboratory, Pasadena, CA

11:00 H2-8
PROPERTIES OF JOVIAN LIGHTNING WHISTLERS DETECTED BY THE JUNO WAVES INSTRUMENT
Ivana Kolmasova, Masafumi Imai, Ondrej Santolik, William S. Kurth, George B. Hospodarsky, Donald A. Gurnett, Scott J. Bolton, John E. P. Connerney
1Institute of Atmospheric Physics CAS, Prague, CZECH REPUBLIC
2Charles University, Prague, CZECH REPUBLIC
3University of Iowa, Iowa City, IA
4Southwest Research Institute, San Antonio, TX
5NASA/Goddard Space Flight Center, Greenbelt, MD

11:20 H2-9
ROTATIONAL MODULATION OF SATURN RADIO EMISSIONS DURING THE CASSINI MISSION
S. Y. Ye*, G. Fischer, W. S. Kurth, J. D. Menietti, D. A. Gurnett
1University of Iowa, Iowa City, IA
2Austrian Academy of Sciences, Graz, AUSTRIA

11:40 H2-10
CASSINI GRAND FINALE: NEW INSIGHTS ON THE SOURCE OF SATURN KILOMETRIC RADIATION
Laurent Lamy, Philippe Zarka, Baptiste Cecconi, William S. Kurth, George B. Hospodarsky, Michiko Morooka, Jan-Erik Wahlund
1LESIA, Observatoire de Paris, Meudon, FRANCE
2University of Iowa, Iowa City, IA
3IRF-U, Upsala, SWEDEN

Session J1: New Telescopes, Techniques and Technology I
(Special Session)
Room 265

Session Co-Chairs: Daniel C. Jacobs, Arizona State University; David DeBoer, University of California

08:20 J1-1
THE SCIENCE PROGRAM FOR THE NEXT GENERATION VERY LARGE ARRAY
Chris Carilli*, Eric Murphy, Rob Selina
NRAO, Socorro, NM

08:40 J1-2
ANTENNA CONCEPT FOR THE NEXT GENERATION VERY LARGE ARRAY
James M. Jackson*, Robert Selina, Wes Grammer
National Radio Astronomy Observatory, Socorro, NM
THURSDAY MORNING, continued

09:00 J1-3
SEARCHING FOR COSMIC DAWN FROM THE SUB-ANTARCTIC
Liju Philip*
School of Chemistry and Physics, University of KwaZulu-Natal, Durban, KZN, SOUTH AFRICA

09:20 J1-4
BASELINE RECEIVER CONCEPT FOR A NEXT GENERATION VERY LARGE ARRAY
Wes Grammer*, Silver Sturgis¹, Sivasankaran Srikanth², Rob Selina¹
¹Electronics, NRAO, Socorro, NM
²Central Development Lab, NRAO, Charlottesville, VA

09:40 J1-5
THE BREAKTHROUGH LISTEN SEARCH FOR INTELLIGENT LIFE BEYOND EARTH
Andrew P. V. Siemion*, Steve Croft¹, David DeBoer¹, Emilio Enriquez¹,², Griffin Foster¹,³, Vimal Gajjar¹, Greg Hellbourg¹, Jack Hickish¹, Brian Lacki¹, Matt Lebofsky¹, David MacMahon¹, Danny Price¹, Dan Werthimer¹, Gerry Zhang¹
¹University of California, Berkeley, Berkeley, CA
²Radboud University, Nijmegen, NETHERLANDS
³University of Oxford, Oxford, UNITED KINGDOM

10:00 Break

10:20 J1-6
SEPARATING THE GLOBAL 21-CM SIGNAL FROM STRONG FOREGROUNDS AND INSTRUMENT SYSTEMATICS USING AN SVD/MCMC PIPELINE
Keith Tauscher*, Jack O. Burns¹, David Rapetti¹,², Eric R. Switzer¹
¹Astrophysical and Planetary Sciences, University of Colorado, Boulder, CO
²NASA Ames Research Center, Mountain View, CA
³NASA Goddard Space Flight Center, Greenbelt, MD

10:40 J1-7
A JOINT DECONVOLUTION ALGORITHM TO COMBINE SINGLE DISH AND INTERFEROMETER DATA FOR WIDEBAND MULTI-TERM IMAGING
Urvashi Rau*, Nikhil Naik²
¹National Radio Astronomy Observatory, Socorro, NM
²Indian Institute of Technology, KGP, Kharagpur, West Bengal, INDIA

11:00 J1-8
COMPARING REDUNDANT AND SKY MODEL BASED INTERFEROMETRIC CALIBRATION: A FIRST LOOK WITH PHASE II OF THE MWA
Wenyang Li*
Physics, Brown University, Providence, RI

11:20 J1-9
OPTIMIZING LOW FREQUENCY ARRAY DESIGN
Matthew Kolopanis*, Daniel C. Jacobs
Arizona State University, Tempe, AZ

11:40 J1-10
A RESISTIVE WIDEBAND BEAM-SPLITTER SCREEN
Nivedita Mahesh*, Ravi Subrahmanyan², Uday N. Shankar², Agaram Raghu Nathan²
¹School of Earth & Space Exploration, Arizona State University, Tempe, AZ
²Raman Research Institute, Bangalore, Karnataka, INDIA

Session K1: Implantable and Textile Antennas for Medical Applications
Room 150
Session Co-Chairs: Magda El-Shenawi, University of Arkansas; Erdem Topsakal, Virginia Commonwealth University

10:20 K1-1
IMPLANTABLE ANTENNAS USING BIOCOMPATIBLE TINITE (TIN)
Jon Dyke*, Ryan Green¹, Natalia Izoumskaia¹, Vitaliy Avrutin¹, Umit Ozgur¹, Martin Mangino², Erdem Topsakal¹
¹Electrical and Computer Engineering, Virginia Commonwealth University, Richmond, VA
²Surgery, Virginia Commonwealth University School of Medicine, Richmond, VA

10:40 K1-2
HIGH GAIN IMPLANTABLE DUAL-BAND PATCH ANTENNA
John Blauert*, Asimina Kiourti
Electrical and Computer Engineering, The Ohio State University, Columbus, OH

11:00 K1-3
SURFACE RESISTIVITY STUDY OF TWO E-TEXTILES IN HARSH ENVIRONMENTS
Bin Xu*, Allyson Cliett², Ling Ni², Rachel Eike², Rinn Cloud², Yang Li²
¹Electrical and Computer Engineering, Baylor University, Waco, TX
²Family and Consumer Science, Baylor University, Waco, TX

11:20 K1-4
A NOVEL FLEXIBLE ELECTRO-TEXTILE 3T MRI RF COIL ARRAY FOR STROKE PREVENTION: DESIGN, CHARACTERIZATION AND PROTOTYPING
Daisong Zhang*, Yahya Rahmat-Samii
Electrical Engineering, University of California, Los Angeles, Los Angeles, CA

11:40 K1-5
A DUAL BAND IMPLANTABLE ANTENNA FOR WIRELESS MEDICAL TELEMETRY SERVICE (WMTS) AND ISM BAND COMMUNICATION
Ryan B. Green*, Madeline R. Hays, Erdem Topsakal
Virginia Commonwealth University, Richmond, VA
13:20 A3-1
UNCERTAINTIES IN RF ELECTRIC FIELD METROLOGY BASED ON RYDBERG ATOM SPECTROSCOPY
Matt T. Simons*, Marcus D. Kautz1, Joshua A. Gordon1, David A. Anderson2, Georg Raithel2,3, Christopher L. Holloway1
1CTL, NIST, Boulder, CO
2Rydberg Technologies, Ann Arbor, MI
3Physics, University of Michigan, Ann Arbor, MI

13:40 A3-2
PRECISION PORTABLE CRYOGENIC BLACKBODY TARGET FOR MICROWAVE/MILLIMETER WAVE RECEIVER CALIBRATION
Fredrick S. Solheim*
Dakota Ridge R & D, Boulder CO

14:00 A3-3
SPATIAL K-MEANS CLUSTERING OF HF NOISE TRENDS IN SOUTHERN CALIFORNIA WATERS
Kristopher R. Buchanan*, Daniel Gaytan, Lu Xu, Chris Dilay, David Hilton
Electromagnetics Technology Branch, Space and Naval Warfare Systems Center Pacific (SSC Pacific), San Diego, CA

14:20 A3-4
NONDESTRUCTIVE ELECTRICAL PROPERTY MEASUREMENTS BY MULTIREFLECT THRU TO 110 GHZ
Nina B. Popovic*1,2, Jasper A. Drisko1, Sean E. Shaheen1, Edward Garboczi1, Chris J. Long1, Nathan D. Orloff1
1CTL, National Institute of Standards and Technology, Boulder, CO
2Electrical Engineering, University of Colorado Boulder, Boulder, CO

Session B3: Complex Media and Metamaterials
Room 1B40

13:20 B3-1
DISPERSION ENGINEERING FOR SLOW-WAVE STRUCTURES USING QUAD COUPLED TRANSMISSION LINES
Shubhendu Bhardwaj*, Muhammed Zuboraj1, John L. Volakis1
1Florida International University, Miami, FL
2Los Alamos National Laboratory, Los Alamos, NM

13:40 B3-2
MODELING OF LAYERED AND CORRUGATED SURFACES USING HIGHER ORDER GENERALIZED IMPEDANCE BOUNDARY CONDITIONS
Shubhendu Bhardwaj*, John Volakis
Florida International University, Miami, FL

14:00 B3-3
IMPROVING THE RADIATION CHARACTERISTICS OF AN ANTIPODAL VIVALDI ANTENNA USING A SPATIALLY VARIABLE METAMATERIAL LENS
John Blaurent*1, Joseph M. Faist1, Yujie He2, Sun K. Hong3, Benjamin S. Cook4, Edward Wheeler5
1Electroscience Laboratory, Ohio State University, Columbus, OH
2Electrical and Computer Engineering, Rose-Hulman Institute of Technology, Terre Haute, IN
3School of of Electrical Engineering, Soongsil University, Seoul, SOUTH KOREA
4Kilby Labs, Texas Instruments, Dallas, TX

14:20 B3-4
TRANSMISSION THROUGH AN INHOMOGENEOUS DIELECTRIC-LOADED SLOT IN AN INFINITE METALLIC SHIELD OF FINITE THICKNESS
Abdulaziz Haddab*, Edward Kuester
Electrical, Computer & Energy Engineering, University of Colorado Boulder, Boulder, CO

14:40 B3-5
AN INFINITE ARRAY OF DIELECTRIC-LOADED SLOTS IN A METALLIC SHIELD OF FINITE THICKNESS
Abdulaziz Haddab*, Edward Kuester
Electrical, Computer & Energy Engineering, University of Colorado Boulder, Boulder, CO

15:00 Break

15:20 B3-6
ALL-PASS CHARACTERISTICS OF A HUYGENS’ UNIT CELL
Ayman H. Dorrah*, George V. Eleftheriades
The Edward S. Rogers Sr. Electrical & Computer Engineering, University of Toronto, Toronto, Ontario, CANADA

15:40 B3-7
PHASE RESPONSE AT RESONANCE FREQUENCY FOR METAMATERIAL-INSERT MEDIUMS
Quang Nguyen*, Amir I. Zaghoul, Steven J. Weiss
US Army Research Laboratory, Adelphi, MD

16:00 B3-8
PT-SYMMETRIC LEAKY-WAVE METASURFACES
Mehdi Hajizadegan*, Pai-Yen Chen
ECE, Wayne State University, Detroit, MI

16:20 B3-9
EQUIVALENT CIRCUIT MODEL OF DIFFERENT CONFIGURATIONS OF MULTILAYER LOOP ELEMENTS USING VECTOR-FITTING
Payal Majumdar*1, Zhiya Zhao2, Chunlin Ji1, Ruopeng Liu1
1EE, CONLEY ROSE P.C., Houston, TX
2Kuang-Chi Institute of Advanced Technology, Shenzhen, Guangdong, CHINA
THURSDAY AFTERNOON, continued

16:40 B3-10
ORIGAMI-INSPIRED FREQUENCY SELECTIVE SURFACE
Deanna Sessions*, Gregory Huff1, Philip Buskohl2, Kazuko Fuchi3
1Texas A&M University, College Station, TX
2Air Force Research Laboratory, Dayton, OH
3University of Dayton Research Institute, Dayton, OH

Session B4: Antenna Systems: Design and Measurements
Room 200
Session Co-Chairs: Dejan Filipovic, University of Colorado Boulder; John Swoboda, MIT Haystack Observatory

13:20 B4-1
COUPLED TRANSMIT SIGNAL AND NOISE CANCELLATION AT THE RF FRONT END IN SIMULTANEOUS TRANSMIT/RECEIVE SYSTEM
Satheesh Bojja Venkatakrishnan*, Elias Alwan, John L. Volakis
Electrical Engineering, Florida International University, Miami, FL

13:40 B4-2
MEASUREMENT OF RADIO ARRAY ANTENNA PATTERNS USING UNMANNED AERIAL VEHICLES AND SOFTWARE DEFINED RADIOS
John P. Swoboda*, Frank D. Lind, Philip J. Erickson
Atmospheric Sciences Group, MIT Haystack Observatory, Westford, MA

14:00 B4-3
A NOVEL, SIZE-REDUCED LOG-PERIODIC DIPOLE ARRAY USING SPHERICAL TOP-LOADING
James C. Howell*, Sungkyun Lim
Electrical Engineering, Georgia Southern University, Statesboro, GA

14:20 B4-4
WIDEBAND CIRCULARLY POLARIZED HORN ANTENNA DESIGN AND EFFECT OF THE POLARIZATION ON BASIC DIRECTION FINDING (DF)
Mustafa Asili*, Adnan Orduyilmaz, Mahmut Serin, Alper Yildirim
Advanced Technologies Research Institute, TUBITAK, Ankara, TURKEY

14:40 B4-5
HIGHLY EFFICIENT HYBRID PLASMONIC LEAKY-WAVE OPTICAL ANTENNA WITH CONTROLLING SLOT’S SHAPES
Zahra Manzoor*, Mohammad Ali Panahi1
1Electrical Engineering, MST University, Rolla, MO
2Electrical Engineering, University of Wisconsin, Madison, WI

15:20 B5-1
ACCURACY STUDY OF SINGULARITY EXTRACTION METHOD FOR NEAR-SINGULAR AND NEAR-HYERSINGULAR SURFACE INTEGRALS IN HIGHER ORDER METHOD OF MOMENTS
Sanja B. Manic*, Ana B. Manic, Branislav M. Notaros
Electrical and Computer Engineering, Colorado State University, Fort Collins, CO

15:40 B5-2
DIRECT DOMAIN DECOMPOSITION METHODS (D3M) FOR ELECTROMAGNETIC COMPUTATIONS
Javad Moshfegh, Marinos N. Vouvakis*
Electrical & Computer Engineering, University of Massachusetts Amherst, Amherst, MA

16:00 B5-3
PARALLEL-IN-TIME COMPUTATION FOR MAXWELL’S EQUATIONS
Shu Wang, Zhen Peng*
University of New Mexico, Albuquerque, NM

16:20 B5-4
THE IMPLEMENTATION AND APPLICATION OF THE ADAPTIVE CROSS APPROXIMATION IN THE METHOD OF MOMENTS CODE EIGER
Joseph Kotulski*
Sandia National Labs, Albuquerque, NM

16:40 B5-5
EXTENDING PROTO-BENCHMARKS TO CREATE BENCHMARKS FOR QUANTIFYING MODERN COMPUTATIONAL ELECTROMAGNETICS PERFORMANCE
Jon T. Kelley1, Jackson W. Massey1, Ali E. Yilmaz2
1Physics, The University of Texas at Austin, Austin, TX
2Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX

Session B6: Emerging Applications of Phased Arrays
(Special Session)
Room 105
Session Co-Chairs: Elias Alwan, Florida International University; Karl Warnick, Brigham Young University

15:20 B6-1
WIDEBAND, SCANNING SPIRAL ARRAY FOR SIMULTANEOUS TRANSMIT AND RECEIVE (STAR)
Alexander Hovsepian*, Satheesh Bojja Venkatakrishnan, Elias A. Alwan, John L. Volakis
Electrical and Computer Engineering, Florida International University, Miami, FL
15:40 B6-2
ULTRA-WIDEBAND PHASED ARRAY OPTIMIZATION IN MIMO CONFIGURATION FOR INCREASED CHANNEL CAPACITY
Samuel S. Mensah*, Abe A. Akhiyat1,2, Elias A. Alwan2, John L. Volakis2
1Electrical and Computer Engineering, The Ohio State University, Columbus, OH
2Electrical and Computer Engineering, Florida International University, Miami, OH

15:40 B7-2
PATCH ANTENNA BENDING EFFECTS FOR WEARABLE APPLICATIONS: GUIDELINES AND DESIGN CURVES
Lingnan Song*, Yahya Rahmat-Samii
Electrical and Computer Engineering, University of California, Los Angeles, Los Angeles, CA

16:00 B6-3
ANALYSIS OF 3-D PHASED ARRAYS BASED ON SWARM APERTURE
Junming Diao*, Yuanxun E. Wang
Electrical Engineering, University of California, Los Angeles, Los Angeles, CA

