

**National Radio Science Meeting**  
**4-7 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**

Co-Chairs: Seth McCormick, *US Army Research Lab*;  
Mitchell Gregory, *US Army Research Lab*

**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\*<sup>1,2</sup>, Elias A. Alwan<sup>1</sup>, John L. Volakis<sup>1</sup>

<sup>1</sup>*Florida International University, Miami, FL*

<sup>2</sup>*The Ohio State University, Columbus, OH*

**09:20 A1-4**

RECONFIGURABLE INTRA-CHIP ANTENNA FOR FUTURE WIRELESS COMMUNICATIONS

Yashika Sharma\*<sup>1</sup>, Junqiang Wu<sup>1</sup>, Adnan Kantemur<sup>1</sup>, Jinpil Tak<sup>1</sup>, Avinash Kodi<sup>2</sup>, Savas Kaya<sup>2</sup>, Ahmed Lour<sup>3</sup>, Hao Xin<sup>1</sup>

<sup>1</sup>*Electrical and Computer Engineering Department, University of Arizona, Tucson, AZ*

<sup>2</sup>*Electrical Engineering and Computer Science, Ohio University, Athens, OH*

<sup>3</sup>*Department of Electrical and Computer Engineering, George Washington University, Washington, D.C.*

**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\*<sup>1</sup>, Takehiko Kobayashi<sup>1</sup>, Atsushi Tomiki<sup>2</sup>  
<sup>1</sup>*Wireless Systems Laboratory, Tokyo Denki University, Adachi-ku, Tokyo, JAPAN*  
<sup>2</sup>*Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, Sagami-hara, 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\*<sup>1</sup>, Ariel Epstein<sup>2</sup>, George V. Eleftheriades<sup>1</sup>

<sup>1</sup>*The Edward S. Rogers Department of Electrical and Computer Engineering, University of Toronto, Toronto, ON, CANADA*

<sup>2</sup>*Andrew 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\*<sup>1</sup>, Edward F. Kuester<sup>2</sup>

<sup>1</sup>*NIST, Boulder, CO*

<sup>2</sup>*University of Colorado, Boulder, CO*

**09:40 B1-5**

ASTERISK-SHAPED-APERTURE ARRAY OPTICAL METASURFACES AT TELECOMMUNICATIONS WAVELENGTHS

Mitchell Semple\*<sup>1</sup>, Aaron C. Hryciw<sup>2</sup>, Ashwin K. Iyer<sup>1</sup>

<sup>1</sup>*Electrical and Computer Engineering, University of Alberta, Edmonton, AB, CANADA*

<sup>2</sup>*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\*<sup>1</sup>, Alexander B. Yakovlev<sup>2</sup>, Alexander Holmes<sup>1</sup>

<sup>1</sup>*Dept. of Electrical Engineering, University of Wisconsin Milwaukee, Milwaukee, WI*

<sup>2</sup>*Dept. of 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 Kalhor\*, 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 Raisi\*, 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\*<sup>1,2</sup>, Ilya O. Sukharevsky<sup>3</sup>, Ayhan Altintas<sup>2</sup>

<sup>1</sup>*Wellman Center for Photomedicine, Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts*

<sup>2</sup>*Bilkent University, Ankara, TURKEY*

<sup>3</sup>*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\*<sup>1</sup>, Alexandra Bringer<sup>1</sup>, Joel T. Johnson<sup>1</sup>, Kenneth C. Jezek<sup>2</sup>, Domenic Belgiovane<sup>1</sup>, Julie Miller<sup>2</sup>, Michael Durand<sup>2</sup>, Caglar Yardim<sup>1</sup>, Chi-Chih Chen<sup>1</sup>, Leung Tsang<sup>3</sup>, Shurun Tan<sup>3</sup>, Mohammedreza Sanamzadeh<sup>3</sup>, Vladimir Leuski<sup>4</sup>, Giovanni Macelloni<sup>5</sup>, Marco Brogioni<sup>5</sup>

<sup>1</sup>*ElectroScience Laboratory, The Ohio State University, Columbus, OH*

<sup>2</sup>*Byrd Polar Research Center, The Ohio State University, Columbus, OH*

<sup>3</sup>*University of Michigan, Ann Arbor, MI*

<sup>4</sup>*Microwave Radiometers and Antennas, Inc., Louisville, CO*

<sup>5</sup>*Institute 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\*<sup>1</sup>, Carl L. Siefring<sup>1</sup>, Stan J. Briczinski<sup>1</sup>, Mike McCarrick<sup>2</sup>, Andrew Howard<sup>3</sup>, Gordon James<sup>3</sup>, Andrew Yau<sup>3</sup>, William Bristow<sup>4</sup>

<sup>1</sup>*Plasma Physics, NRL, Washington, DC*

<sup>2</sup>*Information Technology, NRL, Washington, DC*

<sup>3</sup>*Physics and Astronomy, University of Calgary, Calgary, Alberta, CANADA*

<sup>4</sup>*Physics, 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 INFERENCE METHOD

Qiuyang Shen\*, Zhu Han, Jiefu Chen

*Department of 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 Lu<sup>\*1</sup>, Qiuyang Shen<sup>1</sup>, Xuqing Wu<sup>2</sup>, Jiefu Chen<sup>1</sup>, Xin Fu<sup>1</sup>

<sup>1</sup>*Department of Electrical and Computer Engineering, University of Houston, Houston, TX*

<sup>2</sup>*Department of Information 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 He<sup>\*1,2</sup>, Albin J. Gasiewski<sup>1</sup>, Kun Zhang<sup>1</sup>

<sup>1</sup>*Center for Environmental Technology (CET),, University of Colorado Boulder, Boulder, CO*

<sup>2</sup>*Key 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<sup>\*1</sup>, Walter Petersen<sup>2</sup>, David Wolff<sup>3</sup>, V. Chandrasekar<sup>4</sup>

<sup>1</sup>*University of Colorado Boulder, Boulder, CO*

<sup>2</sup>*NASA Marshall Space Flight Center, Huntsville, AL*

<sup>3</sup>*NASA Wallops Space Flight Center, Wallops Island, VA*

<sup>4</sup>*Colorado State University, Fort Collins, CO*

**09:40 F2-5**

AN ACTIVE SONDE FOR LOCAL REMOTE SENSING OF CLOUD AND PRECIPITATION  
DYNAMICS

Soumojit Bose\*, Albin J. Gasiewski

*NOAA-CU Center for Environmental Technology, University of Colorado, Boulder*

**10:00 Break**

**10:20 F2-6**

NOWCASTING OF AN X-BAND DUAL-POLARIZATION RADAR DURING SOUTHERN CHINA MONSOON RAINFALL FIELD CAMPAIGN

Zhao Shi\*<sup>1,2</sup>, V. Chandrasekar<sup>3</sup>, Jianxin He<sup>1,2</sup>, Lijuan Wang<sup>1,2</sup>

<sup>1</sup>*Chengdu University of Information Technology, Chengdu, SC, CHINA*

<sup>2</sup>*Key Laboratory of Atmosphere Sounding, CMA, Chengdu, SC, CHINA*

<sup>3</sup>*Colorado State University, Fort Collins, CO*

**10:40 F2-7**

NEURAL NETWORK RAINFALL ESTIMATION BASED ON GPM DUAL-FREQUENCY PRECIPITATION RADAR MEASUREMENTS

Haiming 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 DISDROMETERS

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*

**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 Dai<sup>1</sup>, Aravind Venkitasubramony\*<sup>1</sup>, Albin J. Gasiewski<sup>1</sup>, Maciej Stachura<sup>2</sup>, Jack Elston<sup>2</sup>