16:20 B6-4
ADAPTIVE WIRELESS BEAMFORMING FOR SWARM ARRAY
J. Diao*, M. Hedayati1, Y. Huang1, Y. Wang1
1Electrical Engineering, University of California, Los Angeles, Los Angeles, CA

16:40 B6-5
CODE - MODULATED BEAMFORMING FOR MOBILE DISTRIBUTED ARRAY
M. Hedayati*, Y. Huang1, Y. Wang1
1Electrical Engineering, University of California, Los Angeles, Los Angeles, CA

17:00 B6-6
HYPER SPECTRAL FFT IMAGER
Deepthi Gorthi*, David DeBoer1, Jack Hickish1, Aaron Parsons1, Kathryn Rosier1, Dan Werthimer1
1Astronomy, University of California, Berkeley, Berkeley, CA
2Square Kilometre Array, Cape Town, SOUTH AFRICA

17:20 B6-7
ANALYSIS OF ANTENNA LOSS AND RECEIVING EFFICIENCY FOR HIGH-SENSITIVITY SCANNED PHASED ARRAYS
Junming Diao*, Karl F. Warnic2
1Electrical Engineering, University of California, Los Angeles, Los Angeles, CA
2Electrical and Computer Engineering, Brigham Young University, Provo, UT

Session B7: Wearable Antennas and Electronics
(Special Session)
Room 150
Session Co-Chairs: Asimina Kiourti, The Ohio State University; Bashir Morshed, The University of Memphis

15:20 B7-1
SMART WEARABLE ANTENNAS ON FABRIC SUBSTRATES
Umar Hasni*, Erdem Topsakal
Electrical and Computer Engineering, School of Engineering, Virginia Commonwealth University, Richmond, VA

16:00 B7-3
SCALABLE POWER GENERATION FOR WEARABLE ELECTRONICS USING FABRIC ELECTROCHEMISTRY
Raman Vilkhu*, Cody O’Connor1, Wesley Thio2, Piya D. Ghatak3, Anne Co3, Chandan K. Sen1, Asimina Kiourti1
1Electrical and Computer Engineering, The Ohio State University, Columbus, Ohio
2Chemistry, The Ohio State University, Columbus, OH
3Surgery, The Ohio State University, Columbus, OH

16:20 B7-4
WIRELESS RESISTIVE ANALOG PASSIVE TEMPERATURE SENSORS FOR SMART & CONNECTED COMMUNITY
Bashir I. Morshed*
The University of Memphis, Memphis

16:40 B7-5
WEARABLE SENSING DEVICES FOR HUMAN-MACHINE INTERACTION SYSTEMS
Karla C. Welch*, Anand S. Kulkarni, Alan M. Jimenez, Benjamin Douglas
Electrical and Computer Engineering, University of Louisville, Louisville, KY

17:00 B7-6
COIL DISTANCE AND ANGLE MISALIGNMENT EFFECTS ON THE MUTUAL INDUCTANCE FOR 13.56 MHZ WRAP SENSORS
Babak Noroozi, Bashir I. Morshed*
Electrical and Computer Engineering, The University of Memphis, Memphis, TN

17:20 B7-7
INTERMODULATION FMCW (IM-FMCW) RADAR FOR NON-LINEAR WEARABLE TARGETS DETECTION
Zhengyu Peng*, Changshii Li
Electrical and Computer Engineering, Texas Tech University, Lubbock, TX

Session F4: Random and Complex Media
(Special Session)
Room 135
Session Co-Chairs: Saba Mudaliar, Air Force Research Laboratory; Akira Ishimaru, University of Washington

13:20 F4-1
THE SINGLE SCATTERING SUBTRACTION METHOD FOR MULTI-FREQUENCY SURFACES
Kevin Diomedi
ECE, Virginia Polytechnic Institute & State University, Blacksburg, VA
THURSDAY AFTERNOON, continued

13:40 F4-2
A PHYSICS-BASED MODEL FOR THE AMPLITUDE DISTRIBUTION OF BISTATIC SEA CLUTTER
Ahmed M. Balakhder*, Hongkun Li, Joel T. Johnson
Electroscience Laboratory, The Ohio State University, Columbus, OH

14:00 F4-3
MODELING EM WAVE SCATTERING FROM TREE BRANCHES AND LEAVES
Ben Walborn*, Max Bright, Yasuo Kuga, Akira Ishimaru
Electrical Engineering, University of Washington, Seattle, WA

14:20 F4-4
JUNO RADIO SCIENCE OBSERVATIONS AND GRAVITY SCIENCE CALIBRATIONS OF IO PLASMA TORUS
Yu-Ming Yang*, Dustin Buccino1, William F. Folkner1, Kamal Oudhiri1, Phillip H. Higgs2, Marzia Parisi1, Daniel S. Kahan1
1Jet Propulsion Laboratory-NASA, Pasadena, CA
2Boston University, Boston, MA

14:40 F4-5
IMPROVING THE ANGULAR RESOLUTION IN THE EARLY-TIME DIFFUSION IMAGING THROUGH RANDOM MEDIA
Elizabeth Bleszynski*, Marek Bleszynski, Thomas Jaroszewicz
Monopole Research, Thousand Oaks, CA

15:00 Break

15:20 F4-6
HIGH ORDER SCATTERING FROM UNDULATIONS ON A CYLINDRICAL SURFACE
Saba Mudaliar*, Prabavathi Chidambaran2
1Sensors Directorate, Air Force Research Laboratory, Dayton, OH
2P.O. Box 24467, Independent Researcher, Huber Heights, OH

15:40 F4-7
SCATTERING FROM A DISTRIBUTION OF ROUGH PLATES
Max Bright*, Yasuo Kuga, Akira Ishimaru
Electrical Engineering, University of Washington, Seattle, WA

16:00 F4-8
STUDY OF SMAP HIGH RESOLUTION DATA OVER HURRICANES USING EMPIRICAL AND PHYSICS-BASED MODELING
Shanka N. Wijesundara*, Joel T. Johnson
ElectroScience Laboratory, The Ohio State University, Columbus, OH

16:20 F4-9
ENSEMBLE DETECTION ANALYSIS FOR CHARACTERIZING NON-STATIONARY PROCESSES
Mustafa Aksoy*, Paul E. Racette2
1University at Albany, SUNY, Albany, NY
2NASA Goddard Space Flight Center, Greenbelt, MD

13:20 F5-1
WIDE-BAND MILLIMETER AND SUB-MILLIMETER WAVE RADIOMETER INSTRUMENT TO MEASURE TROPOSPHERIC WATER AND CLOUD ICE (TWICE)
Pekka Kangaslahti1, Erich Schlecht1, Jonathan Jiang1, Anders Skalare1, Joelle Cooperrider1, Richard Cofield1, William Deal1, Alex Zamora1, Kevin Leong1, Steven Reising1, Xavier Bosch1, Mehmet Ogtur1, Yuriy Goncharenko1, Braxton Kilmer1
1Jet Propulsion Laboratory, Pasadena, CA
2Northrop Grumman Corporation, Redondo Beach, CA
3Colorado State University, Fort Collins, CO

13:40 F5-2
A DIRECT DETECTION RECEIVER AT 660 GHZ
William R. Deal1, Alexis Zamora1, Kevin Leong1, Gerry Mei1, Pekka Kangaslahti1, Erich Schlecht1, Steven C. Reising1
1Northrop Grumman Corporation, Redondo Beach, CA
2Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA
3Colorado State University, Fort Collins, CO

14:00 F5-3
DESIGN AND ANALYSIS OF COMMAND AND DATA HANDLING SUBSYSTEM FOR TROPOSPHERIC WATER AND CLOUD ICE (TWICE) 6U-CLASS SATELLITE INSTRUMENT
Mehmet Ogtur1, Xavier Bosch-Lluis2, Steven C. Reising2, Yuriy V. Goncharenko2, Braxton Kilmer1, Pekka Kangaslahti2, Erich Schlecht2, Anders Skalare2, Richard Cofield2, Sharmila Padmanabhan2, William R. Deal3, Alex Zamora3
1Microwave Systems Laboratory, Colorado State University, Fort Collins, CO
2Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA
3Northrop Grumman Aerospace Systems, Redondo Beach, CA

14:20 F5-4
DESIGN, FABRICATION, AND TESTING OF AN AMBIENT CALIBRATION TARGET FOR THE TROPOSPHERIC WATER VAPOR AND CLOUD ICE (TWICE) MILLIMETER- AND SUB-MILLIMETER-WAVE RADIOMETER INSTRUMENT
Braxton Kilmer1, Steven C. Reising1, Yuriy Goncharenko1, Mehmet Ogtur1, Pekka Kangaslahti2, Anders Skalare2, Erich Schlecht2, Richard Cofield2, Joelle Cooperrider2, William Deal1, Alex Zamora1
1Microwave Systems Laboratory, Colorado State University, Fort Collins, CO
2Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA
3Northrop Grumman Corporation, Redondo Beach, CA
ICECUBE 883-GHZ CLOUD RADIOMETER EXPERIMENT
Dong L. Wu*
NASA Goddard Space Flight Center, Greenbelt, MD

15:00 Break

TEMPORAL EXPERIMENT FOR STORMS AND TROPICAL SYSTEMS TECHNOLOGY DEMONSTRATION (TEMPEST-D) MISSION FOR GLOBAL OBSERVATIONS OF CLOUDS AND PRECIPITATION FROM CUBESAT Constellations
Steven C. Reising1, Todd C. Gaier2, Sharmila Padmanabhan3, Boon H. Lim4, Cate Heneghan4, Christian D. Kummerow4, V. Chandrasekar1, Wesley Berg1, Shannon T. Brown2, Matthew Pallas3, C Radhakrishnan1
1Colorado State University, Fort Collins, CO
2Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA
3Blue Canyon Technologies, Boulder, CO

THE NASA TROPICS CUBESAT RADIOMETERS
William Blackwell*
MIT Lincoln Laboratory, Lexington, MA

PRELAUNCH PERFORMANCE OF THE 118 GHZ POLARCUBE 3U CUBESAT TEMPERATURE SOUNDING RADIOMETER
Lavanya Periasamy*, Al Gasiowski1, Brian Sanders1, David Gallaher1, Robert Belter2, Joaquin Castillo3, David Kraft1, Josua Gordon1, Michael Hurowitz4
1Electrical Engineering, University of Colorado Boulder, Boulder, CO
2National Snow and Ice Data Center, Boulder, Colorado
3National Institute of Standards and Technology, Boulder, CO
4Orbital Micro Systems, Boulder, CO

DEVELOPMENT AND TESTING OF THE CUBESAT RADIOMETER RADIO FREQUENCY INTERFERENCE TECHNOLOGY VALIDATION (CUBERRT) SYSTEM
Christopher D. Ball*, Charles Rino1, Tatsuhiro Yokoyama2, Scott Palo, University of Colorado; Julio Urbina, Penn State University
1School of Earth Sciences, National Cheng Kung University, Tainan, TAIWAN
2Ann and H. J. Smead Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO
3Space Environment Laboratory, National Institute of Information and Communications Technology, Tokyo, JAPAN

Session Co-Chairs: Philip Erickson, MIT Haystack Observatory; Scott Palo, University of Colorado; Julio Urbina, Penn State University

TOWARD IONOSPHERE FORECAST USING COSMIC-2
Charles Lin*, Chia-Hung Chen1, P. K. Rajesh1, Tomoko Matsuo2
1Earth Sciences, National Cheng Kung University, Tainan, TAIWAN
2Ann and H. J. Smead Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO

EXPLORING THE IONOSPHERE WITH RADIO TELESCOPES AND LIGHTNING STRIKES
Joseph B. Malins*, Kenneth S. ObenBerger1, Gregory B. Taylor1
1Physics and Astronomy, University of New Mexico, Albuquerque, NM
2Space Vehicle Branch, Air Force Research Lab, Kirtland Air Force Base, Albuquerque, NM

ON THE USE OF SYNTHETIC APERTURE RADAR (SAR) AS A TOOL FOR IONOSPHERIC IRREGULARITY CHARACTERIZATION
James P. Conroy*, James P. Conroy2, Jason Hodkin2, Mark Strother2, Kshitija Deshpande1
1Virginia Tech, Blacksburg, VA
2Johns Hopkins Applied Physics Lab, Laurel, MD
3Embry-Riddle Aeronautical University, Daytona Beach, FL

SATELLITE-BEACON IONOSPHERIC-SCINTILLATION GLOBAL MODEL OF THE UPPER ATMOSPHERE (SIGMA): GNSS SIGNAL PROPAGATION MODELING AND CHANNEL MISMATCH ANALYSIS
James P. Conroy*, James P. Conroy2, Kshitija Deshpande1
1Virginia Tech, Blacksburg, VA
2Johns Hopkins Applied Physics Lab, Laurel, MD
3Embry-Riddle Aeronautical University, Daytona Beach, FL

VALIDATION OF AN INVERSE TECHNIQUE TO RETRIEVE INTERMEDIATE-SCALE STRUCTURE STATISTICS FROM TIME SERIES OF IONOSPHERIC SCINTILLATION
Charles S. Carrano*, Charles Rino1, Tatsuhiro Yokoyama2
1Institute for Scientific Research, Boston College, Chestnut Hill, MA
2Space Environment Laboratory, National Institute of Information and Communications Technology, Tokyo, JAPAN

14:00 G1-3

14:20 G1-4

14:40 G1-5

BREAK

15:00 Break

15:20 F5-6

15:40 F5-7

16:00 F5-8

16:20 F5-9

(Special Session)
Room 151

Session Co-Chairs: Philip Erickson, MIT Haystack Observatory; Scott Palo, University of Colorado; Julio Urbina, Penn State University

13:20 G1-1

13:40 G1-2

14:00 G1-3

14:20 G1-4

14:40 G1-5
**THURSDAY AFTERNOON, continued**

15:00 G1-6  
**JUNE SOLSTICE EQUATORIAL SPREAD-F IN THE AMERICAN SECTOR: A NUMERICAL ASSESSMENT OF LINEAR STABILITY AIDED BY INCOHERENT SCATTER RADAR MEASUREMENTS**  
Weijia Zhan*, Fabiano S. Rodrigues  
Physics, The University of Texas at Dallas, Richardson, TX

**Session G2: New RF Data Networks for Global Space Plasma Imaging**  
(Special Session)  
Room 151  
Session Co-Chairs: Gary Bust, JHUAPL; Roy Calfas, ARL:UT

15:20 G2-1  
**IONOSPHERIC IRREGULARITY DRIFT VELOCITY ESTIMATION USING MULTI-GNSS SPACED-RECEIVER ARRAY DURING HIGH LATITUDE PHASE SCINTILLATION**  
Jun Wang*, Jade Morton  
1Electrical and Computer Engineering, Colorado State University, Fort Collins, CO  
2Smead Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO

15:40 G2-2  
**INVESTIGATIONS OF PLASMA INSTABILITIES USING GNSS OBSERVATIONS AND A COMBINATION OF PROPAGATION MODEL AND A FIRST PRINCIPLES PLASMA MODEL**  
Kshitija B. Deshpande*, Matt Zettergren  
Physical Sciences, EMBRY RIDDLE AERONAUTICAL UNIV, DAYTONA BEACH

16:00 G2-3  
**ON IMAGING LOW-LATITUDE F-REGION IONOSPHERIC STRUCTURES USING A SMALL, LOW-POWER COHERENT BACKSCATTER RADAR INTERFEROMETER**  
Fabiano Rodrigues*  
W. B. Hanson Center for Space Sciences, The University of Texas at Dallas, Richardson, TX

16:20 G2-4  
**NEW DIRECTIONS IN DETECTING NATURAL HAZARDS USING GROUND-BASED AND SPACEBORNE MEASUREMENTS**  
Arunita Komjathy*, Giorgio Savastano†, Xing Meng†, Olga Verkhoglyadova‡, Anthony Mannucci§  
1Jet Propulsion Laboratory, Pasadena, CA  
2University of Rome, Rome, ITALY

16:40 G2-5  
**ASSIMILATION OF GLOBALLY DISTRIBUTED GNSS AND FABRY-PEROT INTERFEROMETER DATA PRODUCTS FOR ANALYSIS OF THE SEPTEMBER 8TH, 2017 GEOMAGNETIC STORM**  
Daniel Miladinovich*, Seebany Datta-Barua†, Uriel Ramirez†, Gary Bust‡  
1Mechanical, Materials and Aerospace Engineering, Illinois Institute of Technology, Chicago, IL  
2Applied Physics Laboratory, Johns Hopkins University, Laurel, MD

17:00 G2-6  
**NEW PERSPECTIVE OF THE IONOSPHERE AND PLASMASPHERE FROM GNSS CONSTELLATIONS**  
Rebecca L. Bishop*, Paul R. Straus, Lynette J. Gelinas  
Space Science Application Laboratory, The Aerospace Corporation, El Segundo, CA

17:20 G2-7  
**DATA ASSIMILATION OF GROUND-BASED GPS AND RADIO OCCULTATION TOTAL ELECTRON CONTENT FOR GLOBAL IONOSPHERIC SPECIFICATION**  
Chi-Yen Lin†, Tomoko Matsue*, Tiger Liu‡, Charles Lin§  
1National Central University, Taoyuan, TAIWAN  
2University of Colorado Boulder, Boulder, CO  
3National Cheng Kung University, Tainan, TAIWAN

**Session H3: Physics of the Radiation Belts II**  
(Special Session)  
Room 245  
Session Co-Chairs: Craig Kletzing, University of Iowa; Christopher Crabtree, Naval Research Laboratory

13:20 H3-1  
**THE TURBULENT PLASMASPHERE BOUNDARY LAYER AND THE OUTER RADIATION BELT BOUNDARY**  
Evgeny V. Mishin*, Vladimir Sotnikov†  
1Space Vehicles Directorate, Air Force Research Laboratory, Albuquerque, NM  
2Sensors Directorate, Air Force Research Laboratory, Dayton, OH

13:40 H3-2  
**COMPUTATIONAL MODELING OF DIPOLARIZATION FRONT ASSOCIATED WAVES AND PARTICLE ENERGIZATION**  
Wayne Scales*, Dong Lin  
Virginia Tech, Blacksburg, VA

14:00 H3-3  
**FAST DIFFUSION OF ULTRA-RELATIVISTIC ELECTRONS IN THE OUTER RADIATION BELT: 17 MARCH 2015 STORM EVENT**  
Allison N. Jaynes*, Ashar Ali†, Scot R. Elkington‡, David M. Malaspina*, Daniel N. Baker‡, Xinlin Li**, Shri G. Kanekal†, Craig A. Kletzing†, John R. Wygant§  
1Physics & Astronomy, University of Iowa, Iowa City, IA  
2LASP, University of Colorado Boulder, Boulder, CO  
3Goddard Space Flight Center, Greenbelt, MD  
4University of Minnesota, Minneapolis, MN
14:20 H3-4
INVESTIGATION OF THE FREQUENCY STRUCTURE OF THE FAST MAGNETOSONIC MODE
Scott A. Boardsen*1,2, George B. Hospodarsky3, Mei-Ching Fok4, Craig A. Kletzing5, William S. Kurth6, Robert F. Pfaff6
1Goddard Planetary and Heliophysics Institute, University of Maryland, Baltimore County, Greenbelt, MD
2Physics and Astronomy, University of Iowa, Iowa City, IA
3Physics and Astronomy, University of California, Los Angeles, Los Angeles, CA
4Center for Space Physics, Boston University, Boston, MA
5Physics and Astronomy, University of Iowa, Iowa City, IA
6Physics and Astronomy, University of New Mexico, Albuquerque, New Mexico

14:40 H3-5
VAN ALLEN PROBES OBSERVATIONS OF ELECTROMAGNETIC ION CYCLOTRON (EMIC) WAVE RISING TONES
Kristine Sigsbee*, Craig A. Kletzing, Ondrej Santolik, Charles W. Smith
1Physics and Astronomy, University of Iowa, Iowa City, IA
2Faculty of Mathematics and Physics, Charles University, Prague, CZECH REPUBLIC
3Institute for Earth, Oceans and Space, University of New Hampshire, Durham, NH

15:00 Break

15:20 H3-6
EXCITATION OF WHISTLER-MODE CHORUS WAVES IN A LABORATORY PLASMA
Xin An*, Bart Van Compernolle, Jacob Bortnik, Viktor Decyk, Richard M. Thorne
1Atmospheric and Oceanic Sciences, University of California, Los Angeles, Los Angeles, CA
2Physics and Astronomy, University of Iowa, Iowa City, IA

15:40 H3-7
HAMILTONIAN SINGLE WAVE MODELS TO INVESTIGATE THE NONLINEAR SELF-CONSISTENT INTERACTION OF WHISTLER WAVES AND ELECTRONS
Christopher Crabtree*, Gurudas Ganguli, Erik Tejero
Naval Research Laboratory, Washington

16:00 H3-8
CHORUS WAVES MODULATION OF LANGMUIR WAVES IN THE RADIATION BELTS
1Atmospheric and Oceanic Sciences, University of California, Los Angeles, Los Angeles, CA
2Center for Space Physics, Boston University, Boston, MA
3Astronomy and Physics, University of California, Los Angeles, Los Angeles
4Physics and Astronomy, University of Iowa, Iowa City, IA
5MS-D466, PO Box 1663, Los Alamos National Laboratory, Los Alamos, NM
6Institute for the Study of Earth, Oceans, and Space, University of New Hampshire, Durham, NC

Session J2: New Telescopes, Techniques and Technology II
(Special Session)
Room 265
Session Co-Chairs: Danny Jacobs, Arizona State University; David DeBoer, University of California, Berkeley

15:20 J2-1
DEPLOYMENT OF A NOVEL INTERFEROMETER ARCHITECTURE ON THE LWA-SEVILLETTE STATION
Nithyanandan Thyagarajan*, Adam P. Beardsley, Judd D. Bowman, Greg B. Taylor, Jayce Dowell, Miguel F. Morales
1National Radio Astronomy Observatory, Socorro, NM
2School of Earth and Space Exploration, Arizona State University, Tempe, AZ
3Physics and Astronomy, University of New Mexico, Albuquerque, NM
4Physics, University of Washington, Seattle, WA

15:40 J2-2
ADVANCES IN AN 8 TO 50 GHZ CRYOGENIC LOW NOISE AMPLIFIER FOR THE NEXT GENERATION VERY LARGE ARRAY
Andrew Janzen*, Ezra Long, Lorene Samoska, Jose Velazco
Jet Propulsion Laboratory, Pasadena, CA

16:00 J2-3
PRELIMINARY TEST RESULTS OF JPL'S ULTRAWIDEBAND RECEIVER PACKAGE FOR THE ngVLA
Jet Propulsion Laboratory, Pasadena, CA

16:20 J2-4
HYPER SPECTRAL FFT IMAGER
Deepthi Gorthi*, David DeBoer, Jack Hickish, Aaron Parsons, Kathryn Rosie, Dan Werthimer
1Astronomy, University of California, Berkeley, Berkeley, CA
2Square Kilometre Array, Cape Town, SOUTH AFRICA

16:40 J2-5
THE BREAKTHROUGH LISTEN SEARCH FOR INTELLIGENT LIFE: 1.1-1.9 GHZ OBSERVATIONS OF 692 NEARBY STARS
Jesus E. Enriquez*, Andrew Siemion, Griffin Foster, Vishal Gajjar, Greg Hellbourg, Jack Hickish, Howard Isaacson, Danny C. Price, Steve Croft, David DeBoer, Matt Lebofsky, David MacMahon, Dan Werthimer
1University of California, Berkeley, Berkeley, CA
2 radboud University Nijmegen, Nijmegen, NETHERLANDS
3University of Oxford, Oxford, UNITED KINGDOM
4Swinburne University, Melbourne, AUSTRIA

17:00 J2-6
PROGRESS ON HIRAX, THE HYDROGEN INTENSITY AND REAL-TIME ANALYSIS EXPERIMENT
Emily R. Kuhn*
Physics, Yale University, New Haven, CT
THURSDAY AFTERNOON, continued

Session K2: Interaction of Electromagnetic Waves with Biological Systems
Room 150
Session Co-Chairs: Tyler Bowman, University of Arkansas; Charles Baylis, Baylor University

13:20 K2-1
EFFECTS DUE TO EXPOSURE OF BIOLOGICAL SYSTEMS TO LOW FREQUENCY AND HIGH FREQUENCY ELECTROMAGNETIC FIELDS
Sahithi Kandala*
Electrical Engineering, University of Colorado Boulder, Boulder, CO

13:40 K2-2
EFFECT OF A LOW INTENSITY STATIC MAGNETIC FIELD ON DIFFERENT BIOLOGICAL PARAMETERS THAT CHARACTERIZE THE CELLULAR STRESS
Hakki Gurhan*, Rodolfo Bruzon, Yanyu Xiong, Frank Barnes
Electrical, Computer and Energy Engineering, University of Colorado Boulder, Boulder, CO

14:00 K2-3
DIELECTRIC PROPERTIES OF HONEY BEE BODY TISSUE FOR INSECT TRACKING APPLICATIONS
Omar Alzaabi*, Julio Urbina1, James K. Breakall1, Michael Lanagan2
1Electrical Engineering, Pennsylvania State University, University Park, PA
2Engineering Science and Mechanics, Pennsylvania State University, University Park, PA

Commission Business Meetings

17:00  Commission E  Room 135
17:00  Commission F  Room 155
18:00  Commission A  Room 105
18:00  Commission C  Room 150
18:00  Commission J  Room 265

THURSDAY EVENING, 4 January 2018

The Reception will be held in the lobby of the Engineering Center (ECCR) from 18:30 to 21:00. All registrants are welcome to attend the Reception. Guests are also welcome to attend, as long as the registrants have indicated on their registration form that they are bringing a guest. Beer & wine are included.
FRIDAY MORNING, 5 January 2018

Plenary Session
Mathematics Auditorium (Math 100)

Ernest K. Smith USNC-URSI Student Paper Competition

Chair: Erdem Topsakal, Virginia Commonwealth University

8:20 Announcements
8:30 Rules and Guidelines of the Competition
8:40 Student Paper Presentations

9:40 Break

Meeting Highlight Plenary Talks:

(1) The Wonderful World of Waves in the Near Earth Environment
Paul A. Bernhardt*
Plasma Physics Division, Naval Research Laboratory

(2) Radio Navigation Systems - New Challenges and Opportunities
Jade Morton*
Smead Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO

10:00 P1-1
THE WONDERFUL WORLD OF WAVES IN THE NEAR EARTH ENVIRONMENT
Paul A. Bernhardt*
Plasma Physics Division, Naval Research Laboratory

10:50 P1-2
RADIO NAVIGATION SYSTEMS - NEW CHALLENGES AND OPPORTUNITIES
Jade Morton*
Smead Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO

11:40 Awards Ceremony for Student Paper Competition

12:00 Lunch for All Students, USNC Officers and Commission Chairs
Atrium of Koelbel - Business School

FRIDAY AFTERNOON, 5 January 2018

Session B8: Advanced Analysis, Design & Applications of Waveguiding Structures
(Special Session)
Room 1B40

Session Co-Chairs: Michael Havrilla, Air Force Institute of Technology;
Edward Rothwell, Michigan State University

13:20 B8-1
PARTIAL OVERLAY TECHNIQUE FOR THE WAVEGUIDE CHARACTERIZATION OF CONDUCTOR-BACKED ABSORBERS
Edward J. Rothwell*
Electrical and Computer Engineering, Michigan State University, East Lansing, MI

13:40 B8-2
BIANISOTROPIC SCALAR POTENTIAL FORMULATION WITH BIASED GRAPHENE LAYER
Michael J. Havrilla*
Air Force Institute of Technology, Wright-Patterson AFB, OH

14:00 B8-3
SCATTERING BY CYLINDRICAL POSTS OF VARIOUS CROSS SECTIONS LOCATED INSIDE A PARALLEL-PLATE WAVEGUIDE
Akshaj Arora, Marco D. Poort*, Piergiorgio L. E. Uslenghi
University of Illinois at Chicago, Chicago, IL

14:20 B8-4
A COMPARISON OF UN-ROTATED UNIAXIAL AND ROTATED UNIAXIAL PARALLEL PLATE GREEN’S FUNCTIONS
Alexander G. Knisely*, Michael J. Havrilla
Electrical and Computer Engineering, Air Force Institute of Technology (AFIT), Wright-Patterson AFB, OH

14:40 B8-5
ANALYSIS OF PERIODIC WAVEGUIDES IN LAYERED MEDIA
David R. Jackson*, Donald R. Wilton¹, Dawei Li¹, Wiliam A. Johnson³
¹Electrical and Computer Engineering, University of Houston, Houston, TX
²Synopsys Inc., Mountain View, CA
³Consultant, Albuquerque, NM

15:00 Break

15:20 B8-6
MICROWAVE MICROFLUIDICS
Nathan D. Orloff*, James Booth, Christian Long
NIST, Boulder, CO

15:40 B8-7
COMMUTATED MULTIPATH NETWORKS: MINIATURIZED NON-RECIPROCAL DELAY LINES WITH BROAD BANDWIDTH AND GIANT PHASE VELOCITY
Mykhailo Tymchenko*, Dimitrios Sounas, Andrea Alu
Electrical and Computer Engineering, University of Texas at Austin, Austin, TX

16:00 B8-8
NEW PARADIGM IN COHERENT RADIATING OSCILLATORS BASED ON WAVEGUIDES WITH EXCEPTIONAL POINTS OF DEGENERACY
Mohamed Othman*, Filippo Capolino
Electrical Engineering and Computer Science, University of California, Irvine, Irvine, CA
FRIDAY AFTERNOON, continued

16:20  B8-9
PHOTONIC TOPOLOGICAL INSULATOR: CREATION OF A SPONTANEOUS LATERAL ATOMIC RECOIL FORCE
George W. Hanson*1, Mario Silverinha2, Mauro Antezza1, Ali Hassani Gangaraj3, Francesco Monticone4
1Electrical Engineering, University of Wisconsin Milwaukee, Milwaukee, WI
2Telecommunications, Instituto Superior Tecnico, Lisbon, PORTUGAL
3Physics, University of Montpellier, Montpellier, FRANCE
4Electrical Engineering, Cornell University, Ithica, NY

16:40  B8-10
DRESSED STATE APPROACH TO QUANTUM ELECTROMAGNETICS
Aiyin Liu1, Weng C. Chew2
1ECE, University of Illinois at Urbana-Champaign, Urbana, IL
2ECE, Purdue university, West Lafayette, IN

Session B9: 3D Printed Antennas
(Special Session)
Room 200
Session Co-Chairs: Jacob Adams, North Carolina State University; Hao Xin, University of Arizona

13:20  B9-1
ADDITIVE MANUFACTURING OF LUNEBURG LENS ANTENNAS USING SPACE-FILLING CURVES AND FUSED FILAMENT FABRICATION
Zachary Larimore*, Sarah Jensen, Austin Good, Mark Mirotznik
Electrical and Computer Engineering, University of Delaware, Newark, DE

13:40  B9-2
MULTIFUNCTIONAL GRADED DIELECTRICS FABRICATED USING DRY POWDER PRINTING
Austin J. Good1, David Roper2, Brandon Good3, Shridhar Yarlagadda4
1Electrical Engineering, University of Delaware, Newark, DE
2Carderock Division, Naval Surface Warfare Center, Bethesda, MD
3Center for Composite Materials, University of Delaware, Newark, DE

14:00  B9-3
LIQUID METAL 3D PRINTED MICROFLUIDIC CHANNEL RECONFIGURABLE PATCH ANTENNA WITH SWITCHABLE SLOTS
Lingman Song*, Wuran Gao, Chi On Chui, Yahya Rahmat-Samii
Electrical and Computer Engineering, University of California, Los Angeles, Los Angeles, CA

14:20  B9-4
3D PRINTED MONOLITHIC W-BAND SLOTTED WAVEGUIDE ARRAY ANTENNA
Adnan Kantemur*, Yashika Sharma, Jinpil Tak, Hao Xin
ECE, University of Arizona, Tucson, AZ

14:40  B9-5
ON THE USE OF 3D PRINTING TECHNOLOGY FOR ELECTRICALLY SMALL ANTENNAS
Myeongjun Kong, Geonyeong Shin, Su-Hyeon Lee, Ick-Jae Yoon*
Electrical Engineering, Chungnam National University, Daejeon, SOUTH KOREA

15:00  Break

15:20  B9-6
3D PRINTED ANTENNAS: ENABLING COMPLEX ANTENNA STRUCTURE
Junyu Shen*, Morteza Abbasi, David S. Ricketts
Electrical and Computer Engineering, North Carolina State University, Raleigh, NC

15:40  B9-7
LIQUID METAL PATCH ARRAYS WITH INTEGRATED FEEDING NETWORK AND 3D TRANSITIONS
Vivek Bharambe1, Dishit F. Parekh2, Collin Ladd2, Michael D. Dickey3, Jacob J. Adams1
1Electrical and Computer Engineering, North Carolina State University, Raleigh, NC
2Chemical and Biomolecular Engineering, North Carolina State University, Raleigh, NC

16:00  B9-8
X-BAND CONFORMAL ANTENNA FABRICATION USING DIRECT DIGITAL MANUFACTURING
Merve Kacar1, Casey Perkowski2, Paul Deffenbaugh3, Kenneth Church1, Thomas Weller1, Gokhan Mumcu1
1Electrical Engineering, University of South Florida, Tampa, FL
2Sciperio, Orlando, FL

16:20  B9-9
STRUCTURALLY EMBEDDED VASCULAR ANTENNAS (SEVA) IN BOTH MULTI-LAYER AND COMPLEX CURVED COMPOSITES
Gregory H. Huff1, Amrita Bal1, Darren J. Hartl1, Jeffery W. Baur2, Geoffrey J. Frank1,2,3, Robyn Bradford Bradford4, David Phillips Phillips4, Thao Gibson Gibson4, Daniel R. Rapking4
1Texas A & M University, College Station, TX
2Air Force Research Lab, WBAFB, OH
3Universal Technology Corporation, Beavercreek, OH
4University of Dayton Research Institute, Dayton, OH