<sup>1</sup>*ECEE, University of Colorado Boulder, Boulder, CO*

<sup>2</sup>*Black Swift Technologies (BST) LLC, Boulder, CO*

**11:20 F3-4**

QUANTIFYING COLLABORATION IN THE EARTH SCIENCES AS A RESULT OF THE EARTHCUBE PROJECT

Ryan Gooch\*<sup>1</sup>, V Chandrasekar<sup>1</sup>, Simon Goring<sup>2</sup>

<sup>1</sup>*Colorado State University, Fort Collins, CO*

<sup>2</sup>*University of Wisconsin, Madison, WI*

**Session GH1: Meteors, Orbital Debris and Dusty Plasmas  
(Special Session)**

**Room 151**

Session Co-Chairs: Eric Gillman, *Naval Research Laboratory*;  
Ed Thomas, *Auburn University*

**08:20 GH1-1**

STUDIES OF DUST PARTICLE CONFINEMENT AND TRANSPORT IN STRONGLY MAGNETIZED PLASMAS USING THE MAGNETIZED DUSTY PLASMA EXPERIMENT (MDPX) DEVICE

Edward Thomas\*<sup>1</sup>, Spencer LeBlanc<sup>1</sup>, Taylor Hall<sup>1</sup>, Uwe Konopka<sup>1</sup>, Robert L. Merlino<sup>2</sup>,  
Marlene Rosenberg<sup>3</sup>

<sup>1</sup>*Physics, Auburn University, Auburn, AL*

<sup>2</sup>*Physics and Astronomy, University of Iowa, Iowa City, IA*

<sup>3</sup>*Electrical and Computer Engineering, University of California - San Diego, La Jolla, CA*

**08:40 GH1-2**

METHODS FOR THE CHARACTERIZATION OF IMPOSED, ORDERED STRUCTURES IN MDPX

Taylor Hall\*, Edward Thomas

*Auburn University, Auburn, AL*

**09:00 GH1-3**



MEASUREMENTS OF DENSITY GRADIENTS AND DUSTY PLASMA ROTATION IN INDUCTIVELY COUPLED DISCHARGES AT HIGH MAGNETIC FIELDS

W. J. Birmingham\*, C. A. Romero-Talamas, E. M. Bates

*Mechanical Engineering Department, University of Maryland, Baltimore County, Baltimore, MD*

**09:20 GH1-4**

DUSTY PLASMA ROTATION AND ACCELERATION IN INDUCTIVELY COUPLED DISCHARGES AT HIGH MAGNETIC FIELDS

Carlos A. Romero-Talamas\*, William J. Birmingham, Evan M. Bates

*Mechanical Engineering, University of Maryland, Baltimore County, Baltimore, MD*

**09:40 GH1-5**

MEASUREMENTS OF THERMAL EFFECTS IN THE DISPERSION RELATION OF THE DUST ACOUSTIC WAVE

Jeremiah Williams\*

*Wittenberg University, Springfield, OH*

**10:00 Break**

**10:20 GH1-6**

NON-INVASIVE IMPEDANCE MEASUREMENTS IN A COMPLEX PLASMA

Eric D. Gillman\*, Bill E. Amatucci

*Plasma Physics Division, Naval Research Laboratory, Washington, DC*

**10:40 GH1-7**

EXPERIMENTAL CAPABILITIES AT IMPACT

Mihaly Horanyi\*

*LASP and Physics, University of Colorado Boulder, Boulder, Colorado*

**11:00 GH1-8**

AMBIPOLAR ELECTRIC FIELD AND DIFFUSIVE COOLING OF ELECTRONS IN METEOR TRAILS

Victor P. Pasko\*<sup>1</sup>, Michael C. Kelley<sup>2</sup>

<sup>1</sup>*Penn State University, University Park, PA*

<sup>2</sup>*Cornell University, Ithaca, NY*

**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\*<sup>1</sup>, Run Shi<sup>1</sup>, Qianli Ma<sup>2</sup>

<sup>1</sup>*Boston University, Boston, MA*

<sup>2</sup>*University of California, Los Angeles, Los Angeles, CA*

**08:40 H1-2**

STATISTICAL PROPERTIES OF PLASMASPHERIC HISS FROM VAN ALLEN PROBES

David P. Hartley\*<sup>1</sup>, Craig A. Kletzing<sup>1</sup>, Ondrej Santolik<sup>2,3</sup>, Lunjin Chen<sup>4</sup>, Richard B. Horne<sup>5</sup>

<sup>1</sup>*University of Iowa, Iowa City, IA*

<sup>2</sup>*Institute of Atmospheric Physics, Prague, CZECH REPUBLIC*

<sup>3</sup>*Charles university, Prague, CZECH REPUBLIC*

<sup>4</sup>*University of Texas at Dallas, Dallas, TX*

<sup>5</sup>*British 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

Ashanthi S. Maxworth\*<sup>1</sup>, Mark Golkowski<sup>1</sup>, David Malaspina<sup>2</sup>, Allison Jaynes<sup>2</sup>

<sup>1</sup>*Electrical Engineering, University of Colorado Denver, Denver, CO*

<sup>2</sup>*Laboratory 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\*<sup>1,2</sup>, Miles Bengtson<sup>3</sup>, Dylan English<sup>2</sup>, Maxx Miller<sup>2</sup>, Logan Turco<sup>2</sup>

<sup>1</sup>*Space Vehicles Directorate, Air Force Research Laboratory/RVBXC, Albuquerque, NM*

<sup>2</sup>*Dept. of Physical Sciences, Embry-Riddle Aeronautical University, Daytona Beach, FL*

<sup>3</sup>*Dept. of Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO*

**10:40 H1-7**

NONLINEAR PLASMA WAVES AT INJECTION FRONTS IN THE INNER  
MAGNETOSPHERE - A CENSUS

David M. Malaspina\*<sup>1</sup>, Alexander Ukhorskiy<sup>2</sup>, Xiangning Chu<sup>3</sup>

<sup>1</sup>*Laboratory for Atmospheric and Space Physics, University of Colorado Boulder, Boulder, CO*

<sup>2</sup>*Applied Physics Laboratory, Johns Hopkins University, Laurel, MD*

<sup>3</sup>*University of California, Los Angeles, Los Angeles, CA*

**11:00 H1-8**

NONLINEAR WAVE-PARTICLE AND WAVE-WAVE INTERACTIONS IN THE OUTER  
RADIATION BELT: PHYSICAL MECHANISMS AND OBSERVATIONAL EFFECTS

Oleksiy Agapitov\*<sup>1</sup>, Anton Artemyev<sup>2</sup>, Ivan Vasko<sup>1</sup>, Didier Mourenas<sup>3</sup>, James Drake<sup>4</sup>,

Forrest S. Mozer<sup>1</sup>

<sup>1</sup>*Space Science Laboratory, University of California, Berkeley, Berkeley, CA*

<sup>2</sup>*University of California, Los Angeles, Los Angeles, CA*

<sup>3</sup>*CEA, DAM, DIF, Arpajon, FRANCE*

<sup>4</sup>*University of Maryland, MD*

**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\*<sup>1,2</sup>, Daniel J. Gershman<sup>2</sup>, James M. Raines<sup>3</sup>, Eun-Hwa Kim<sup>4</sup>,

James A. Slavin<sup>3</sup>

<sup>1</sup>*Goddard Planetary and Heliophysics Institute, University of Maryland, Baltimore County,  
Greenbelt, MD*