Session B10: Nonmagnetic and Nonreciprocal Devices
Room 150
Session Co-Chairs: Andrea Alu, University of Texas at Austin; Yuanxun Wang, University of California, Los Angeles

13:20  B10-1
NON-RECIROCAL OPTICAL MANIPULATION USING DYNAMIC MODULATION
Yu Shi1, Momchil Minkov1, Qian Lin1, Shanhui Fan1
1Electrical Engineering, Stanford University, Stanford, CA
2Applied Physics, Stanford University, Stanford, CA
13:40 B10-2
MAGNETLESS NONRECIPIROCAL DEVICES BASED ON ANGULAR MOMENTUM BIASING
Dimitrios Sounas*, Ahmed Kord, Andrea Alu
The University of Texas at Austin, Austin, TX

14:00 B10-3
MAGNETIC-FREE RF CIRCULATORS USING MEMS RESONATORS
Sunil A. Bhave*
Purdue University, West Lafayette, IN

14:20 B10-4
A4-4 TIME VARYING NON-RECIPROCAL SYSTEMS: A TRUE PATH TO OUTPERFORM MAGNETIC NONRECIPIROCAL DEVICES
Songbin Gong*
University of Illinois at Urbana Champaign, Urbana, IL

14:40 B10-5
NONRECIPIROCAL EXPONENTIAL AMPLIFICATION IN TIME-VARYING TRANSMISSION LINE (TVTL)
Xiating Zou*, Qianteng Wu, Yuanxun E. Wang
Electrical and Computer Engineering, University of California, Los Angeles, Los Angeles, CA

15:00 Break

15:20 B10-6
MAGNETIC-FREE RADIO FREQUENCY CIRCULATOR BASED ON SPATIOTEMPORAL COMMUTATION OF MEMS RESONATORS
Yao Yu*, Ahmed Kord1, Dimitrios Sounas2, Zhenyun Qian1, Giuseppe Michetti1, Andrea Alu1, Matteo Rinaldi*1
1Northeastern University, Boston, MA
2University of Texas at Austin, Austin, TX

15:40 B10-7
MAGNETLESS NON-RECIPIROCAL COMPONENTS BASED ON SPATIO-TEMPORAL CONDUCTIVITY-MODULATION
Aravind Nagulu, Negar Resikarimian, Tolga Dinc, Harish Krishnaswamy*
Electrical Engineering, Columbia University, New York, NY

Session CDE1: Spectrum Issues, Developments, and Solutions
(Special Session)
Room 135
Session Co-Chairs: Charles Baylis, Baylor University; Eric Mokole, The MITRE Corporation; Zoya Popovic, University of Colorado Boulder

13:20 CDE1-1
SUMMARY OF RECENT RADAR SPECTRUM ACTIVITIES
Eric L. Mokole*, Lawrence Cohen*2
1Signal Proc & Comm Analysis / Elec Sys & Tech, The MITRE Corporation, McLean, VA
2Radar Division, US Naval Research Laboratory, Washington, DC

13:40 CDE1-2
SUGGESTED R&D AREAS FOR RADAR COMMUNICATION CO-EXISTENCE AND CO-DESIGN
Eric L. Mokole*2, Lawrence Cohen*2
1Signal Proc & Comm Analysis / Elec Sys & Tech, The MITRE Corporation, McLean, VA
2Radar Division, US Naval Research Laboratory, Washington, DC

14:00 CDE1-3
ADAPTIVE AND RECONFIGURABLE RADAR FOR OPTIMUM SHARING
Charles Baylis*1, Dimitrios Peroulis2
1Baylor University, Waco, TX
2Purdue University, West Lafayette, IN

14:20 CDE1-4
MULTI-DIMENSIONAL COEXISTENCE: EXTENDING THE CONCEPT OF THE SPECTRAL MASK TO INCLUDE TRANSMITTER TRANSMISSION PATTERN FOR SPECTRUM SHARING
Austin S. Egbert*1, Casey Latham1, Pedro Rodriguez-Garcia1, Charles Baylis1, Lawrence Cohen2, Robert J. Marks1
1Electrical & Computer Engineering, Baylor University, Waco, TX
2Naval Research Laboratory, Washington, DC

14:40 CDE1-5
FREQUENCY-AGILE POWER AMPLIFIER MATCHING NETWORK RECONFIGURATION USING A HYBRID REAL-TIME SEARCH
Christopher D. Kappelmann*, Lucilia Lamers*, Zachary Hays1, Sarvin Rezayar1, Charles Baylis1, Robert J. Marks1, Ed Viveiros*, Mohammad Abu Khater1, Abbas Semnani1, Dimitrios Peroulis1
1Baylor University, Waco TX
2Army Research Laboratory, Adelphi MD
3Purdue University, West Lafayette IN

15:00 Break

15:20 CDE1-6
COEXISTENCE OF LTE AND RADAR SYSTEM: METHODOLOGY AND ASSESSMENT OF RADAR RECEIVERS
Darren McCarthy*
Aerospace & Defense Technical Marketing, Rohde & Schwarz America, Beaverton, OR

15:40 CDE1-7
ON THE SUSCEPTIBILITY OF CODED OFDM TO INTERFERENCE: A SIMULATION STUDY
Jason B. Coder*, Yao Ma
Communications Technology Laboratory, National Institute of Standards and Technology, Boulder, CO

16:00 CDE1-8
ON THE IMPACTS OF IN-BAND LTE EMISSIONS
Aziz Kord*, Jason B. Coder
Communications Technology Laboratory, National Institute of Standards and Technology, Boulder, CO
FRIDAY AFTERNOON, continued

16:20  CDE1-9
UNMANNED AERIAL VEHICULAR ANTENNA RECEPTION TESTER FOR SPECTRUM UTILIZATION
Conor J. Ferguson*, Aaron D. Shepard, Austin D. Ratcliffe, Dylan J. Neal, Dylan R. Boyd, Mehmet Kurum
Mississippi State University, Mississippi State, MS

16:40  CDE1-10
A METHOD FOR TRIGGERING DISPARATE TYPES OF SCIENTIFIC INSTRUMENTATION AND LTE NETWORK EQUIPMENT
Noel C. Hess*, Aziz Kord, Jason Coder, Ryan Jacobs
Communications Technology Laboratory, National Institute of Standards and Technology, Boulder, CO

Session D1: Active Microwave Circuits from RF to THz
Room 1B51
Session Co-Chairs: Leonardo Ranzani, Raytheon BBN Technologies; Jonathan Chisum, University of Notre Dame

13:20  D1-1
LOW-INTERFERENCE HARMONIC TRANSPONDER SENSORS USING GRAPHENE ELECTRONICS
Liang Zhu*, Pai-Yen Chen
Electrical and Computer Engineering, Wayne State University, Detroit, MI

13:40  D1-2
NONLINEAR CHARACTERIZATION OF PHASE-CHANGE SWITCHES FOR RECONFIGURABLE MILLIMETER-WAVE FRONT-ENDS
N. J. Estes, Jonathan D. Chisum*
Electrical Engineering, University of Notre Dame, Notre Dame, IN

14:00  D1-3
ASSESSMENT OF VO2 PHASE-CHANGE MATERIALS FOR PROGRAMMABLE MICROWAVE CIRCUITS
David A. Connelly, Jonathan D. Chisum*
Electrical Engineering, University of Notre Dame, South Bend, IN

14:20  D1-4
REAL-TIME TRANSISTOR STABILITY MEASUREMENTS USING THE ACCELERATION OF THE GAIN FOR THE NEXT GENERATION RADAR
Lucilia R. Hays*, Charles Baylis1, Robert Marks1, Edward Viveiros1
1Baylor University, Waco, TX
2Army Research Laboratory, Adelphi, MD

14:40  D1-5
DESIGN OF UNGROUNDED CPW GAN-ON-SI CIRCUIT COMPONENTS FOR HIGH-EFFICIENCY POWER AMPLIFIER MMICS
Philip Zurek*, Myles Foreman, Zoya Popovic
Electrical, Computer, and Energy Engineering, University of Colorado Boulder, Boulder, CO

15:20  D1-6
FIELD-PROGRAMMABLE JOSEPHSON AMPLIFIER
Leonardo M. Ranzani*, Florent Lecocq1, Gabe A. Peterson1, Katarina Cicak1, Raymond W. Simmonds1, John D. Teufel1, Jose Aumentado2
1Raytheon BBN Technologies, Cambridge, MA
2National Institute of Standards and Technology, Boulder, CO

15:40  D1-7
W-BAND MMIC POWER AMPLIFIERS USING 90-NM GAN-ON-SIC TECHNOLOGY
Mauricio E. Pinto*, Zoya Popovic
ECEE, University of Colorado Boulder, Boulder, CO

16:00  D1-8
A 4K-PIXEL SINGLE-BIT, SINGLE-PIXEL COMPRESSIVE SENSING CAMERA FOR THz IMAGING APPLICATIONS
Syed An Nazmus Saqueb*, Kubilay Sertel
The Ohio State University, Columbus, OH

Session F6: Remote Sensing from Small Satellites II
Room 155
Session Co-Chairs: Albin Gasiewski, University of Colorado Boulder; Steven Reising, Colorado State University

13:20  F6-1
RAINCUBE, A KA-BAND PRECIPITATION RADAR MISSION LAUNCHING IN 2018
Eva Peral*, Shannon Statham1, Simone Tanelli1, Doug Price1, Jonathan Sauder1, Nacer Chahat1, Travis Imken1, Austin Williams2
1Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA
2Tyvak Nano-Satellite Systems, Inc, Irvine, CA

13:40  F6-2
ROLE OF GPSRO CALIBRATION IN AN OPERATIONAL CAPACITY FOR MIRATA
Bobby Holden*, Kerri Cahoy1, Greg Allan1, Erin Main1, Thomas Murphy1, William Blackwell1, Dan Cousins1, Michael Shields1
1Massachusetts Institute of Technology, Boston, MA
2MIT Lincoln Laboratory, Lexington, MA
14:00 F6-3
ATOMMS: A CM AND MM WAVELENGTH SATELLITE TO SATELLITE OCCULTATION SYSTEM FOR WEATHER & CLIMATE
Emil R. Kursinski*, Dale Ward1, Angel Otarola1
1Space Sciences and Engineering, Golden, CO
2Atmospheric Sciences, University of Arizona, Tucson, AZ

14:20 F6-4
IN-SITU IONOSPHERE MEASUREMENTS FROM THE COMPACT IONOSPHERE PROBE ON INSPIRESAT-1
Amal Chandran*, Loren Chang1, Priyadarshan Hari4, Kaustubh Kandi4, Duann Yi1, William Evonosky1
1Laboratory for Atmospheric and Space Physics, University of Colorado Boulder, Boulder, CO
2School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore, SINGAPORE
3Graduate Institute for Space Science, National Central University, Jengli, Taiwan, TAIWAN
4Avionics, Indian Institute of Space Science and Technology, Trivandrum, INDIA

Panel F7: RF Propagation Modeling and Measurements Room 155
Session Co-Chairs: Michael Newkirk, JHU/APL; Nicholas DeMinco, Institute for Telecommunication Sciences

15:20 F7-1
USING SIX SIGMA MODELING TECHNIQUES TO VALIDATE AND GENERALIZE IN-BUILDING PATH LOSS MODELS
Mark A. McFarland*, Bob Johnk
Telecommunications Theory Division, Institute for Telecommunication Sciences, Boulder, CO

15:40 F7-2
USING STATISTICAL LEARNING TO CLASSIFY SIX IN-BUILDING PROPAGATION ENVIRONMENTS
Mark A. McFarland*, Bob Johnk
Telecommunications Theory Division, Institute for Telecommunication Sciences, Boulder, CO

16:00 F7-3
EXPERIMENTAL STUDY OF DVB MULTIPATH BEHAVIOR
Zhiyan Cui*, Yikun Huang
Electric and Computer Engineer, University of California, Los Angeles, Los Angeles, CA

16:20 F7-4
AN ANALYTICAL STUDY OF THE EFFECT OF PARAMETER VARIATION ON RADIO-WAVE PROPAGATION LOSS
Nicholas N. DeMinco*
Institute for Telecommunication Sciences, Boulder, CO

16:40 F7-5
EXTRACTION OF DOPPLER OBSERVABLES FROM OPEN-LOOP RECORDINGS FOR THE JUNO RADIO SCIENCE INVESTIGATION
Dustin R. Buccino*, Daniel S. Kahan, Oscar Yang, Kamal Oudhiri
Jet Propulsion Lab, Pasadena, CA

Session G3: Ionospheric Effects of the Solar Eclipse (Special Session) Room 151
Session Chair: Terry Bullett, University of Colorado Boulder
13:20 G3-1
THE GREAT AMERICAN SOLAR ECLIPSE OF AUGUST 21, 2017; UNDERSTANDING THE RESPONSE OF THE IONOSPHERE
Douglas P. Drob*, Joseph D. Huba1, Aaron J. Ridley3, Gregory D. Earle1, Lee Kordella1
1Space Science Division, U.S. Naval Research Laboratory, Washington, DC
2Plasma Physics Division, U.S. Naval Research Laboratory, Washington, DC
3Climate and Space Sciences, The University of Michigan, Ann Arbor, MI
4Center for Space Science and Engineering Research, VA Polytechnic Institute and State University, Blacksburg, VA

13:40 G3-2
MODELING AND ANALYSIS OF THE D-REGION RESPONSE TO THE 2017 TOTAL SOLAR ECLIPSE
Wei Xu*, Robert A. Marshall1, Douglas Drob2, Daniel Marsh1, Jan Sojka4, Don Rice6
1Colorado Center for Astrodynamics Research, University of Colorado Boulder, Boulder, CO
2Space Science Division, Naval Research Laboratory, Washington, DC
3National Center for Atmospheric Research, Boulder, CO
4Physics, Utah State University, Logan, UT

14:00 G3-3
SOLAR ECLIPSE EFFECTS ON VLF WAVE PROPAGATION AND LWPC MODELING
James R. Bittle*, Mark Golkowski, Chad Renick
Electrical Engineering, University of Colorado Denver, Denver, CO

14:20 G3-4
E-POP RRI RADIO SCIENCE DURING THE AUGUST 21, 2017 ECLIPSE
Gareth W. Perry*, Paul A. Bernhardt1, Robert A. Farrow1, H G. James1, Andrew D. Howarth1, Andrew W. Yau1
1Physics and Astronomy, University of Calgary, Calgary, Alberta, CANADA
2Plasma Physics Division, Naval Research Laboratory, Washington, DC
3Unaffiliated
FRIDAY AFTERNOON, continued

14:40 G3-5
FIRST-LOOK ANALYSIS OF ECLIPSEMOB CROWDSOURCED DATA COLLECTION
Kiersten C. Kerby-Patel1,2, Jill K. Nelson1, William C. Liles3, Laura A. Lukes2
1Engineering, Univ. of Mass. Boston, Boston, MA
2George Mason Univ., Fairfax, VA
3Independent Consultant, Reston, VA

15:00 Break

15:20 G3-6
MEASUREMENTS OF THE IMPACT OF THE SOLAR ECLIPSE ON THE IONOSPHERE USING HF WAVES
Paul A. Bernhardt1, Joe D. Huba3, Stan J. Briczinski1, Carl L. Siefert2, Kevin Sterne2, Mike Ruohoniemi2, Simon Shepherd3, Ethan Miller1, Gareth Perry3, Robert Farrow6
1NRL, Washington, DC
2Electrical and Computer Eng., Virginia Tech, Blacksburg, VA
3Engineering, Dartmouth, Hanover, MA
4Applied Physics Lab, Johns Hopkins University, Laurel, MD
5Physics and Astronomy, University of Calgary, Calgary, Alberta, CANADA
6Amateur Radio, Ammon, ID

15:40 G3-7
OBlique and Vertical Incidence sounding of the Ionosphere during the 2017 Solar Eclipse
Terence W. Bullett*, Justin E. Mabie, Nikolay A. Zabotin
University of Colorado Boulder, Boulder, CO

16:00 G3-8
DYNASONDE ANALYSIS OF THE LUSK, WI - BOULDER, CO AUGUST 2017 TOTAL SOLAR ECLIPSE EXPERIMENT DATA
Nikolay Zabotin1, Huan Song1,2, Terence Bullett3,4, Justin Mabie3,4
1ECEE, University of Colorado Boulder, Boulder, CO
2Wuhan University, Wuhan, CHINA
3NCEI, NOAA, Boulder, CO
4CIRES, University of Colorado Boulder, Boulder, CO

16:20 G3-9
MEASURING WAVES GENERATED BY SOLAR TERMINATOR WITH DYNASONDE TECHNIQUES
Nikolay Zabotin1, Huan Song1,2, Terence Bullett3
1ECEE, University of Colorado Boulder, Boulder, CO
2Wuhan University, Wuhan, CHINA
3NCEI, NOAA, Boulder, CO

13:20 H4-1 RADIO AND PLASMA WAVE OBSERVATIONS AT SATURN AND JUPITER
William S. Kurth*1, D. A. Gurnett1, G. B. Hospodarsky1, S. Ye1, J. D. Menietti1, A. M. Persson1, A. Sulaiman1, M. Imai1, S. Tetrack1, P. Zarka1, L. Lamy1, B. Cecconi2, C. Louis2, A. Lecacheux2, W. M. Farrell1, G. Fischer1, J. E. Wahlund1, M. Morooka1, L. Hadid1, S. J. Bolton1, J. E. P. Connerney1, S. M. Levin1, P. Valek1, F. Allegrini2, P. Louarn3, B. H. Mauk9
1University of Iowa, Iowa City, IA
2Observatoire de Paris, Meudon, FRANCE
3NASA/Goddard Space Flight Center, Greenbelt, MD
4Austrian Academy of Sciences, Graz, AUSTRIA
5IRF-U, Uppsala, SWEDEN
6Southwest Research Institute, San Antonio, TX
7Jet Propulsion Laboratory, Pasadena, CA
8Applied Physics Lab, Johns Hopkins University, Laurel, MD

13:40 H4-2
MMS ANALYSIS OF EMIC WAVES IN THE MAGNETOSHEATH
Scott A. Boardsten2,3,4, Adolf O. Vinas2, Frederick D. Wilder3, Alex Glocer1, William R. Paterson1, Alex C. Barrie1, Dan J. Gershman2, Barbara L. Giles3, Thomas E. Moore2, D. A. Roberts2, Christopher T. Russell4
1Goddard Planetary and Heliophysics Institute, UMBC, Greenbelt, MD
2Heliophysics Division, NASA/GSFC, Greenbelt, MD
3Institute of Atmospheric and Space Physics, University of Colorado Boulder, Boulder, CO
4Earth, Planetary and Space Sciences, University of California, Los Angeles, Los Angeles, CA

14:00 H4-3
USING FIELD-PARTICLE CORRELATIONS TO DIAGNOSE PARTICLE ENERGIZATION BY ELECTROMAGNETIC WAVES IN SPACE AND LABORATORY PLASMAS
Gregory G. Howes*
Physics and Astronomy, University of Iowa, Iowa City, IA

14:20 H4-4
LOW-ALTITUDE ION HEATING, BBELF WAVES, AND DOWNFLOWING IONS IN THE RETURN CURRENT REGION
Yangyang Shen*, David J. Krudsen1, Johnathan K. Burchill1, Andrew Howarth1, Andrew You1, Gareth Perry1, Gordon James1, David Miles1, Leroy Cogger1
1University of Calgary, Calgary, AB, CANADA
2University of Iowa, Iowa City, IA

14:40 H4-5
INFLUENCE OF THE INHOMOGENEOUS STRUCTURE OF THE IONOSPHERIC PLASMA ON THE ULF NOISE SPECTRA
Dmitry S. Kotik*, Elena N. Ermakova, Alexander V. Pershin, Alexander V. Ryabov
Radio Physical Research Institute, Nizhny Novgorod State University, Nizhny Novgorod, RUSSIAN FEDERATION

Session H4: Waves and Turbulence in Space and Laboratory Plasmas I
(Special Session)
Room 245
Session Co-Chairs: Stephen Vincena, University of California, Los Angeles;
Bill Amatucci, Naval Research Laboratory
15:00 Break

15:20 H4-6
FORMATION OF ALFVENIC DOUBLE LAYERS AND AURORAL PARTICLE ACCELERATION
Yan Song*, Robert L. Lysak
University of Minnesota, Minneapolis, MN

15:40 H4-7
A STUDY OF AURORAL ELECTRON ACCELERATION BY ALFVEN WAVES IN THE LAPD
J. W. R. Schroeder\(^1\), G. G. Howes\(^1\), S. Skiff\(^1\), C. A. Kletzing\(^1\),
T. A. Carter\(^2\), S. Vincena\(^2\), S. Dorfman\(^2\)
\(^1\)Physics and Astronomy, University of Iowa, Iowa City, IA
\(^2\)Physics and Astronomy, University of California, Los Angeles, Los Angeles, CA

16:00 H4-8
IONOSPHERIC FEEDBACK INSTABILITY IN THE ALFVEN RESONATOR AT HIGH LATITUDES: 3D MODELING
Beket Tulegenov*, Anatoly V. Streletsov
Physical Sciences, Embry-Riddle Aeronautical University, Daytona Beach, FL

16:20 H4-9
SUPPRESSION OF THE IONOSPHERIC FEEDBACK INSTABILITY BY ION FLOW VELOCITY SHEAR IN THE E-LAYER
Dmytro Sydorenko*, Robert Rankin
Physics, University of Alberta, Edmonton, Alberta, CANADA

16:40 H4-10
LABORATORY STUDIES ON THE NONLINEAR INTERACTIONS OF KINK-UNSTABLE FLUX ROPES AND SHEAR ALFVEN WAVES
Stephen Vincena*, Shreekrishna K. Tripathi, Walter Gekelman,
Timothy DeHaas, Patrick Pribyl
Physics and Astronomy, UCLA, Los Angeles, CA

Session J3: ALMA 2030
(Special Session)
Room 265
Session Co-Chairs: Henry Wootten, NRAO/University of Virginia;
Arielle Moulet, NRAO

13:20 J3-1
SUSTAINING ALMA SCIENCE THROUGH 2030 A NORTH AMERICAN PERSPECTIVE
Henry A. Wootten*
NRAO/University of Virginia, Charlottesville, Virginia

13:40 J3-2
UPGRADE TO THE 64-ANTENNA ALMA CORRELATOR
Rodrigo Amestica*, Richard J. Lacasse\(^1\), Raymond P. Escoffier\(^2\),
Joseph H. Greenberg\(^3\), Alejandro F. Saez\(^2\), Alain Baudry\(^1\),
John C. Webber\(^4\)
\(^1\)National Radio Astronomy Observatory, Charlottesville, VA
\(^2\)National Radio Astronomy Observatory (retired), Charlottesville, VA
\(^3\)Laboratoire d’Astrophysique de Bordeaux, OASU, Universite de Bordeaux, Bordeaux, Nouvelle-Aquitaine, FRANCE
\(^4\)Astronomy, University of Massachusetts, Amherst, MA

14:00 J3-3
THE NEXT GENERATION ALMA CORRELATOR
Jonathan Weintroub*
Submillimeter Array, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA

14:20 J3-4
THE ALMA PHASING PROJECT PHASE 2: EXTENDING AND ENHANCING THE VLBI SCIENCE CAPABILITIES
OF ALMA
Lynn D. Matthews\(^1\), Geoffrey B. Crew\(^1\), Michael H. Hecht\(^1\),
Sheperd S. Doelman\(^1\), Vincent L. Fish\(^1\), Walter Alev\(^3\),
Richard Lacasse\(^4\), Ivan Marti-Vidal\(^1\), Neil M. Nagar\(^4\),
Helge Rottmann\(^3\), Alan L. Roy\(^3\), Alejandro F. Saez\(^2\)
\(^1\)Haystack Observatory, Massachusetts Institute of Technology, Westford, MA
\(^2\)Harvard-Smithsonian Center for Astrophysics, Cambridge, MA
\(^3\)Max-Planck-Institut fur Radioastronomie, Bonn, GERMANY
\(^4\)NRAO Technology Center, National Radio Astronomy Observatory, Charlottesville, VA

14:40 J3-5
THE ALMA BAND 1 RECEIVER: BUILDING THE LOWER FREQUENCY END OF ALMA
Oscar Morara*
Academia Sinica Institute of Astronomy and Astrophysics (ASIAA),
Taipei, TAIWAN

15:00 Break

15:20 J3-6
SUPERCONDUCTING PARAMETRIC AMPLIFIERS: THE NEXT BIG THING IN (SUB)MILLIMETER-WAVE RECEIVERS
Omid Noroozian\(^*,1\), Anthony R. Kerr\(^1\), Jeffrey G. Mangum\(^1\),
Peter K. Day\(^1\), Henry G. LeDuc\(^1\), David P. Woody\(^1\),
Jonas Zmuidzinas\(^1\), Arthur W. Lichtenberger\(^4\),
Michael E. Cyberey\(^4\), Robert M. Weikle\(^4\)
\(^1\)National Radio Astronomy Observatory, Charlottesville, VA
\(^2\)Jet Propulsion Laboratory, NASA, Pasadena, CA
\(^3\)California Institute of Technology, Charlottesville, VA
\(^4\)University of Virginia, Charlottesville, VA

15:40 J3-7
PLANS FOR AN ALMA BAND-6 RECEIVER UPGRADE
Anthony R. Kerr*, Omid Noroozian\(^*,1\), Sivasankaran Srikanth\(^1\),
Arthur W. Lichtenberger\(^4\), Joel Schleeh\(^4\), Neal R. Erickson\(^4\)
\(^1\)Central Development Laboratory, NRAO, Charlottesville, VA
\(^2\)EECS, University of Virginia, Charlottesville, VA
\(^3\)Low Noise Factory, Gothenburg, SWEDEN
\(^4\)Astronomy, University of Massachusetts, Amherst, MA
FRIDAY AFTERNOON, continued

16:00 J3-8
DISCOVERY FROM HYPERSPECTRAL ALMA IMAGERY WITH NEUROSCOPE
Erzsébet Merényi*1,2, Andrea Isella1, Joshua Taylor1
1Statistics, Rice University, Houston, TX
2Electrical and Computer Engineering, Rice University, Houston, TX

16:20 J3-9
FULL-MUELLER MOSAIC IMAGING WITH ALMA
Sanjay Bhatnagar*
National Radio Astronomy Observatory, Socorro, NM

16:40 J3-10
THE SPECTRUM LANDSCAPE: PROSPECTS FOR RADIO ASTRONOMY
Harvey S. Liszt*
National Radio Astronomy Observatory, Charlottesville, VA

Session K3: Imaging and Monitoring in Medical Applications
Room 105
Session Co-Chairs: Branislav Notaros, Colorado State University; Farnaz Foroughian, The University of Tennessee

13:20 K3-1
CLASSIFICATION OF HUMAN HEAD MOTION PATTERNS USING TRANSMISSION COEFFICIENT OF ON-NECK ANTENNAS
Drew G. Bresnahan*, Yang Li1, Youngwook Kim1
1Electrical and Computer Engineering, Baylor University, Waco, TX
2Electrical and Computer Engineering, California State University, Fresno, Fresno, CA

13:40 K3-2
THZ IMAGING COMPARISON OF XENOGRAFT AND TRANSGENIC MURINE BREAST CANCER TUMORS
Tyler Bowman*, Narasimhan Rajaram1, Keith Bailey1, Magda El-Shenawee1
1Electrical Engineering, University of Arkansas, Fayetteville, AR
2Biomedical Engineering, University of Arkansas, Fayetteville, AR
3Oklahoma Animal Disease Diagnostic Laboratory, Oklahoma State University, Stillwater, OK

14:00 K3-3
USING SLOTTED WAVEGUIDES FOR RF EXCITATION IN MAGNETIC RESONANCE IMAGING AT 7 T
Pranav S. Athalye*, Milan M. Ilic1,2, Branislav M. Notaros1
1Electrical & Computer Engineering, Colorado State University, Fort Collins, CO
2School of Electrical Engineering, University of Belgrade, Belgrade, Serbia, YUGOSLAVIA

14:20 K3-4
THE WAVELENGTH SELECTION FOR CALIBRATING NON-CONTACT DETECTION OF BLOOD OXYGEN SATURATION USING IMAGING PHOTOPLETHYSMOGRAPHY
Farnaz Foroughian*, Chandler J. Bauder1, Paul T. Theilmann1, Aly E. Fairly1
1Electrical Engineering and Computer Science, The University of Tennessee, Knoxville, TN
2MaXentric Technologies LLC, San Diego, CA

Session K4: Therapeutic and Treatment Monitoring Applications
Room 105
Session Co-Chairs: John Stang, University of Southern California; Nader Behdad, University of Wisconsin

15:20 K4-1
A BALUN-FREE HYBRID HELIX/MONOPOLE ANTENNA FOR MICROWAVE ABLATION
Yahya Mohtashami*, Nader Behdad, Susan C. Hagness
Electrical and Computer Engineering, University of Wisconsin-Madison, Madison, WI

15:40 K4-2
3D MICROWAVE TRACKING OF TREATMENT PROBE IN THERMAL THERAPY
Guanbo Chen, John Stang*, Pratik Shah, Mahta Moghaddam
University of Southern California, Los Angeles, CA

16:00 K4-3
FEASIBILITY STUDY OF INTEGRATED PULSED MICROWAVE ABLATION AND THERMOACOUSTIC MONITORING
James F. Sawicki*, Audrey L. Evans, Hung Luyen, Yahya Mohtashami, Nader Behdad, Susan C. Hagness
Electrical and Computer Engineering, University of Wisconsin-Madison, Madison, WI

16:20 K4-4
DIELECTRIC CHARACTERIZATION OF PORCINE MODEL FOR SUBCUTANEOUS WIRELESS TELEMETRY
Madeline R. Hays*, Ryan Green1, Martin Mangino3, Erdem Topsakal2
1Biomedical Engineering, Virginia Commonwealth University, Richmond, VA
2Electrical and Computer Engineering, Virginia Commonwealth University, Richmond, VA
3Surgery, VCU School of Medicine, Richmond, VA

Commission Business Meetings
17:00 Commission B Room 1B40
17:00 Commission G Room 151
18:00 Commission D Room 1B51
18:00 Commission H Room 245
18:00 Commission K Room 105
SATURDAY MORNING, 6 January 2018

Session B11: Numerical Methods
Room 1B40
Session Co-Chairs: Branislav Notaros, Colorado State University; Yahya Rahmat-Samii, University of California, Los Angeles

08:20 B11-1
SHAPE-PHASED AND MATERIAL-ENGINEERED INHOMOGENEOUS LENS ANTENNAS: GO CURVED RAY TRACING AND APERTURE FIELDS
Jordan F. Budhu*, Yahya Rahmat-Samii
University of California, Los Angeles, Los Angeles, CA

08:40 B11-2
EM SIMULATION AND CHARACTERIZATION OF UNDERGROUND MINES USING RAY TRACING, VECTOR PARABOLIC EQUATION, AND HYBRID APPROACHES
Cam Key*, Blake Troksa, Slobodan Savić, Milan M. Ilić, Branislav M. Notaros
1Electrical & Computer Engineering, Colorado State University, Fort Collins, CO
2School of Electrical Engineering, University of Belgrade, Belgrade, YUGOSLAVIA

09:00 B11-3
SEEING THE INVISIBLE: IMAGING HIDDEN FEATURES WITH MULTIPLE-SCATTERING RECONSTRUCTIONS
Mert Hidayetoglu*, Wen-Mei Hwu, Weng-C. Chew
1Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, Urbana, IL
2Electrical and Computer Engineering, Purdue University, West Lafayette, IN

09:20 B11-4
AN UNCONDITIONALLY STABLE TIME-DOMAIN SOLVER UNIFYING ELECTRODYNAMICS AND MICROMAGNETICS
Zhi (Jackie) Yao*, Rustu U. Tok, Yuanxun Ethan Wang
Electrical Engineering, University of California, Los Angeles, CA

09:40 B11-5
FAST DESIGN OF TERAHERTZ PLASMONIC DEVICES USING UNCONDITIONALLY STABLE FINITE DIFFERENCE TIME-DOMAIN METHODS
Shubhendu Bhardwaj*
Florida International University, Miami, FL

10:00 Break

10:20 B11-6
SPHERICAL FDTD NUMERICAL DISPERSION ANALYSIS
Ravi C. Bollimuntha*, Mohammed F. Hadi, Melinda J. Picket-May, Atef Z. Elsherbeni
1EE, Colorado School of Mines, Golden, CO
2Electrical Engineering, California State University, Northridge, CA

10:40 B11-7
A FINITE VOLUMES-BASED FDTD MATERIAL DISPERSION MODELING
Neeti P. Sonth*, Ravi C. Bollimuntha, Mohammed F. Hadi, Melinda J. Picket-May, Atef Z. Elsherbeni
1EE, University of Colorado Boulder, Boulder, CO
2Electrical Engineering, Colorado School of Mines, Golden, CO

11:00 B11-8
ELECTRICAL SCIENCES AT SANDIA NATIONAL LABORATORIES
Lorena I. Basilio*, Joseph P. Castro
Sandia National Laboratories, Albuquerque NM

11:20 B11-9
CHARACTERISTIC MODE ANALYSIS OF KNOT WIRE-SCATTERERS
1Computer Science and Electrical Engineering, University of Missouri-Kansas City, Kansas City, MO
2Materials Science and Engineering Division, National Institute of Standards and Technology, Gaithersburg, MD
3Applied Chemicals and Materials Division, National Institute of Standards and Technology, Boulder, CO

Session B12: Microstrip and Printed Devices and Antennas
Room 105
Session Co-Chairs: Sembiam Rengarajan, California State University; Aly Fathy, University of Tennessee

08:20 B12-1
ON THE CONDUCTOR LOSS IN MICROSTRIP REFLECTARRAYS
Sembiam R. Rengarajan*, Richard E. Hodges
1Electrical and Computer Engineering, California State University, Northridge, CA
2Jet Propulsion Laboratory, Pasadena, CA