<sup>2</sup>*Heliophysics, NASA/GSFC, Greenbelt, MD*

<sup>3</sup>*Department of Atmospheric, Oceanic and Space Sciences, University of Michigan, Ann Arbor,  
MI*

<sup>4</sup>*Princeton Plasma Physics Laboratory, Princeton University, Princeton, NJ*

**08:40 H2-2**

THE CASE FOR VENUS LIGHTNING

Christopher T. Russell\*

*University of California, Los Angeles, Los Angeles, CA*

**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 MULTIFLUID MHD MODELING

Morgan M. Matheny\*<sup>1</sup>, Jeremy Riousset<sup>2</sup>, Heidi K. Nykyri<sup>1</sup>

<sup>1</sup>*Physical Sciences, Embry-Riddle Aeronautical University, Daytona Beach, FL*

<sup>2</sup>*Physical Sciences, Florida Institute of Technology, Melbourne, FL*

**09:40 H2-5**

JUNO WAVES INVESTIGATION OBSERVATIONS AT JUPITER

George B. Hospodarsky\*<sup>1</sup>, William S. Kurth<sup>1</sup>, Masafumi Imai<sup>1</sup>, Sadie S. Tetrick<sup>1</sup>, Donald A. Gurnett<sup>1</sup>, Shengyi Ye<sup>1</sup>, Philippe Zarka<sup>2</sup>, Ivana Kolmasova<sup>3,4</sup>, Ondrej Santolik<sup>3,4</sup>, Philippe Louarn<sup>5</sup>, Frederic Allegrini<sup>6</sup>, Phil Valek<sup>6</sup>, Barry H. Mauk<sup>7</sup>, George B. Clark<sup>7</sup>, Scott J. Bolton<sup>6</sup>, Jack E. P. Connerney<sup>8,9</sup>, Steven M. Levin<sup>10</sup>

<sup>1</sup>*Dept. of Physics and Astronomy, University of Iowa, Iowa City, IA*

<sup>2</sup>*LESIA, Observatoire de Paris, Paris, FRANCE*

<sup>3</sup>*Department of Upper Atmosphere, Institute of Atmospheric Physics CAS, Prague, CZECH REPUBLIC*

<sup>4</sup>*Faculty of Mathematics and Physics, Charles University, Prague, CZECH REPUBLIC*

<sup>5</sup>*IRAP, Toulouse, FRANCE*

<sup>6</sup>*Southwest Research Institute, San Antonio, TX*

<sup>7</sup>*Applied Physics Laboratory Johns Hopkins, Laurel, MD*

<sup>8</sup>*NASA Goddard Space Flight Center, Greenbelt, MD*

<sup>9</sup>*Space Research Corporation, Annapolis, MD*

<sup>10</sup>*Jet 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\*<sup>1</sup>, Donald A. Gurnett<sup>1</sup>, William S. Kurth<sup>1</sup>, George Clark<sup>2</sup>, Barry H. Mauk<sup>2</sup>, Scott J. Bolton<sup>3</sup>, Jack Connerney<sup>4</sup>, Steven M. Levin<sup>5</sup>

<sup>1</sup>*Physics and Astronomy, University of Iowa, Iowa City, IA*

<sup>2</sup>*The Johns Hopkins University Applied Physics Laboratory, Laurel, MD*

<sup>3</sup>*Southwest Research Institute, San Antonio, TX*

<sup>4</sup>*Goddard Space Flight Center, Greenbelt, MD*

<sup>5</sup>*Jet Propulsion Laboratory, Pasadena, CA*

**10:40 H2-7**

JUNO DIRECTION-FINDING MEASUREMENTS OF JUPITER'S NARROWBAND  
KILOMETRIC RADIATION

Masafumi Imai\*<sup>1</sup>, William S. Kurth<sup>1</sup>, George B. Hospodarsky<sup>1</sup>, Scott J. Bolton<sup>2</sup>,  
John E. P. Connerney<sup>3</sup>, Steven M. Levin<sup>4</sup>

<sup>1</sup>*University of Iowa, Iowa City, IA*

<sup>2</sup>*Southwest Research Institute, San Antonio, TX*

<sup>3</sup>*NASA Goddard Space Flight Center, Greenbelt, MD*

<sup>4</sup>*Jet Propulsion Laboratory, Pasadena, CA*

**11:00 H2-8**

PROPERTIES OF JOVIAN LIGHTNING WHISTLERS DETECTED BY THE JUNO WAVES  
INSTRUMENT

Ivana Kolmasova\*<sup>1,2</sup>, Masafumi Imai<sup>3</sup>, Ondrej Santolik<sup>1,2</sup>, William S. Kurth<sup>3</sup>,  
George B. Hospodarsky<sup>3</sup>, Donald A. Gurnett<sup>3</sup>, Scott J. Bolton<sup>4</sup>, John E. P. Connerney<sup>5</sup>

<sup>1</sup>*Institute of Atmospheric Physics CAS, Prague, CZECH REPUBLIC*

<sup>2</sup>*Charles university, Prague, CZECH REPUBLIC*

<sup>3</sup>*University of Iowa, Iowa City, IA*

<sup>4</sup>*Southwest Research Institute, San Antonio, TX*

<sup>5</sup>*NASA/Goddard Space Flight Center, Greenbelt, MD*

**11:20 H2-9**

ROTATIONAL MODULATION OF SATURN RADIO EMISSIONS DURING THE CASSINI  
MISSION

S. Y. Ye\*<sup>1</sup>, G. Fischer<sup>2</sup>, W. S. Kurth<sup>1</sup>, J. D. Menietti<sup>1</sup>, D. A. Gurnett<sup>1</sup>

<sup>1</sup>*University of Iowa, Iowa City, IA*

<sup>2</sup>*Austrian Academy of Sciences, Graz, AUSTRIA*

**11:40 H2-10**

CASSINI GRAND FINALE : NEW INSIGHTS ON THE SOURCE OF SATURN  
KILOMETRIC RADIATION

Laurent Lamy<sup>1</sup>, Philippe Zarka<sup>1</sup>, Baptiste Cecconi<sup>1</sup>, William S. Kurth\*<sup>2</sup>,  
George B. Hospodarsky<sup>2</sup>, Michiko Morooka<sup>3</sup>, Jan-Erik Wahlund<sup>3</sup>

<sup>1</sup>*LESIA, Observatoire de Paris, Meudon, FRANCE*

<sup>2</sup>*University of Iowa, Iowa City, IA*

<sup>3</sup>*IRF-U, Uppsala, 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*

**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*

**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\*<sup>1</sup>, Silver Sturgis<sup>1</sup>, Sivasankaran Srikanth<sup>2</sup>, Rob Selina<sup>1</sup>

<sup>1</sup>*Electronics, NRAO, Socorro, NM*

<sup>2</sup>*Central Development Lab, NRAO, Charlottesville, VA*

**09:40 J1-5**

THE BREAKTHROUGH LISTEN SEARCH FOR INTELLIGENT LIFE BEYOND EARTH

Andrew P. V. Siemion\*<sup>1</sup>, Steve Croft<sup>1</sup>, David DeBoer<sup>1</sup>, Emilio Enriquez<sup>1,2</sup>, Griffin Foster<sup>1,3</sup>,

Vishal Gajjar<sup>1</sup>, Greg Hellbourg<sup>1</sup>, Jack Hickish<sup>1</sup>, Brian Lacki<sup>1</sup>, Matt Lebofsky<sup>1</sup>,

David MacMahon<sup>1</sup>, Danny Price<sup>1,4</sup>, Dan Werthimer<sup>1</sup>, Gerry Zhang<sup>1</sup>