08:40 B12-2 A 360° Scanning Lens Design
Tuan M. Nguyen*, Octem Kilic
EECS, The Catholic University of America, Washington DC

09:00 B12-3
A COMPACT FEED NETWORK FOR WIDEBAND CIRCULARLY POLARIZED 2’2 SPIRAL ARRAY ANTENNA FOR GPS APPLICATIONS
Farshid Tamjidi*, Chris M. Thomas, Aly E. Fathy
1Electrical Engineering and Computer Science, University of Tennessee Knoxville, Knoxville, TN
2MaXentric Technologies LLC, La Jolla, CA

Session B13: Electromagnetic Materials and Devices
(Special Session)
Room 135
Session Co-Chairs: Filippo Capolino, University of California, Irvine; Jacob Adams, North Carolina State University
SATURDAY MORNING, continued

08:20 B13-1
PLASMA VARACTOR FOR RECONFIGURABLE RF/ MICROWAVE SYSTEMS
Abbas Semnani*, Sergey O. Macheret, Dimitrios D. Peroulis
Purdue University, West Lafayette, IN

08:40 B13-2
HIGH-POWER MICROWAVE TUNABLE RESISTOR BASED ON LOW-TEMPERATURE PLASMA TECHNOLOGY
Abbas Semnani*, Sergey O. Macheret, Dimitrios D. Peroulis
Purdue University, West Lafayette, IN

09:00 B13-3
EXPERIMENTALLY CHARACTERIZED 3D MAPS OF CARBON NANOTUBE DISTRIBUTIONS: TESTBEDS FOR ACCURATE ELECTROMAGNETIC MODELING OF NANOCOMPOSITES
Md Khadimul Islam1, Spencer On1, Ahmed M. Hassan1, Bharath Natarajan1, Itai Y. Stein1, Estelle Cohen1, Brian L. Wardle1, Renu Sharma5, J. Alexander Liddle5, Edward J. Garboczi5
1Computer Science and Electrical Engineering, University of Missouri-Kansas City, Kansas City, MO
2Materials Science and Engineering Division, National Institute of Standards and Technology, Gaithersburg, MD
3Aeronautics and Astronautics, Massachusetts Institute of Technology, Cambridge, MA
4Center for Nanoscale Science and Technology, National Institute of Standards and Technology, Gaithersburg, MD
5Applied Chemicals and Materials Division, National Institute of Standards and Technology, Boulder, CO

09:20 B13-4
TWO-SCALE CONCEPT FOR FIELD ENHANCEMENT AT OPTICAL FREQUENCY: COMBINATION OF RAYLEIGH ANOMALY AND PLASMONIC RESONANCES
Mahsa Darvishzadeh Varcheie*, Filippo Capolino
Electrical Engineering and Computer Science, University of California, Irvine, Irvine, CA

09:40 B13-5
DETECTION AND CHARACTERIZATION OF CHIRAL NANO-SAMPLES USING PHOTO-INDUCED FORCE
Mohammad Kamandi*, Mohammad Albooyeh, Filippo Capolino
Electrical Engineering and Computer Science, University of California, Irvine, Irvine, CA

10:00 Break

10:20 B13-6
OVER THE AIR VALIDATION OF AN HF BROADBAND DIRECT ANTENNA MODULATION TRANSMITTER
Kurt R. Schab*, Danyang Huang, Jacob J. Adams
Electrical and Computer Engineering, North Carolina State University, Raleigh, NC

10:40 B13-7
UHF SATCOM ANTENNA USING A MAGNETICALLY LOADED ARTIFICIAL MAGNETIC CONDUCTOR
Katherine J. Duncan1, Frank A. Vassallo2, Daniel T. Bennett1, Juan C. Correa1, Thomas P. Ketterl1, Thomas M. Weller1
1Electrical Engineering and Computer Science, United States Military Academy, West Point, NY
2TECOMSYS, Clearwater, FL
3Defense, Baltimore MD
4EECS, University of South Florida, Tampa, FL

Session B14: Antennas for Specialized Platforms: SmallSats, UAVs, and UUVs
(Special Session)
Room 105
Session Co-Chairs: Reyhan Baktur, Utah State University; David Jackson, University of Houston

10:20 B14-1
CONFORMAL INTEGRATED SOLAR PANEL ANTENNAS FOR CUBESATS
Benjamin B. Oborn*, Reyhan Baktur
Electrical and Computer Engineering, Utah State University, Logan UT

10:40 B14-2
DEPLOYABLE MICROWAVE ANTENNA FOR CUBESATS, NANOSATS, AND SMALLSATS
Tristen C. Hohman*
Boulder Environmental Sciences and Technology, Boulder, CO

11:00 B14-3
UMBRELLA REFLECTOR CHARACTERIZATION FOR CUBESATS: ANALYTICAL FORMULATION FOR BORESIGHT GAIN LOSS
Vignesh Manohar*, Yahya Rahmat-Samii
Electrical and Computer Engineering, University of California, Los Angeles, Los Angeles, CA

11:20 B14-4
PLANAR ANTENNAS FOR CIRCULAR POLARIZATION IN A CONSTRAINED SPACE
William O. Coburn*, Seth A. McCormick
RF and Electronics Div., US Army Research Laboratory, Adelphi, MD

11:40 B14-5
DUAL-MODE MICROSTRIP ANTENNAS WITH INCREASED BANDWIDTH
Xinyu Liu1, David R. Jackson1, Ji Chen1, Murilo H. Seko1
1Electrical and Computer Engineering, University of Houston, Houston, TX
2Electronic Systems Engineering, University of Sao Paulo, Sao Paulo, BRAZIL

Session D2: Filters and Tunable Microwave Circuits
(Special Session)
Room 1B51
Session Co-Chairs: Dimitra Psychogiou, University of Colorado Boulder; Zoya Popovic, University of Colorado Boulder
08:20  D2-1  
BALANCED MICROWAVE RF FILTERS WITH QUASI-ELLIPITIC-TYPE DIFFERENTIAL COMMON-MODE PASSBAND AND MULTI-NOTCH COMMON-MODE SUPPRESSION  
Dakotah J. Simpson*, Dimitra Psychogiou  
Electrical, Computer, and Energy Engineering, University of Colorado Boulder, Boulder, CO

08:40  D2-2  
QUASI-REFLECTIONLESS BANDPASS FILTERS WITH FLAT IN-BAND GROUP DELAY  
Alexander J. Rosner*, Roberto Gomez-Garcia¹, Jose-Maria Munoz-Ferreras², Dimitra Psychogiou¹  
¹Electrical, Computer and Energy Engineering, University of Colorado Boulder, Boulder, CO  
²Dpt. of Signal Theory and Communications, University of Alcala de Henares, Madrid, SPAIN

09:00  D2-3  
A 3.5/5.8-GHZ DUAL-BAND EFFICIENCY-OPTIMIZED POWER AMPLIFIER  
Allison Y. Duh*, Taylor Barton, Zoya Popovic  
Electrical, Computer and Energy Engineering, University of Colorado Boulder, Boulder, CO

09:20  D2-4  
DIRECT TUNING OF CAVITY POSITION NUMBERS FOR CIRCUIT OPTIMIZATION USING AN EVANESCENT-MODE CAVITY TUNER DESIGNED FOR RECONFIGURABLE RADAR TRANSMISSION  
Lucilia R. Hays¹, Sarvin Rezayat¹, Zachary Hays¹, Austin Egbert¹, Christopher Kappelmann¹, Charles Baylis¹, Robert J. Marks¹, Edward Viveiros³, Dimitrios Peroulis³, Mohammad Abu-Khater¹, Abbas Semnani¹  
¹Electrical and Computer Engineering, Baylor University, Waco, TX  
²Army Research Laboratory, Adelphi, MD  
³Electrical and Computer Engineering, Purdue University, West Lafayette, IN

09:40  D2-5  
3D FAST PAE OPTIMIZATION USING AN EVANESCENT-MODE CAVITY TUNER  
Zachary Hays¹, Charles Baylis¹, Mohammad Khater¹, Edward Viveiros³  
¹Baylor University, Waco, TX  
³Army Research Laboratory, Adelphi, MD

10:00  Break

10:20  D2-6  
REAL-TIME MULTI-VARIABLE AMPLIFIER OPTIMIZATION USING A NONLINEAR TUNABLE VARACTOR MATCHING NETWORK IN THE POWER SMITH TUBE  
Sarvin Rezayat¹, Charles Baylis¹, Ed Viverios², John Penn², Robert J. Marks III²  
¹Baylor University, Waco, TX  
²Army Research Laboratory, Adelphi, MD

10:40  D2-7  
AN EVANESCENT-MODE CAVITY-BASED HIGH-POWER IMPEDANCE TUNER FOR ADAPTIVE RADAR APPLICATIONS  
Abbas Semnani¹, Mohammad Abu Khater¹, Dimitrios Peroulis³, Charles Charles Baylis¹, Lucilia Hays¹, Christopher Kappelmann¹, Zachary Hays²  
¹Purdue University, West Lafayette, IN  
²Baylor University, Waco, TX

11:00  D2-8  
RECONFIGURABLE PLANAR DIPOLE USING LIQUID-METAL NODES FOR FREQUENCY-TUNING APPLICATIONS  
Anthony W. Comb*¹, Kent J. Sarabia, Kareem S. B. Elasy, Aaron T. Ohta, Wayne A. Shiroma  
Electrical Engineering, University of Hawaii at Manoa, Honolulu, HI

Session F8: RF Propagation Utilizing Numerical Weather Prediction  
(Special Session)  
Room 155

Session Co-Chairs: Tracy Haack, Naval Research Laboratory; Thomas Hanley, Johns Hopkins University Applied Physics Lab; Katherine Horgan, Johns Hopkins University Applied Physics Lab, Laurel, MD

08:20  F8-1  
USING CLIMATOLOGY TO SUPPORT EM PROPAGATION MODELING  
Thomas R. Hanley*, Jonathan Z. Gehman, Nathaniel S. Winstead  
Johns Hopkins University Applied Physics Lab, Laurel, MD

08:40  F8-2  
PRELIMINARY STUDY ON USE OF ENSEMBLE WEATHER PREDICTION DATA FOR INVERSELY DETERMINING ATMOSPHERIC REFRACTIVITY IN SURFACE DUCTING CONDITIONS  
Daniel P. Greenway¹, Tracy Haack¹, Erinn E. Hackett²³  
¹Geography and Computer Science, Ball State University, Muncie, IN  
²Marine Meteorology Division, Naval Research Laboratory, Monterey, CA  
³Coastal and Marine Systems Science, Coastal Carolina University, Conway, SC

09:00  F8-3  
AN EVALUATION OF SURFACE LAYER MODELS AND THE EVAPORATION DUCTS USING RADIO FREQUENCY LOSS INVERSIONS  
Tracy Haack¹, Andrew Kammere¹, Robert Banks¹, Qi Wang¹, Caglar Yardim¹, Luyao Xu¹, Paul Frederickson¹  
¹Marine Meteorology Division, Naval Research Laboratory - Marine Meteorology Division, Monterey, CA  
²ONR Naval Research Enterprise Internship Program, Washington DC  
³Electrical and Computer Engineering, The Ohio State University, Electroscience Laboratory, Columbus, OH  
²Meteorology/Oceanography, Naval Postgraduate School, Monterey, CA
09:20 F8-4
FURTHER IMPROVEMENTS AND VALIDATION FOR THE NAVY ATMOSPHERIC VERTICAL SURFACE LAYER MODEL (NAVSLAM)
Paul A. Frederickson*
Meteorology, Naval Postgraduate School, Monterey, CA

09:40 F8-5
A TECHNIQUE TO ESTIMATE OUTER SCALE OF TURBULENCE FROM NUMERICAL WEATHER PREDICTION IN THE ATMOSPHERIC BOUNDARY LAYER
Matt C. Wilbanks*, Victor R. Wiss, William D. Thornton, Katherine Katherine, Jordan McCammon
Naval Surface Warfare Center Dahlgren Division, Dahlgren, VI

10:00 Break

10:20 F8-6
OVERVIEW OF CASPER-WEST FIELD CAMPAIGN
Qing Wang*
Naval Postgraduate School, Monterey, CA

10:40 F8-7
COMPRESSIVE TWO DIMENSIONAL BEAMFORMING OF MIMO DATA COLLECTED IN A REFRACTIVE ENVIRONMENT
Mark A. Wagner*, Santosh Nannuru, Peter Gerstoft
Electrical Engineering, University of California San Diego, La Jolla, CA

Session FGH1: GNSS and Radio Beacon Remote Sensing
(Special Session)
Room 150
Session Co-Chairs: Carl Siefring, Naval Research Laboratory; Clara Chew, NASA Jet Propulsion Laboratory; John Swoboda, MIT Haystack Observatory

08:20 FGH1-1
FGH1-1 FORWARD MODELING OF CYGNSS GNSS-R LAND REFLECTION MEASUREMENTS
Andrew J. O'Brien*, Mohammad Al-Khaldi, Joel T. Johnson
The Ohio State University, Columbus, OH

08:40 FGH1-2
AN ANALYSIS OF CYGNSS REFLECTIONS OVER LAND
Mohammad Al-Khaldi*, Joel Johnson, Jeonghwan Park, Andrew O'Brien
ElectroScience Lab, The Ohio State University, Columbus, OH

09:00 FGH1-3
A THEORETICAL STUDY OF THE RELATIONSHIP BETWEEN BISTATIC SCATTERING CROSS SECTIONS AND GPS REFLECTOMETRY DELAY-DOPPLER MAPS OVER VEGETATED LAND IN SUPPORT OF SOIL MOISTURE RETRIEVAL
Amir Azemati*, Mahta Moghaddam1, Arvind Bhat2
1Ming Hsieh Electrical Engineering, University of Southern California, Los Angeles, CA
2Intelligent Automation, Inc. (IAI), Rockville, MD

09:20 FGH1-4
RESULTS FROM A WETLANDS GNSS-R AIRCRAFT CAMPAIGN
Stephen T. Lowe*, Clara C. Chew2, Jesal Shah1, Michael Kilzer1, Son Nghiem1
1Jet Propulsion Laboratory, Pasadena, CA
2UCAR, Boulder, CO

09:40 FGH1-5
GPS STOCHASTIC TEC AND PHASE SCINTILLATION
Charles L. Rino*, Brian Breitsch1, Yu Morton1, Charles Carrano2
1Smead Aerospace Engineering Sciences Department, University of Colorado Boulder, Boulder, CO
2Institute of Scientific Research, Boston College, Boston, MA

10:00 Break

10:20 FGH1-6
COMPARISON OF SIMULATED AND REAL-WORLD DIFFRACTION EFFECTS IN GNSS PHASE MEASUREMENTS USING THE GEOMETRY-IONOSPHERE-FREE COMBINATION
Brian Breitsch*, Charles Rino2, Jade Morton1
1Aerospace / Remote-Sensing, University of Colorado Boulder, Boulder, CO
2Institute for Scientific Research, Boston College, Boston, MA

10:40 FGH1-7
CHARACTERIZATION OF GNSS SCINTILLATIONS OVER THREE NIGERIAN STATIONS; NSUKKA, ILE-IFE AND ILORIN DURING 2010-2012
Andrew Akala*, Patricia Doherty2, Keith Groves2, Charles Carrano2, Christopher Bridgwood2
1University of Lagos, Lagos, NIGERIA
2ISR, Boston College, Boston, MA

11:00 FGH1-8
BEACON DATA PROCESSING FOR THE 2017 RAPID DEPLOYMENT TO JICAMARCA
John P. Swoboda*, Ryan Volz, Anthea J. Coster, Frank D. Lind
Atmospheric Sciences Group, MIT Haystack Observatory, Westford, MA

11:20 FGH1-9
PRELIMINARY SIMULTANEOUS OBSERVATIONS OF THE IONOSPHERE WITH BEACONS, IN-SITU HF RECEIVER AND INCOHERENT SCATTER RADAR IN THE POLAR CAP
Carl L. Siefring*, Paul A. Bernhardt1, H. Gordon James2, Andrew W. Yau1, Roger H. Varney1
1Plasma Physics Division, Naval Research Laboratory, Washington, DC
2Physics and Astronomy, University of Calgary, Calgary, AB, CANADA
3Center for GeoSpace Studies, SRI International, Menlo Park, CA

Session G4: Space-Based Ionospheric Measurements
(Special Session)
Room 151
Session Co-Chairs: Y. Jade Morton, University of Colorado Boulder; Nicolas Lee, Stanford University

30
A NEW TECHNIQUE TO RETRIEVE GLOBAL D- AND E-REGION ELECTRON DENSITY FROM GPS RO
Dong L. Wu*
NASA Goddard Space Flight Center, Greenbelt, MD

ASSESSMENT OF THE IMPACT OF FORMOSAT-7/COSMIC-2 GNSS RO OBSERVATIONS ON MID- AND LOW-LATITUDE IONOSPHERE SPECIFICATION AND FORECASTING USING OBSERVING SYSTEM SIMULATION EXPERIMENTS
Chih-Ting Hsu*, Tomoko Matsuo1, Xinan Yue1, Tzu-Wei Fang3, Timothy Fuller-Rowell1, Kayo Ide1, Jann-Yenq Liu1
1Institute of Space Science, National Central University of Taiwan, Taoyuan, TAIWAN
2Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO
3Chinese Academy of Sciences, Beijing, CHINA