<sup>1</sup>*UC Berkeley, CA*

<sup>2</sup>*Radboud University, Nijmegen, NETHERLANDS*

<sup>3</sup>*University of Oxford, Oxford, UNITED KINGDOM*

<sup>4</sup>*Swinburne University, Melbourne, AUSTRALIA*

**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\*<sup>1</sup>, Jack O. Burns<sup>1</sup>, David Rapetti<sup>1,2</sup>, Eric R. Switzer<sup>3</sup>

<sup>1</sup>*Astrophysical and Planetary Sciences, University of Colorado, Boulder, CO*

<sup>2</sup>*NASA Ames Research Center, Mountain View, CA*

<sup>3</sup>*NASA 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\*<sup>1</sup>, Nikhil Naik<sup>2</sup>

<sup>1</sup>*National Radio Astronomy Observatory, Socorro, NM*

<sup>2</sup>*Indian 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<sup>1</sup>, Ravi Subrahmanyam<sup>2</sup>, Uday N. Shankar<sup>2</sup>, Agaram Raghunathan<sup>2</sup>

<sup>1</sup>*School of Earth & Space Exploration, Arizona State University, Tempe, AZ*

<sup>2</sup>*Raman 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<sup>\*1</sup>, Ryan Green<sup>1</sup>, Natalia Izioumskaia<sup>1</sup>, Vitaliy Avrutin<sup>1</sup>, Umit Ozgur<sup>1</sup>,

Martin Mangino<sup>2</sup>, Erdem Topsakal<sup>1</sup>

<sup>1</sup>*Electrical and Computer Engineering, Virginia Commonwealth University, Richmond, VA*

<sup>2</sup>*Department of Surgery, 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<sup>\*1</sup>, Allyson Cliett<sup>2</sup>, Ling Ni<sup>2</sup>, Rachel Eike<sup>2</sup>, Rinn Cloud<sup>2</sup>, Yang Li<sup>1</sup>

<sup>1</sup>*Electrical and Computer Engineering, Baylor University, Waco, TX*

<sup>2</sup>*Family 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, VI*

**THURSDAY AFTERNOON, 4 January 2018**

**Session A3: Measurement of Materials and EM Fields  
Room 105**

Session Co-Chairs: Jeanne Quimby, *NIST*;  
Steven Weiss, *US Army Research Lab*

**13:20 A3-1**

UNCERTAINTIES IN RF ELECTRIC FIELD METROLOGY BASED ON RYDBERG ATOM SPECTROSCOPY

Matt T. Simons\*<sup>1</sup>, Marcus D. Kautz<sup>1</sup>, Joshua A. Gordon<sup>1</sup>, David A. Anderson<sup>2</sup>, Georg Raithel<sup>2,3</sup>, Christopher L. Holloway<sup>1</sup>

<sup>1</sup>*CTL, NIST, Boulder, CO*

<sup>2</sup>*Rydberg Technologies, Ann Arbor, MI*

<sup>3</sup>*Physics, 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\*<sup>1,2</sup>, Jasper A. Drisko<sup>1</sup>, Sean E. Shaheen<sup>2</sup>, Edward Garboczi<sup>1</sup>, Chris J. Long<sup>1</sup>, Nathan D. Orloff<sup>1</sup>

<sup>1</sup>*CTL, National Institute of Standards and Technology, Boulder, CO*

<sup>2</sup>*Electrical Engineering, University of Colorado Boulder, Boulder, CO*

**Session B3: Complex Media and Metamaterials**



## Room 1B40

Session Co-Chairs: Edward Kuester, *University of Colorado*;  
George Eleftheriades, *University of Toronto*

### 13:20 B3-1

DISPERSION ENGINEERING FOR SLOW-WAVE STRUCTURES USING QUAD  
COUPLED TRANSMISSION LINES

Shubhendu Bhardwaj<sup>\*1</sup>, Muhammed Zuboraj<sup>2</sup>, John L. Volakis<sup>1</sup>

<sup>1</sup>*Florida International University, Miami, FL*

<sup>2</sup>*Los 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<sup>\*</sup>, John Volakis

*Florida International University, Miami, FL*

### 14:00 B3-3

IMPROVING THE RADIATION CHARACTERISTICS OF AN ANTIPODAL VIVALDI  
ANTENNA USING A SPATIALLY VARIANT METAMATERIAL LENS

John Blauert<sup>\*1</sup>, Joseph M. Faia<sup>2</sup>, Yujie He<sup>2</sup>, Sun K. Hong<sup>3</sup>, Benjamin S. Cook<sup>4</sup>,

Edward Wheeler<sup>2</sup>

<sup>1</sup>*Electroscience Department, Ohio State University, Columbus, OH*

<sup>2</sup>*Electrical and Computer Engineering, Rose-Hulman Institute of Technology, Terre Haute, IN*

<sup>3</sup>*School of Electronics Engineering, Soongsil University, Seoul, SOUTH KOREA*

<sup>4</sup>*Kilby 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<sup>\*</sup>, 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<sup>\*</sup>, 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<sup>\*</sup>, George V. Eleftheriades

*The Edward S. Rogers Sr. Department of 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\*<sup>1</sup>, Zhiya Zhao<sup>2</sup>, Chunlin Ji<sup>2</sup>, Ruopeng Liu<sup>2</sup>  
<sup>1</sup>*EE, CONLEY ROSE P.C., Houston, TX*  
<sup>2</sup>*Kuang-Chi Institute of Advanced Technology, Shenzhen, Guangdong, CHINA*

**16:40 B3-10**

ORIGAMI-INSPIRED FREQUENCY SELECTIVE SURFACE

Deanna Sessions\*<sup>1</sup>, Gregory Huff<sup>1</sup>, Philip Buskohl<sup>2</sup>, Kazuko Fuchi<sup>3</sup>  
<sup>1</sup>*Texas A&M University, College Station, TX*  
<sup>2</sup>*Air Force Research Laboratory, Dayton, OH*  
<sup>3</sup>*University 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 Venkatakrisnan\*, 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\*<sup>1</sup>, Mohammad Ali Panahi<sup>2</sup>

<sup>1</sup>*EE, MST University, Rolla, MO*

<sup>2</sup>*EE, University of Wisconsin, Madison, WI*

**Session B5: Advances in Computational Electromagnetics on Modern Computers  
(Special Session)**

**Room 200**

Session Co-Chairs: Zhen Peng, *University of New Mexico;*

*Ali Yilmaz, University of Texas at Austin*

**15:20 B5-1**

ACCURACY STUDY OF SINGULARITY EXTRACTION METHOD FOR NEAR-SINGULAR AND NEAR-HYPERSINGULAR 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. Kelley<sup>1</sup>, Jackson W. Massey<sup>2</sup>, Ali E. Yilmaz\*<sup>2</sup>

<sup>1</sup>*Department of Physics, The University of Texas at Austin, Austin, TX*

<sup>2</sup>*Department of Electrical 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: Junming Diao, *University of California, Los Angeles*;  
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\*<sup>1,2</sup>, Abe A. Akhiyat<sup>1,2</sup>, Elias A. Alwan<sup>2</sup>, John L. Volakis<sup>2</sup>

<sup>1</sup>*Electrical and Computer Engineering, The Ohio State University, Columbus, OH*

<sup>2</sup>*Electrical and Computer Engineering, Florida International University, Miami, OH*

**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

Junming Diao\*

*Electrical Engineering, University of California, Los Angeles, Los Angeles, CA*

**16:40 B6-5**

CODE - MODULATED BEAMFORMING FOR MOBILE DISTRIBUTED ARRAY

Maziar Hedayati\*

*Electrical Engineering, University of California, Los Angeles, Los Angeles, CA*

**17:20 B6-6**

**HYPER SPECTRAL FFT IMAGER**

Deepthi Gorthi\*<sup>1</sup>, David DeBoer<sup>1</sup>, Jack Hickish<sup>1</sup>, Aaron Parsons<sup>1</sup>, Kathryn Rosie<sup>2</sup>, Dan Werthimer<sup>1</sup>

<sup>1</sup>*Dept. of Astronomy, University of California, Berkeley, Berkeley, CA*

<sup>2</sup>*Square Kilometre Array, Cape Town, SOUTH AFRICA*

**17:40 B6-7**

**ANALYSIS OF ANTENNA LOSS AND RECEIVING EFFICIENCY FOR HIGH-SENSITIVITY SCANNED PHASED ARRAYS**

Junming Diao\*<sup>1</sup>, Karl F. Warnick<sup>2</sup>

<sup>1</sup>*Electrical Engineering, University of California, Los Angeles, Los Angeles, CA*

<sup>2</sup>*Electrical 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*

**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 B7-3**

**SCALABLE POWER GENERATION FOR WEARABLE ELECTRONICS USING FABRIC ELECTROCHEMISTRY**

Raman Vilkuh\*<sup>1</sup>, Cody O'Connor<sup>1</sup>, Wesley Thio<sup>2</sup>, Piya D. Ghatak<sup>3</sup>, Anne Co<sup>2</sup>, Chandan K. Sen<sup>3</sup>, Asimina Kiourti<sup>1</sup>

<sup>1</sup>*Department of Electrical and Computer Engineering, The Ohio State University, Columbus, Ohio*

<sup>2</sup>*Department of Chemistry, The Ohio State University, Columbus, OH*

<sup>3</sup>*Department of Surgery, 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*

**17:20 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*

**17:40 B7-7**

INTERMODULATION FMCW (IM-FMCW) RADAR FOR NON-LINEAR WEARABLE  
TARGETS DETECTION  
Zhengyu Peng\*, Changzhi Li  
*Department of 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*

**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\*<sup>1</sup>, Dustin Buccino<sup>1</sup>, William F. Folkner<sup>1</sup>, Kamal Oudrhiri<sup>1</sup>, Phillip H. Phipps<sup>2</sup>,  
Marzia Parisi<sup>1</sup>, Daniel S. Kahan<sup>1</sup>

<sup>1</sup>*Jet Propulsion Laboratory-NASA, Pasadena, CA*

<sup>2</sup>*Boston 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\*<sup>1</sup>, Prabavathi Chidambaram<sup>2</sup>

<sup>1</sup>*Sensors Directorate, Air Force Research Laboratory, Dayton, OH*

<sup>2</sup>*P.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\*<sup>1</sup>, Paul E. Racette<sup>2</sup>

<sup>1</sup>*University at Albany, SUNY, Albany, NY*

<sup>2</sup>*NASA Goddard Space Flight Center, Greenbelt, MD*

**Session F5: Remote Sensing from Small Satellites I  
(Special Session)**

**Room 155**

Session Co-Chairs: Steven Reising, *Colorado State University*;  
Albin Gasiewski, *University of Colorado Boulder*

**13:20 F5-1**

WIDE-BAND MILLIMETER AND SUB-MILLIMETER WAVE RADIOMETER  
INSTRUMENT TO MEASURE TROPOSPHERIC WATER AND CLOUD ICE (TWICE)

Pekka Kangaslahti\*<sup>1</sup>, Erich Schlecht<sup>1</sup>, Jonathan Jiang<sup>1</sup>, Anders Skalare<sup>1</sup>, Joelle Cooperrider<sup>1</sup>,  
Richard Cofield<sup>1</sup>, William Deal<sup>2</sup>, Alex Zamora<sup>2</sup>, Kevin Leong<sup>2</sup>, Steven Reising<sup>3</sup>, Xavier Bosch<sup>1</sup>,  
Mehmet Ogut<sup>3</sup>, Yuriy Goncharenko<sup>3</sup>, Braxton Kilmer<sup>3</sup>

<sup>1</sup>*Jet Propulsion Laboratory, Pasadena, CA*

<sup>2</sup>*Northrop Grumman Corporation, Redondo Beach, CA*

<sup>3</sup>*Colorado State University, Fort Collins, CO*

**13:40 F5-2**

A DIRECT DETECTION RECEIVER AT 660 GHZ

William R. Deal\*<sup>1</sup>, Alexis Zamora<sup>1</sup>, Kevin Leong<sup>1</sup>, Gerry Mei<sup>1</sup>, Pekka Kangaslahti<sup>2</sup>,  
Erich Schlecht<sup>2</sup>, Steven C. Reising<sup>3</sup>

<sup>1</sup>*Northrop Grumman Corporation, Redondo Beach, CA*

<sup>2</sup>*Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA*

<sup>3</sup>*Colorado 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 Ogut\*<sup>1</sup>, Xavier Bosch-Lluis<sup>2</sup>, Steven C. Reising<sup>1</sup>, Yuriy V. Goncharenko<sup>1</sup>,  
Braxton Kilmer<sup>1</sup>, Pekka Kangaslahti<sup>2</sup>, Erich Schlecht<sup>2</sup>, Anders Skalare<sup>2</sup>, Richard Cofield<sup>2</sup>,  
Sharmila Padmanabhan<sup>2</sup>, William R. Deal<sup>3</sup>, Alex Zamora<sup>3</sup>

<sup>1</sup>*Microwave Systems Laboratory, Colorado State University, Fort Collins, CO*

<sup>2</sup>*Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA*

<sup>3</sup>*Northrop 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 Kilmer\*<sup>1</sup>, Steven C. Reising<sup>1</sup>, Yuriy Goncharenko<sup>1</sup>, Mehmet Ogut<sup>1</sup>, Pekka Kangaslahti<sup>2</sup>,  
Anders Skalare<sup>2</sup>, Erich Schlecht<sup>2</sup>, Richard Cofield<sup>2</sup>, Joelle Cooperrider<sup>2</sup>, William Deal<sup>3</sup>,  
Alex Zamora<sup>3</sup>

<sup>1</sup>*Microwave Systems Laboratory, Colorado State University, Fort Collins, CO*

<sup>2</sup>*Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA*

<sup>3</sup>*Northrop Grumman Corporation, Redondo Beach, CA*

**14:40 F5-5**

ICECUBE 883-GHZ CLOUD RADIOMETER EXPERIMENT

Dong L. Wu\*

*NASA Goddard Space Flight Center, Greenbelt, MD*

**15:00 Break**



**15:20 F5-6**

TEMPORAL EXPERIMENT FOR STORMS AND TROPICAL SYSTEMS TECHNOLOGY  
DEMONSTRATION (TEMPEST-D) MISSION FOR GLOBAL OBSERVATIONS OF  
CLOUDS AND PRECIPITATION FROM CUBESAT CONSTELLATIONS

Steven C. Reising\*<sup>1</sup>, Todd C. Gaier<sup>2</sup>, Sharmila Padmanabhan<sup>2</sup>, Boon H. Lim<sup>2</sup>, Cate Heneghan<sup>2</sup>,  
Christian D. Kummerow<sup>1</sup>, V. Chandrasekar<sup>1</sup>, Wesley Berg<sup>1</sup>, Shannon T. Brown<sup>2</sup>,  
Matthew Pallas<sup>3</sup>, C Radhakrishnan<sup>1</sup>