MEASUREMENT OF IONOSPHERIC SCINTILLATION PARAMETERS FROM SYNTHETIC APERTURE RADAR AND THEIR COMPARISON
Shradha Mohanty*, Charles S. Carrano2, Gulab Singh1
1CSRE, Indian Institute of Technology Bombay, Mumbai, Maharashtra, INDIA
2ISR, Boston College, Boston, MA

COLLABORATIVE SPACE AND GROUND-BASED OBSERVATIONS USING THE PUERTO RICO CUBESAT, THE AGUADILLA RADIO ARRAY, AND ARECIBO OBSERVATORY
Brett Isham1, Jan Bergman2, Alireza Mahmoudian3, Amilcar Rincon-Charris1, Fredrik Bruhn3, Peter Funk3, Bjorn Gustavsson4, Terence Bullert5, Linda Krause6
1Interamerican University of Puerto Rico, Bayamón, PR
2Swedish Institute of Space Physics, Uppsala, SWEDEN
3Malardalen University, Vasteras, SWEDEN
4University of Tromsø, Tromso, NORWAY
5University of Colorado, Boulder, CO
6NASA Marshall Space Flight Center, Huntsville, AL

MULTI-DIAGNOSTIC OBSERVATIONS OF EQUATORIAL IONOSPHERIC TURBULENCE
Rezy Pradipta1, Endawoke Yizengaw1, Patricia H. Doherty*
1Institute for Scientific Research, Boston College, Chestnut Hill, MA

Session GH2: Ionospheric Modification
(Special Session)
Room 151
Session Co-Chairs: Robert Moore, University of Florida; Eliana Nossa, SRI
Session H5: Waves and Turbulence in Space and Laboratory Plasmas II  
(Special Session)  
Room 245  
Session Co-Chairs: Stephen Vincena, University of California, Los Angeles; Bill Amatucci, Naval Research Laboratory

08:20 H5-1  
REVIEW OF GROUND-LEVEL INTERFEROMETRY APPLIED TO NATURAL AURORAL RADIO EMISSIONS  
James W. LaBelle*, Adam Burnett  
Dartmouth College, Hanover NH

08:40 H5-2  
ANALYSIS OF ULF WAVES DURING SUBSTORMS OBSERVED IN THE IONOSPHERE FROM THE DAYSIDE GROUND MAGNETOMETER AND IN THE SOLAR WIND FROM THE SATELLITE  
Mergen Alimaganbetov*, Anatoly V. Streltsov  
Embry-Riddle Aeronautical University, Daytona Beach, FL

09:00 H5-3  
STUDIES OF THE MODIFICATION OF LANGMUIR PROBE TRACES IN STRONGLY MAGNETIZED PLASMAS USING THE MAGNETIZED DUSTY PLASMA EXPERIMENT (MDPX) DEVICE  
Edward Thomas*, Spencer LeBlanc, Taylor Hall, Uwe Konopka, Robert L. Merlino, Marlene Rosenberg  
1Physics, Auburn University, Auburn, AL  
2Physics and Astronomy, University of Iowa, Iowa City, IA  
3Electrical and Computer Engineering, University of California - San Diego, La Jolla, CA

09:20 H5-4  
LOW FREQUENCY WAVE EMISSION AND TRANSPORT IN THE PRESENCE OF SINGLE AND MULTIPLE INTERACTING MAGNETIZED TEMPERATURE STRIATIONS  
Richard Sydora*, Scott Karbashewski, Bart Van Compernolle, Matt Poulos, George Morales  
1Physics, University of Alberta, Edmonton, Alberta, CANADA  
2Physics and Astronomy, University of New Mexico, Albuquerque, NM

10:00 Break

10:20 H5-5  
DIRECT IN SITU OBSERVATIONS OF WHISTLER-MODE CHORUS MODULATION OF 500EV EDI ELECTRONS BY MMS  
Kristoff Paulson*, Matthew Argall, Narges Ahmadi, Hiroshi Matsui, Charlie Farrugia, Terry Forbes, Roy Torbert, Hans Vaith, Olivier Le Contel, Hugo Breuillard  
1Space Science Center, University of New Hampshire, Durham, NH  
2LASP, University of Colorado Boulder, Boulder, CO  
3Southwest Research Institute, Durham, NH  
4Laboratory of Plasma Physics, Paris, FRANCE

10:40 J4-3  
VLBA SCIENCE HIGHLIGHTS  
Greg B. Taylor*  
Physics and Astronomy, University of New Mexico, Albuquerque, NM

10:20 J4-4  
VERY LONG BASELINE INTERFEROMETRY (VLBI) IN THE AGE OF FERMI AND GAIA  
Frank K. Schinzel*†, Leonid Petrov‡  
1National Radio Astronomy Observatory, Socorro, NM  
2Astrogeo Center, Falls Church, VA

10:40 J4-5  
POLARIZATION EVOLUTION OF PARSEC-SCALE JETS IN ACTIVE GALACTIC NUCLEI  
Matthew L. Lister*  
Physics and Astronomy, Purdue University, West Lafayette, IN

10:00 Break

10:20 J4-6  
MASER OBSERVATIONS WITH VLBI  
Ylva Pihlstrom*  
Physics and Astronomy, University of New Mexico, Albuquerque, NM

10:40 J4-7  
GRAVITATIONAL LENSES AS HIGH-RESOLUTION TELESCOPES  
Anna Barnacka*  
Harvard University, Cambridge, MA

11:00 J4-8  
ASTROMETRY WITH VLBI  
Robert T. Zavala*†, Gregory B. Taylor‡  
1US Naval Observatory Flagstaff Station, Flagstaff, AZ  
2Astronomy, University of New Mexico, Albuquerque, NM
TOWARDS THE ICRF3: COMPARING USNO 2016A VLBI GLOBAL SOLUTION TO GAIA AND ICRF2
Megan C. Johnson*, Julien Frouard, Alan L. Fey, Bryan N. Dorland, Valeri Makarov
Astrometry, United States Naval Observatory, Washington, DC

Session J5: New Telescopes, Techniques and Technology III
(Special Session)
Room 200
Session Co-Chairs: Danny Jacobs, Arizona State University; David DeBoer, University of California, Berkeley

08:20 J5-1
REAL-TIME BEAMFORMING FOR THE FOCAL-PLANE L-BAND ARRAY FEED ON THE GREEN BANK TELESCOPE (FLAG)
Mark W. Ruzindana*, Karl F. Warnick¹, Brian D. Jeffs¹
Richard A. Black¹, Mitchell Burnett¹, D. J. Pisano²
Duncan R. Lorimer², Nicholas Pingel², Kaustubh Rajwade²,
Richard M. Prestage², Steve White², Bob Simon²,
Luke Hawkins², William Shillue², D. A. Roshi³
¹Electrical/Computer Engineering, Brigham Young University, Provo, UT
²Physics and Astronomy, West Virginia University, Morgantown, WV
³Green Bank Observatory, Green Bank, WV

08:40 J5-2
PERFORMANCE ESTIMATES FOR THE NEXT-GENERATION VERY LARGE ARRAY
Robert J. Selina*, Brian Butler, Eric J. Murphy
National Radio Astronomy Observatory, Socorro, NM

09:00 J5-3
A STUDY OF THE COMPACT WATER VAPOR RADIOMETER FOR THE KARL G. JANSKY VERY LARGE ARRAY
Ajay Gill*, Robert Selina², Bryan Butler²
¹Electrical and Computer Engineering, University of Toronto, Toronto, Ontario, CANADA
²National Radio Astronomy Observatory, Socorro, NM

09:20 J5-4
NEXT GENERATION SETI AND CASPER EXPERIMENTS
Dan Werthimer*
Astronomy, University of California, Berkeley, Berkeley, CA

09:40 J5-5
21-CM POWER-SPECTRUM ANALYSES OF THE 3C196 FLANKING FIELD
Nivedita Mahesh*, Andre R. Offringa¹
¹School of Earth & Space Exploration, Arizona State University, Tempe, AZ
²Netherlands Institute of Radio Astronomy, Dwingeloo, NETHERLANDS

10:00 Break

11:00 J5-6
SCATTERING STUDY OF PULSARS BELOW 100 MHZ
Karishma Bansal*, Greg Taylor¹, Kevin Stovall²
¹Physics & Astronomy, University of New Mexico, Albuquerque, NM
²NRAO, Socorro, NM

11:20 J5-7
COMPLEMENTARY STUDY OF JUNO/MWR INVESTIGATION OF JUPITER’S SYNCHROTRON EMISSION FROM GROUND-BASED OBSERVATIONS AT LOW FREQUENCIES
Daniel Santos-Costa¹, Masafumi Imai², Scott J. Bolton¹,
Steve M. Levin¹, Mike A. Janssen¹, Philippe Zarka³,
Julien Girard³, Cyril Tasse³, Hajime Kita³, Fuminori Tsuchiya³,
Hiroyuki Misawa³, Jack E. Connerney³
¹Southwest Research Institute, San Antonio, TX
²University of Iowa, Iowa City, IA
³Jet Propulsion Laboratory / Caltech, Pasadena, CA

11:40 J5-10
BUILDING CONFIDENCE IN EOR POWER SPECTRUM LIMITS
Miguel F. Morales*
Physics, University of Washington, Seattle, WA

SATURDAY NOON, 6 January 2018
Fifth Hans Liebe Lecture Event
Math 100

12:15 HL -1
SPECTROSCOPY AND REMOTE SENSING STUDIES WITH THE ATMOSPHERIC RADIATION MEASUREMENT (ARM) GROUND-BASED MICROWAVE AND MILLIMETER-WAVE RADIOMETERS: A REVIEW OF ACCOMPLISHMENTS AND RECENT CHALLENGES
Maria P. Cadeddu*
Argonne National Laboratory, Lemont, IL
<table>
<thead>
<tr>
<th>Time</th>
<th>Session B15: Antenna Arrays</th>
<th>Location</th>
<th>Chair(s)</th>
<th>Title</th>
<th>Authors</th>
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<tbody>
<tr>
<td>13:20</td>
<td>B15-1</td>
<td>Room 1B40</td>
<td>Randy Haupt, Colorado School of Mines; Dimitra Psychogiou, University of Colorado Boulder</td>
<td>Concentric Ring Array of Connecting Spirals with Interleaved Waves</td>
<td>Pedro Mendes Ruiz*, Israel Hinostroza¹, Regis Guinvarch¹, Randy Haupt²</td>
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<td>¹SONDRA, CentraleSupelec, Gif-sur-yvette, FRANCE ²Electrical Engineering, Colorado School of Mines, Golden, CO</td>
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<td>14:00</td>
<td>B15-3</td>
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<td>Assumptions Needed for a Valid Average Element Pattern in a Three Dimensional Array</td>
<td>Alan L. O’Donnell*, Robert McGwier</td>
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<td>Average Element Pattern for a Three Dimensional Array</td>
<td>Alan L. O’Donnell*, Robert McGwier</td>
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<td>Wideband Monostatic Co-Polarized Co-Channel Simultaneous Transmit and Receive Omnidirectional and Broadside Antenna Arrays</td>
<td>Ehab Etellisi*, Mohamed Elmansouri, Dejan Filipovi</td>
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<td>Measured Performance of an Electrically Thin Broadband Antenna</td>
<td>Steven Weiss*</td>
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<td>16:00</td>
<td>B15-8</td>
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<td></td>
<td>Analytical Effective Length Comparisons of Circularly Distributed Antenna Arrays</td>
<td>Timi Adeyemi*, Kristopher Buchanan, Carlos Flores-Molina, Sara Wheeland, Drew Overturf</td>
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<td>Sidelobe Behavior and Bandwidth Characteristics of Distributed Antenna Arrays</td>
<td>Kristopher R. Buchanan, Timi Adeyemi*, Carlos Flores-Molina, Sara Wheeland, Drew Overturf</td>
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<td>Compact Wide-Angle Circular Polarized Sequential Rotated Quarter Sector Patch Antenna with Notches for Phased Array Applications</td>
<td>Ghanshyam Mishra*, Satish K. Sharma</td>
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<td>Low-Dielectric Constant Materials in Additive Manufacturing for Improved Air Interface Matching in High Frequency Applications</td>
<td>Paul E. Parsons*¹, Zachary J. Larimore¹, Mark S. Mirotznik²</td>
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<td>Steven Weiss*</td>
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Session B16: Antenna Development using Additive Manufacturing

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<th>Time</th>
<th>Session B16: Antenna Development using Additive Manufacturing</th>
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<th>Chair(s)</th>
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<tr>
<td>13:20</td>
<td>B16-1</td>
<td>Room 1B40</td>
<td>Steven Weiss, US Army Research Lab; Seth McCormick, US Army Research Lab</td>
<td>Low-Dielectric Constant Materials in Additive Manufacturing for Improved Air Interface Matching in High Frequency Applications</td>
<td>Paul E. Parsons*¹, Zachary J. Larimore¹, Mark S. Mirotznik²</td>
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<td>Steven Weiss*</td>
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34
14:20 B16-4
ULTRA-LOW PROFILE WIDEBAND TIGHTLY COUPLED DIPOLE ARRAY
Alexander D. Johnson*, John L. Volakis
Florida International University, Miami, FL

Session B17: Millimeter-Wave and 5G Antennas and Systems
(Special Session)
Room 200
Session Co-Chairs: Shubhendu Bhawardaj, Florida International University;
Joshua Kovitz, Georgia Tech Research Institute

15:20 B17-1
ANTENNAS FOR 5G: TRENDS, CHALLENGES, AND POTENTIAL SOLUTIONS
Joshua M. Kovitz*1, Shubhendu Bhawardaj2
1Advanced Concepts Laboratory, Georgia Tech Research Institute, Atlanta, GA
2Electrical and Computer Engineering, Florida International University, Miami, FL

15:40 B17-2
INTERFERENCE MITIGATION FOR 5G MILLIMETER WAVE COMMUNICATIONS
Dimitrios Siafarikas*, Elias A. Alwan, John L. Volakis
Electrical and Computer Engineering, Florida International University, Miami, FL

16:00 B17-3
WIRELESS ENERGY HARVESTING FROM 700-900 MHZ
Brock J. DeLong*, Cedric W. L. Lee1, Asimina Kiourti1,
Satheesh Bojja Venkatakrishnan1, John L. Volakis1
1ECE, The Ohio State University, Columbus, OH
2CEC, Florida International University, Miami, FL

16:20 B17-4
IMPACT OF MULTIPLE LENS REFLECTIONS ON THE PERFORMANCE OF LENS-INTEGRATED THz ANTENNAS
Burak Ozbey*, Kubilay Sertel
ElectroScience Laboratory, The Ohio State University, Columbus, OH

16:40 B17-5
TUNED ZERO-BIAS SCHOTTKY DIODE DETECTORS FOR MICROWAVE RADIOMETERS
Colton R. Dunlap*
Boulder Environmental Sciences and Technology, Boulder, CO

17:00 B17-6
CIRCULARLY POLARIZED METAL ANTENNAS AND CHARACTERIZATION-METHODS FOR SUB-MM-WAVE AND TERAHERTZ FREQUENCIES
Shubhendu Bhawardaj*
Electrical and Computer Engineering, Florida International University, Miami, FL

Session B18: Guided Waves and Wireless Propagation
Room 105
Session Co-Chairs: Jiefu Chen, University of Houston; Valery Zavorotny, NOAA/Earth System Research Laboratory

15:20 B18-1
MODAL ANALYSIS OF A PARALLEL-PLATE WAVEGUIDE CONTAINING AN INTERNAL PERFORATED SHEET
Nick J. Krull*, Edward F. Kuester
Electrical, Computer and Energy Engineering, CU Boulder, Boulder, CO

15:40 B18-2
GENERALIZED SCATTERING MATRIX COMPUTATION BASED ON 2-D AND 3-D HIGHER ORDER FEM AND MODE MATCHING FOR UNDERGROUND MINE TUNNEL MODELING
Sanja B. Manic*, Milan M. Ilic1,2, Branislav M. Notaros1
1Electrical and Computer Engineering, Colorado State University, Fort Collins, CO
2School of Electrical Engineering, University of Belgrade, Belgrade, Serbia, YUGOSLAVIA

16:00 B18-3
DUAL-MODE WAVEGUIDE CAVITY FILTERS AND MULTIPLEXERS
Zheng Wang*
Boulder Environmental Sciences and Technology, Boulder, CO

16:20 B18-4
ULTRA-WIDEBAND RING-CAVITY POWER COMBINER
V. Foroutan1, O. Manoochehri*1, A. Darvazehban1, F. Farzami1 and D. Erricolo1
1Electrical and Computer Engineering, University of Illinois at Chicago
2Amirkabir University of Technology

16:40 B18-5
DOWNHOLE WIRELESS COMMUNICATION USING MAGNETIC INDUCTION TECHNIQUE
Li Yan*, Debing Wei, Miao Pan, Jiefu Chen
Electrical and Computer Engineering, University of Houston, Houston, TX

17:00 B18-6
ON CALCULATION OF THE ELECTROMAGNETIC FIELD IN THE VICINITY OF A TRANSMITTER LOCATED NEAR THE DIELECTRIC HALF-SPACE
Alexander G. Voronovich*, Valery U. Zavorotny
Physical Sciences Division, NOAA/Earth System Research Laboratory, Boulder, CO

Session BGH1: Techniques for Modeling of Waves in Plasmas
(Special Session)
Room 135
Session Co-Chairs: Mark Golkowski, University of Colorado Denver; Robert Lysak, University of Minnesota
SATURDAY AFTERNOON, continued

13:20 BGH1-1
NUMERICAL MODELING OF ULF WAVES IN EARTH’S MAGNETOSPHERE: IONOSPHERIC EFFECTS
Robert L. Lysak*, Yan Song¹, Colin L. Waters², Murray D. Sciffer³
¹University of Minnesota, Minneapolis, MN
²University of Newcastle, Callaghan, NSW, AUSTRALIA

13:40 BGH1-2
3D SIMULATION OF PROPAGATION OF EMIC WAVES IN EARTH’S MAGNETOSPHERE AND IONOSPHERE
Dmytro Sydorenko, Robert Rankin*
Physics, University of Alberta, Edmonton, Alberta, CANADA

14:00 BGH1-3
FINITE DIFFERENCE SIMULATION OF MAGNETOSPHERIC EMIC AND WHISTLER MODE WAVES
Poorya Hosseini*, Mark Golkowski, Vijay Harid
Electrical Engineering, University of Colorado Denver, Denver, CO

14:20 BGH1-4
GRID-BASED METHODS FOR SIMULATING ELECTROMAGNETIC WAVES IN COLLISION FREE PLASMAS
Vijay Harid*
Electrical Engineering, University of Colorado Denver, Denver, CO

14:40 BGH1-5
HIGH-PERFORMANCE NUMERICAL SIMULATION OF RF WAVE HEATING AND SHEATH EFFECTS IN FUSION PLASMAS
Thomas G. Jenkins*
Tech-X Corporation, Boulder, CO

Session C1: Advances in Signal Processing and Distributed Sensor Arrays
Room 150
Session Co-Chairs: Gregory Huff, Texas A & M University; Jean-Francois Chamberland, Texas A&M University; Eric Mokole, The MITRE Corporation

13:20 C1-1
EXPLOITING INTER VOXEL CORRELATION IN COMPRESSED COMPUTATIONAL IMAGING
Naren Viswanathan*, Suresh Venkatesh, David Schurig
University of Utah, Salt Lake City, UT

13:40 C1-2
MULTI-ELEMENT COHERENT DISTRIBUTED ARRAY FOR IDENTIFYING AND GEO-LOCATING TRANSMITTERS
Chanci N. King*, Albin J. Gasiewski
ECCE, University of Colorado Boulder, Boulder, CO

14:00 C1-3
FAST SUCCESSIVE SPECTRAL ESTIMATION OF IRREGULARLY SAMPLED DATA
Peter A. Parker*
Los Alamos National Laboratory, Los Alamos, NM

14:20 C1-4
PHENOMENOLOGY OF SIGNALS DEGRADED BY PHASE NOISE
Roger P. Cutitta*, Charles R. Dietlein
U.S. Army Research Laboratory, Adelphi MD

14:40 C1-5
FORWARD-LOOKING SAR MOVING TARGET IMAGING VIA JOINT TIME-FREQUENCY TRANSFORM AND INTERFEROMETRIC PROCESSING
Matthew J. Burfeindt*
Air Force Research Laboratory, Eglin AFB, FL

15:00 Break

15:20 C1-6
SOFTWARE-DEFINED CONTROL OF PATTERN AND POLARIZATION RECONFIGURABLE ANTENNAS IN EDGE NETWORKS
Texas A & M University, College Station, TX

15:40 C1-7
DIGITAL RF: A SOFTWARE PACKAGE TO IMPLEMENT EFFECTIVE RF DATA STRATEGIES USING SOFTWARE-DEFINED RADIO ARCHITECTURES
Frank D. Lind¹, Philip J. Erickson¹, William Rideout¹, Ryan Volz¹, John P. Swoboda*, Juha Vierinen²
¹Atmospheric Sciences Group, MIT Haystack Observatory, Westford, MA
²Physics, University of Tromso, Tromso, NORWAY

16:00 C1-8
GPM AND WEATHER RADAR INTEGRATION IN COLOMBIA FOR PRECIPITATION MEASUREMENT
Ivan Arias*, V. Chandrasekar
Electrical and Computer Engineering, Colorado State University, Fort Collins, CO

16:20 C1-9
ENSEMBLE DETECTION ANALYSIS IN SPACE-BORNE DOPPLER MEASUREMENTS
Mustafa Aksoy*, Paul E. Racette¹, Lihua Li²
¹University at Albany, SUNY, Albany, NY
²NASA Goddard Space Flight Center, Greenbelt, MD
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<th>Time</th>
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<td>15:00</td>
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<td>1. Simpson College, Indiana, IA</td>
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<td>4. National Institute of Standards and Technology, Gaithersburg, MD</td>
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<td>5. Station de radioastronomie de Nancy, Nancy, FRANCE</td>
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<td>6. West Virginia University, Morgantown, WV</td>
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<td>15:40</td>
<td>FEJ1-1</td>
<td>SMAP: ANALYSIS OF RESIDUAL RADIO FREQUENCY INTERFERENCE SOURCES</td>
<td>Gonzalo A. Cucho-Padrin*, Lara Waldrop, Farzad Kamalabadi, Tian Zhi, Wang Yue*</td>
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<td>2. Electrical and Computer Engineering, George Mason University, Fairfax, VA</td>
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<td>1. Dept of ECEE, University of Colorado, Boulder</td>
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<td>2. Blackswift Technologies LLC, Boulder</td>
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<td>13:40</td>
<td>FEJ1-3</td>
<td>AN RFI MITIGATION STRATEGY TO IMPROVE PROTECTION OF GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) RADIO OCCULTATION (RO) MEASUREMENTS FOR EARTH OBSERVATION</td>
<td>David B. Kunkee*, David G. Lubar, Paul H. Kim</td>
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<td>The Aerospace Corporation, Los Angeles, CA</td>
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<td>14:00</td>
<td>FEJ1-4</td>
<td>A MINIATURE NULLSTEERING GPS ANTENNA</td>
<td>Yue Zheng*, Yikun Huang, Yuanxun E. Wang</td>
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<td>University of California, Los Angeles, Los Angeles, CA</td>
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<td>14:20</td>
<td>FEJ1-5</td>
<td>AUTOMATED TUNING OF RFI IDENTIFICATION AND FLAGGING ALGORITHMS</td>
<td>Urvashi Rau*, Bruno J. Martins*</td>
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<td>1. National Radio Astronomy Observatory, Socorro, New Mexico</td>
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<td>2. UNISUL, Tubarao, Brazil</td>
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<td>15:00</td>
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<td>15:40</td>
<td>G5-1</td>
<td>WHAT IS NEEDED TO FORECAST SPORADIC E?</td>
<td>Chia-Hung K. Chen, Charles Lin, Tomoko Matsuo, Jann-Yenq Liu</td>
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<td>2. Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, CO</td>
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<td>3. Space Weather Prediction Center, National Oceanic and Atmospheric Administration, CO</td>
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<td>4. Institute of Space Science, National Central University, Taoyuan, TAIWAIN</td>
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<td>5. Center for Space and Remote Sensing Research, National Central University, Taoyuan, TAIWAN</td>
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<td>16:00</td>
<td>G5-3</td>
<td>ON THE MORPHOLOGY OF THE EQUATORIAL EVENING VORTEX</td>
<td>Samuel A. Shidler, Fabiano S. Rodrigues, Bela G. Fejer</td>
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<td>2. Utah State University, Logan, UT</td>
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16:20 G5-4
IONOSPHERIC IMAGING USING RADIO OCCULTATION AND TOPSIDE TEC DATA FROM COMMERCIAL LOW EARTH ORBIT SATELLITES
Victoriya V. Forsythe, Donald Hampton*
University of Alaska Fairbanks, Geophysical Institute, Fairbanks, AK

16:40 G5-5
MAPPING THE D-REGION IONOSPHERE WITH A NETWORK OF VLF TRANSMITTERS AND RECEIVERS
Forrest W. Gasdia*, Robert A. Marshall
Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO

17:00 G5-6
ISR SPECTRA SIMULATIONS WITH ELECTRON-ION COULOMB COLLISIONS
William J. Longley*1, Meers M. Oppenheim1, Alex C. Fletcher1,2, Yakov S. Dimant1
1Center for Space Physics, Boston University, Boston, MA
2Physics, Massachusetts Institute of Technology, Cambridge, MA

Session HEG1: Lightning and the Ionosphere (Special Session)
Room 245
Session Co-Chairs: Victor Pasko, Penn State University; Robert Marshall, University of Colorado Boulder

13:20 HEG1-1
TERRESTRIAL GAMMA-RAY FLASH (TGF) OBSERVATIONS WITH FERMI GBM
Michael S. Briggs*1, Oliver J. Roberts2, Matthew Stanbro1, Eric S. Cramer1, Robert H. Holsworth1, J E. Grove4, A Chekhtman1, Shelia McBreen6
1CSPAR, University of Alabama in Huntsville, Huntsville, AL
2USRA, USRA, Huntsville, AL
3Earth and Space Sciences, University of Washington, Seattle, WA
4Space Science Division, NRL, Washington, DC
5College of Science, George Mason University, Fairfax, VA
6School of Physics, University College Dublin, Dublin, IRELAND

13:40 HEG1-2
MODELING OF X-RAY IMAGES AND ENERGY SPECTRA PRODUCED BY STEPPING LIGHTNING LEADERS
Wei Xu*1, Robert A. Marshall1, Sebastien Celestin2, Victor P. Pasko3
1Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO
2Laboratory of Physics and Chemistry of the Environment and Space (LPC2E), University of Orleans, Orleans, FRANCE
3Communications and Space Sciences Laboratory, The Pennsylvania State University, University Park, PA

14:00 HEG1-3
FIELD ENHANCEMENT AND RADIO EMISSIONS FROM HEAD-ON COLLISION OF STREAMERS
Feng Shi*, Ningyu Liu, Joseph R. Dwyer
Physics and Space Science Center (EOS), University of New Hampshire, Durham, NC

14:20 HEG1-4
VHF INTERFEROMETRIC IMAGING OF THE INITIATION AND PROPAGATION OF IN-CLOUD LIGHTNING LEADERS
Steven Cummer*1, Fanchao Lyu1, Zilong Qin1, Mingli Chen2
1Electrical and Computer Engineering, Duke University, Durham, NC
2Building Service Engineering, The Hong Kong Polytechnic University, Hung Hom, Hong Kong, CHINA

14:40 HEG1-5
SECONDARY EFFECTS OF LIGHTNING-INDUCED ELECTRON PRECIPITATION: CHEMICAL EFFECTS, OPTICAL EMISSIONS, AND X-RAYS
Robert A. Marshall*1, Wei Xu1, Austin Sousa1, Antti Kero3
1Smead Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO
2Aeronautics and Astronautics, Stanford University, Stanford, CA
3Sodankyla Geophysical Observatory, University of Oulu, Oulu, FINLAND

15:00 Break

15:20 HEG1-6
LWPC MODELING OF VLF PERTURBATIONS FROM LIGHTNING INDUCED ENERGETIC ELECTRON PRECIPITATION ON OVERLAPPING PATHS OF PROPAGATION
Chad M. Renick*, Mark Golkowski1, Sandeep Sarker1, Morris Cohen2
1Electrical Engineering, University of Colorado Denver, Denver, CO
2Electrical and Computer Engineering, Georgia Tech, Atlanta, GA

15:40 HEG1-7
PROPAGATION ANALYSIS OF DAYTIME Tweek ATMOSPHERICS ORIGINATING FROM EUROPEAN NORTH ATLANTIC WINTER THUNDERSTORMS
Ondrej Santolik*1,2, Ivana Kolmasova1,2
1Institute of Atmospheric Physics CAS, Prague, CZECH REPUBLIC
2Faculty of Mathematics and Physics, Charles University, Prague, CZECH REPUBLIC

16:00 HEG1-8
REAL-TIME ESTIMATION OF IONOSPHERIC PARAMETERS FROM VLF ATMOSPHERICS USING MACHINE-LEARNED MODELS
Andre Lucas Antunes de Sa*, Robert A. Marshall
Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO
IONOSPHERIC D-REGION REMOTE SENSING USING ELF SFERICS
Mark Golkowski¹, Sandeep Sarker¹, Chad Renick¹,
Robert C. Moore², Morris B. Cohen¹
¹Electrical Engineering, University of Colorado Denver, Denver, CO
²Electrical and Computer Engineering, University of Florida,
Gainesville, FL
³Electrical and Computer Engineering, Georgia Institute of
Technology, Atlanta, GA

Session J6: Spectral Line Cosmology and Low-Frequency
Arrays
(Special Session)
Room 265
Session Co-Chairs: David DeBoer, University of California,
Berkeley; Greg Taylor, University of New Mexico

13:20 J6-1
PULSARS AT LOW FREQUENCIES
Kevin Stovall*
National Radio Astronomy Observatory, Socorro, NM

13:40 J6-2
21CM POWER SPECTRUM LESSONS: UPDATED
RESULTS FROM THE PAPER EXPERIMENT
Carina Cheng*, Paper Collaboration
University of California, Berkeley, Berkeley CA

14:00 J6-3
THE VLA LOW BAND IONOSPHERE AND TRANSIENT
EXPERIMENT (VLITE)
Tracy Clarke¹, Namir Kassim¹, Simona Giacintucci¹,
Wendy Peters¹, Emil Polisensky¹, Joseph Helmboldt¹,
Emily Richards²
¹Naval Research Laboratory, Washington, DC
²National Research Council, Washington, DC

14:20 J6-4
LATEST RESULTS FROM EDGES
Judd D. Bowman*¹, Alan E. E. Rogers², Raul A. Monsalve³,⁴,
Thomas J. Mездzen³, Nivedita Mahesh³
¹School of Earth and Space Exploration, Arizona State University,
Tempe, AZ
²Haystack Observatory, Massachusetts Institute of Technology,
Westford, MA
³Center for Astrophysics and Space Astronomy, University of
Colorado, Boulder, CO
⁴Facultad de Ingenieria, Universidad Catolica de la Santisima
Concepcion, Concepcion, CHILE

14:40 J6-5
THE LWA1 LOW FREQUENCY SKY SURVEY
Jayce Dowell*¹, Gregory B. Taylor¹, Frank Schinzel¹,⁴,
Namir E. Kassim¹, Kevin Stovall¹,²
¹Physics and Astronomy, University of New Mexico, Albuquerque, NM
²National Radio Astronomy Observatory, Socorro, NM
³Radio Astrophysics and Sensing Section, Naval Research
Laboratory, Washington, DC

15:00 Break

15:20 J6-6
HYPERION: A NOVEL APPROACH TO OBSERVING THE
REIONIZATION GLOBAL SIGNAL
Kara Kundert*, Aaron Parsons
Astronomy, University of California, Berkeley, Berkeley, CA

15:40 J6-7
IMPROVED 21CM EPOCH OF REIONIZATION POWER
SPECTRUM MEASUREMENTS WITH A HYBRID
FOREGROUND SUBTRACTION AND AVOIDANCE
TECHNIQUE
Joshua Kerrigan*
Brown University, Providence, RI

16:00 J6-8
STEREOSCOPIC OBSERVATIONS OF JUPITER’S
DECAMETRIC RADIO BURSTS WITH JUNO, CASSINI,
STEREO A, WIND AND EARTH-BASED RADIO
OBSERVATORIES
Masatumi Imai*, William S. Kurth¹, George B. Hospodarsky¹,
Scott J. Bolton², John E. P. Connerney¹, Steven M. Levin¹,
Alain Lecacheux¹, Laurent Lamy¹, Philippe Zarka¹,
Tracy E. Clarke², Charles A. Higgins³
¹University of Iowa, Iowa City, IA
²Southwest Research Institute, San Antonio, TX
³NASA Goddard Space Flight Center, Greenbelt, MD
⁴Jet Propulsion Laboratory, Pasadena, CA
⁵Observatoire de Paris, Meudon, FRANCE
⁶Naval Research Laboratory, Washington, DC
⁷Middle Tennessee State University, Murfreesboro, TN

16:20 J6-9
ADDRESSING FOREGROUNDS AND SYSTEMATICS FOR
IMAGING THE 21CM REIONIZATION SIGNAL
Aaron Parsons*
Astronomy, University of California, Berkeley, Berkeley, CA

16:40 J6-10
NGLOBO HIGH RESOLUTION, LOW-FREQUENCY
IMAGING AND HIGH-Z HI COSMOLOGY: THE LONG
VIEW TOWARDS INSTRUMENTAL CONVERGENCE
Namir E. Kassim*
Remote Sensing Division, Naval Research Laboratory, Washington, DC

SUNDAY MORNING, 7 January 2018
08:00 – 11:00 USNC-URSI Executive Council Breakfast
Meeting, Marriott Hotel