<sup>1</sup>*Colorado State University, Fort Collins, CO*

<sup>2</sup>*Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA*

<sup>3</sup>*Blue Canyon Technologies, Boulder, CO*

**15:40 F5-7**

THE NASA TROPICS CUBESAT RADIOMETERS

William Blackwell\*

*MIT Lincoln Laboratory, Lexington, MA*

**16:00 F5-8**

PRELAUNCH PERFORMANCE OF THE 118 GHZ POLARCUBE 3U CUBESAT  
TEMPERATURE SOUNDING RADIOMETER

Lavanya Periasamy\*<sup>1</sup>, Al Gasiewski<sup>1</sup>, Brian Sanders<sup>1</sup>, David Gallaher<sup>2</sup>, Robert Belter<sup>1</sup>,  
Joaquin Castillo<sup>1</sup>, David Kraft<sup>1</sup>, Josua Gordon<sup>3</sup>, Michael Hurowitz<sup>4</sup>

<sup>1</sup>*Electrical Engineering, University of Colorado Boulder, Boulder, CO*

<sup>2</sup>*National Snow and Ice Data Center, Boulder, Colorado*

<sup>3</sup>*National Institute of Standards and Technology, Boulder, CO*

<sup>4</sup>*Orbital Micro Systems, Boulder, CO*

**16:20 F5-9**

DEVELOPMENT AND TESTING OF THE CUBESAT RADIOMETER RADIO  
FREQUENCY INTERFERENCE TECHNOLOGY VALIDATION (CUBERRT) SYSTEM

Christopher D. Ball\*<sup>1</sup>, Chi-Chih Chen<sup>1</sup>, Andrew J. O'Brien<sup>1</sup>, Christa J. McKelvey<sup>1</sup>,  
Graeme E. Smith<sup>1</sup>, Mark Andrews<sup>1</sup>, J. Landon Garry<sup>1</sup>, Joel T. Johnson<sup>1</sup>, Sidharth Misra<sup>2</sup>,  
Rudi M. Bendig<sup>2</sup>, Carl Felten<sup>2</sup>, Shannon T. Brown<sup>2</sup>, Robert F. Jarnot<sup>2</sup>, Jonathon Kocz<sup>3</sup>,  
Damon C. Bradley<sup>4</sup>, Priscilla N. Mohammed<sup>4</sup>, Jared F. Lucey<sup>4</sup>, Kevin A. Horgan<sup>4</sup>,  
Quenton Bonds<sup>4</sup>, Carlos Duran-Aviles<sup>4</sup>, Michael A. Solly<sup>4</sup>, Matthew A. Fritts<sup>4</sup>,  
Jeffrey R. Piepmeier<sup>4</sup>, Matthew Pallas<sup>5</sup>, Ervin Krauss<sup>5</sup>, Doug Laczkowski<sup>5</sup>

<sup>1</sup>*The Ohio State University, Columbus, OH*

<sup>2</sup>*NASA Jet Propulsion Laboratory, Pasadena, CA*

<sup>3</sup>*California Institute of Technology, Pasadena, CA*

<sup>4</sup>*NASA Goddard Space Flight Center, Greenbelt, MD*

<sup>5</sup>*Blue Canyon Technologies, Boulder, CO*

**Session G1: New Horizons in Active and Passive Radio Techniques for  
Geospace Remote Sensing  
(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

TOWARD IONOSPHERE FORECAST USING COSMIC-2

Charles Lin\*<sup>1</sup>, Chia-Hung Chen<sup>1</sup>, P. K. Rajesh<sup>1</sup>, Tomoko Matsuo<sup>2</sup>

<sup>1</sup>*Department of Earth Sciences, National Cheng Kung University, Tainan, TAIWAN*

<sup>2</sup>*Ann and H. J. Smead Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO*

### 13:40 G1-2

EXPLORING THE IONOSPHERE WITH RADIO TELESCOPES AND LIGHTNING STRIKES

Joseph B. Malins\*<sup>1</sup>, Kenneth S. Obenberger<sup>2</sup>, Gregory B. Taylor<sup>1</sup>

<sup>1</sup>*Department of Physics and Astronomy, University of New Mexico, Albuquerque, NM*

<sup>2</sup>*Space Vehicle Branch, Air Force Research Lab, Kirtland Air Force Base, Albuquerque, NM*

### 14:00 G1-3

ON THE USE OF SYNTHETIC APERTURE RADAR (SAR) AS A TOOL FOR IONOSPHERIC IRREGULARITY CHARACTERIZATION

James P. Conroy\*<sup>1</sup>, James P. Conroy<sup>2</sup>, Jason Hodkin<sup>2</sup>, Mark Strother<sup>2</sup>, Kshitija Deshpande<sup>3</sup>

<sup>1</sup>*Virginia Tech, Blacksburg, VA*

<sup>2</sup>*Johns Hopkins Applied Physics Lab, Laurel, MD*

<sup>3</sup>*Embry-Riddle Aeronautical University, Daytona Beach, FL*

### 14:20 G1-4

SATELLITE-BEACON IONOSPHERIC-SCINTILLATION GLOBAL MODEL OF THE UPPER ATMOSPHERE (SIGMA): GNSS SIGNAL PROPAGATION MODELING AND CHANNEL MISMATCH ANALYSIS

James P. Conroy\*<sup>1</sup>, James P. Conroy<sup>2</sup>, Kshitija Deshpande<sup>3</sup>

<sup>1</sup>*Virginia Tech, Blacksburg, VA*

<sup>2</sup>*Johns Hopkins Applied Physics Lab, Laurel, MD*

<sup>3</sup>*Embry-Riddle Aeronautical University, , Daytona Beach, FL*

### 14:40 G1-5

VALIDATION OF AN INVERSE TECHNIQUE TO RETRIEVE INTERMEDIATE-SCALE STRUCTURE STATISTICS FROM TIME SERIES OF IONOSPHERIC SCINTILLATION

Charles S. Carrano\*<sup>1</sup>, Charles Rino<sup>1</sup>, Tatsuhiro Yokoyama<sup>2</sup>

<sup>1</sup>*Institute for Scientific Research, Boston College, Chestnut Hill, MA*

<sup>2</sup>*Space Environment Laboratory, National Institute of Information and Communications Technology, Tokyo, JAPAN*

### 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 Department, 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\*<sup>1</sup>, Jade Morton<sup>2</sup>

<sup>1</sup>*Electrical and Computer Engineering, Colorado State University, Fort Collins, CO*

<sup>2</sup>*Smead 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

Attila Komjathy\*<sup>1</sup>, Giorgio Savastano<sup>2</sup>, Xing Meng<sup>1</sup>, Olga Verkhoglyadova<sup>1</sup>,

Anthony Mannucci<sup>1</sup>

<sup>1</sup>*Jet Propulsion Laboratory, Pasadena*

<sup>2</sup>*University 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\*<sup>1</sup>, Seebany Datta-Barua<sup>1</sup>, Uriel Ramirez<sup>1</sup>, Gary Bust<sup>2</sup>

<sup>1</sup>*Mechanical, Materials and Aerospace Engineering Department, Illinois Institute of Technology, Chicago, IL*

<sup>2</sup>*Applied 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<sup>1</sup>, Tomoko Matsuo\*<sup>2</sup>, Tiger Liu<sup>1</sup>, Charles Lin<sup>3</sup>

<sup>1</sup>*National Central University, Taoyuan, TAIWAN*

<sup>2</sup>*University of Colorado Boulder, Boulder, CO*

<sup>3</sup>*National 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\*<sup>1</sup>, Vladimir Sotnikov<sup>2</sup>

<sup>1</sup>*Space Vehicles Directorate, Air Force Research Laboratory, Albuquerque, NM*

<sup>2</sup>*Sensors 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\*<sup>1</sup>, Ashar Ali<sup>2</sup>, Scot R. Elkington<sup>2</sup>, David M. Malaspina<sup>2</sup>, Daniel N. Baker<sup>2</sup>, Xinlin Li<sup>2</sup>, Shri G. Kanekal<sup>3</sup>, Craig A. Kletzing<sup>1</sup>, John R. Wygant<sup>4</sup>

<sup>1</sup>*Dept. of Physics & Astronomy, University of Iowa, Iowa City, IA*

<sup>2</sup>*LASP, University of Colorado Boulder, Boulder, CO*

<sup>3</sup>*Goddard Space Flight Center, Greenbelt, MD*

<sup>4</sup>*University of Minnesota, Minneapolis, MN*

**14:20 H3-4**

INVESTIGATION OF THE FREQUENCY STRUCTURE OF THE FAST MAGNETOSONIC MODE

Scott A. Boardsen\*<sup>1,2</sup>, George B. Hospodarsky<sup>3</sup>, Mei-Ching Fok<sup>2</sup>, Craig A. Kletzing<sup>3</sup>, William S. Kurth<sup>3</sup>, Robert F. Pfaff<sup>2</sup>

<sup>1</sup>*Goddard Planetary and Heliophysics Institute, University of Maryland, Baltimore County, Greenbelt, MD*

<sup>2</sup>*Heliophysics Division, NASA/GSFC, Greenbelt, MD*

<sup>3</sup>*Department of Physics and Astronomy, University of Iowa, Iowa City, IA*

**14:40 H3-5**

VAN ALLEN PROBES OBSERVATIONS OF ELECTROMAGNETIC ION CYCLOTRON (EMIC) WAVE RISING TONES

Kristine Sigsbee\*<sup>1</sup>, Craig A. Kletzing<sup>1</sup>, Ondrej Santolik<sup>2</sup>, Charles W. Smith<sup>3</sup>

<sup>1</sup>*Department of Physics and Astronomy, University of Iowa, Iowa City, IA*

<sup>2</sup>*Faculty of Mathematics and Physics, Charles University, Prague, CZECH REPUBLIC*

<sup>3</sup>*Institute 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\*<sup>1</sup>, Bart Van Compernelle<sup>2</sup>, Jacob Bortnik<sup>1</sup>, Viktor Decyk<sup>2</sup>, Richard M. Thorne<sup>1</sup>

<sup>1</sup>*Atmospheric and Oceanic Sciences, University of California, Los Angeles, Los Angeles, CA*

<sup>2</sup>*Physics and Astronomy, University of California, Los Angeles, Los Angeles, CA*

**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

Jinxing Li\*<sup>1</sup>, Jacob Bortnik<sup>1</sup>, Xin An<sup>1</sup>, Wen Li<sup>2</sup>, Richard M. Thorne<sup>1</sup>, Meng Zhou<sup>3</sup>,

William S. Kurth<sup>4</sup>, George B. Hospodarsky<sup>4</sup>, Herbert O. Funsten<sup>5</sup>, Harlan E. Spence<sup>6</sup>

<sup>1</sup>*Department of Atmospheric and Oceanic Sciences, University of California, Los Angeles, Los Angeles, CA*

<sup>2</sup>*Center for Space Physics, Boston University, Boston, MA*

<sup>3</sup>*Department of Astronomy and Physics, University of California, Los Angeles, Los Angeles*

<sup>4</sup>*Department of Physics and Astronomy, University of Iowa, Iowa City, IA*

<sup>5</sup>*MS-D466, PO Box 1663, Los Alamos National Laboratory, Los Alamos, NM*

<sup>6</sup>*Institute 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-SEVILLETA STATION

Nithyanandan Thyagarajan\*<sup>1</sup>, Adam P. Beardsley<sup>2</sup>, Judd D. Bowman<sup>2</sup>, Greg B. Taylor<sup>3</sup>, Jayce Dowell<sup>3</sup>, Miguel F. Morales<sup>4</sup>

<sup>1</sup>*National Radio Astronomy Observatory, Socorro, NM*

<sup>2</sup>*School of Earth and Space Exploration, Arizona State University, Tempe, AZ*

<sup>3</sup>*Department of Physics and Astronomy, University of New Mexico, Albuquerque, NM*

<sup>4</sup>*Department of Physics, 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*

**16:00 J2-3**

PRELIMINARY TEST RESULTS OF JPL's ULTRAWIDEBAND RECEIVER PACKAGE FOR THE ngVLA

Jose E. Velazco\*, Andrew W. Janzen, Daniel J. Hoppe, Lorene A. Samoska, Ezra M. Long, James G. Bowen, Larry R. D'Addario, Melissa A. Soriano, Joseph Lazio

*Jet Propulsion Laboratory, Pasadena, CA*

**16:20 J2-4**

HYPER SPECTRAL FFT IMAGER

Deepthi Gorthi\*<sup>1</sup>, David DeBoer<sup>1</sup>, Jack Hickish<sup>1</sup>, Aaron Parsons<sup>1</sup>, Kathryn Rosie<sup>2</sup>, Dan Werthimer<sup>1</sup>

<sup>1</sup>*Dept. of Astronomy, University of California, Berkeley, Berkeley*

<sup>2</sup>*Square 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\*<sup>1,2</sup>, Andrew Siemion<sup>1,2</sup>, Griffin Foster<sup>1,3</sup>, Vishal Gajjar<sup>1</sup>, Greg Hellbourg<sup>1</sup>, Jack Hickish<sup>1</sup>, Howard Isaacson<sup>1</sup>, Danny C. Price<sup>1,4</sup>, Steve Croft<sup>1</sup>, David DeBoer<sup>1</sup>, Matt Lebofsky<sup>1</sup>, David MacMahon<sup>1</sup>, Dan Werthimer<sup>1</sup>

<sup>1</sup>*University of California, Berkeley, Berkeley, CA*

<sup>2</sup>*Radboud University Nijmegen, Nijmegen, NETHERLANDS*

<sup>3</sup>*University of Oxford, Oxford, UNITED KINGDOM*

<sup>4</sup>*Swinburne 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*

**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**

MODELLING THZ INTERACTION WITH BREAST CANCER TISSUES USING FDTD

Amir Shariffar\*, Magda El-Shenawee

*Electrical Engineering, University of Arkansas, Fayetteville, AR*

**14:20 K2-4**

DIELECTRIC PROPERTIES OF HONEY BEE BODY TISSUE FOR INSECT TRACKING APPLICATIONS

Omar Alzaabi\*<sup>1</sup>, Julio Urbina<sup>1</sup>, James K. Breakall<sup>1</sup>, Michael Lanagan<sup>2</sup>

<sup>1</sup>*Electrical Engineering, Pennsylvania State University, University Park, PA*

<sup>2</sup>*Engineering 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**

**(2) Fast Radio Bursts: The Story So Far**

Co-Chairs: Greg Huff, *Texas A&M University*;  
Charles Baylis, *Baylor University*;  
David DeBoer, *University of California, Berkeley*

**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\*

*Aerospace Engineering and Science, University of Colorado Boulder, Boulder, CO*



**11:40 Awards Ceremony for Student Paper Competition**

**12:00 Lunch for Student Travel Awardees, 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

*Department of 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\*<sup>1</sup>, Donald R. Wilton<sup>1</sup>, Dawei Li<sup>2</sup>, William A. Johnson<sup>3</sup>

<sup>1</sup>*Dept. of Electrical and Computer Engineering, University of Houston, Houston, TX*

<sup>2</sup>*Synopsys Inc., Mountain View, CA*

<sup>3</sup>*Consultant, 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*

**16:20 B8-9**

**PHOTONIC TOPOLOGICAL INSULATOR: CREATION OF A SPONTANEOUS LATERAL  
ATOMIC RECOIL FORCE**

George W. Hanson\*<sup>1</sup>, Mario Silveirinha<sup>2</sup>, Mauro Antezza<sup>3</sup>, Ali Hassani Gangaraj<sup>4</sup>,  
Francesco Monticone<sup>4</sup>

<sup>1</sup>*Dept. of Electrical Engineering, University of Wisconsin Milwaukee, Milwaukee, WI*

<sup>2</sup>*Dept. of Telecommunications, Instituto Superior Tecnico, Lisbon, PORTUGAL*

<sup>3</sup>*Dept. of Physics, University of Montpellier, Montpellier, FRANCE*

<sup>4</sup>*Dept. of Electrical Engineering, Cornell University, Ithaca, NY*

**16:40 B8-10**

**DRESSED STATE APPROACH TO QUANTUM ELECTROMAGNETICS**

Aiyin Liu\*<sup>1</sup>, Weng C. Chew<sup>2</sup>

<sup>1</sup>*ECE, University of Illinois at Urbana-Champaign, Urbana, IL*

<sup>2</sup>*ECE, 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. Good\*<sup>1</sup>, David Roper<sup>2</sup>, Brandon Good<sup>2</sup>, Shridhar Yarlagadda<sup>3</sup>

<sup>1</sup>*Electrical Engineering, University of Delaware, Newark, DE*

<sup>2</sup>*Carderock Division, Naval Surface Warfare Center, Bethesda, MD*

<sup>3</sup>*Center for Composite Materials, University of Delaware, Newark, DE*

**14:00 B9-3**

LIQUID METAL 3D PRINTED MICROFLUIDIC CHANNEL RECONFIGURABLE PATCH ANTENNA WITH SWITCHABLE SLOTS

Lingnan 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\*

*Dept. of 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

*Dept. of 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 Bharambe\*<sup>1</sup>, Dishit P. Parekh<sup>2</sup>, Collin Ladd<sup>2</sup>, Michael D. Dickey<sup>2</sup>, Jacob J. Adams<sup>1</sup>

<sup>1</sup>*Dept. of Electrical and Computer Engineering, North Carolina State University, Raleigh, NC*

<sup>2</sup>*Dept. of Chemical and Biomolecular Engineering, North Carolina State University, Raleigh, NC*

**16:00 B9-8**

X-BAND CONFORMAL ANTENNA FABRICATION USING DIRECT DIGITAL MANUFACTURING

Merve Kacar\*<sup>1</sup>, Casey Perkowski<sup>2</sup>, Paul Deffenbaugh<sup>2</sup>, Kenneth Church<sup>2</sup>, Thomas Weller<sup>1</sup>, Gokhan Mumcu<sup>1</sup>

<sup>1</sup>*Electrical Engineering, University of South Florida, Tampa, FL*

<sup>2</sup>*Sciperio, Orlando, FL*

**16:20 B9-9**

STRUCTURALLY EMBEDDED VASCULAR ANTENNAS (SEVA) IN BOTH MULTI-LAYER AND COMPLEX CURVED COMPOSITES

Gregory H. Huff\*<sup>1</sup>, Amrita Bal<sup>1</sup>, Darren J. Hartl<sup>1</sup>, Jeffery W. Baur W. Baur<sup>2</sup>,

Geoffrey J. Frank<sup>2,3</sup>, Robyn Bradford Bradford<sup>2,4</sup>, David Phillips Phillips<sup>4</sup>, Thao Gibson Gibson<sup>4</sup>, Daniel R. Rapping<sup>4</sup>

<sup>1</sup>*Texas A & M University, College Station, TX*

<sup>2</sup>*Air Force Research Lab, WBAFB, OH*

<sup>3</sup>*Universal Technology Corporation, Beavercreek, OH*

<sup>4</sup>*University 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-RECIPROCAL OPTICAL MANIPULATION USING DYNAMIC MODULATION

Yu Shi\*<sup>1</sup>, Momchil Minkov<sup>1</sup>, Qian Lin<sup>2</sup>, Shanhui Fan<sup>1</sup>

<sup>1</sup>*Electrical Engineering, Stanford University, Stanford, California*

<sup>2</sup>*Applied Physics, Stanford University, Stanford, CA*

**13:40 B10-2**

MAGNETLESS NONRECIPROCAL 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 NONRECIPROCAL DEVICES

Songbin Gong\*

*University of Illinois at Urbana Champaign, Urbana, IL*

**14:40 B10-5**

NONRECIPROCAL 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<sup>1</sup>, Ahmed Kord<sup>2</sup>, Dimitrios Sounas<sup>2</sup>, Zhenyun Qian<sup>1</sup>, Giuseppe Michetti<sup>1</sup>, Andrea Alu<sup>2</sup>,  
Matteo Rinaldi\*<sup>1</sup>

<sup>1</sup>*Northeastern University, Boston, MA*

<sup>2</sup>*University of Texas at Austin, Austin, TX*

**15:40 B10-7**

MAGNETLESS NON-RECIPROCAL COMPONENTS BASED ON SPATIO-TEMPORAL  
CONDUCTIVITY-MODULATION

Aravind Nagulu, Negar Resikarimian, Tolga Dinc, Harish Krishnaswamy\*

*Department of Electrical Engineering, Columbia University, New York*

**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<sup>1</sup>, Lawrence Cohen\*<sup>2</sup>

<sup>1</sup>*Signal Proc & Comm Analysis / Elec Sys & Tech, The MITRE Corporation, McLean, Virginia*

<sup>2</sup>*Radar 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\*<sup>1</sup>, Lawrence Cohen<sup>2</sup>

<sup>1</sup>*Signal Proc & Comm Analysis / Elec Sys & Tech, The MITRE Corporation, McLean, Virginia*

<sup>2</sup>*Radar Division, US Naval Research Laboratory, Washington, DC*

**14:00 CDE1-3**

ADAPTIVE AND RECONFIGURABLE RADAR FOR OPTIMUM SHARING

Charles Baylis\*<sup>1</sup>, Dimitrios Peroulis<sup>2</sup>

<sup>1</sup>*Baylor University, Waco, TX*

<sup>2</sup>*Purdue 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\*<sup>1</sup>, Casey Latham<sup>1</sup>, Pedro Rodriguez-Garcia<sup>1</sup>, Charles Baylis<sup>1</sup>, Lawrence Cohen<sup>2</sup>, Robert J. Marks<sup>1</sup>

<sup>1</sup>*Department of Electrical & Computer Engineering, Baylor University, Waco, TX*

<sup>2</sup>*Naval Research Laboratory, Washington, DC*

**14:40 CDE1-5**

FREQUENCY-AGILE POWER AMPLIFIER MATCHING NETWORK RECONFIGURATION USING A HYBRID REAL-TIME SEARCH

Christopher D. Kappelmann\*<sup>1</sup>, Lucilia Lamers<sup>1</sup>, Zachary Hays<sup>1</sup>, Sarvin Rezayat<sup>1</sup>, Charles Baylis<sup>1</sup>, Robert J. Marks<sup>1</sup>, Ed Viveiros<sup>2</sup>, Mohammad Abu Khater<sup>3</sup>, Abbas Semnani<sup>3</sup>, Dimitrios Peroulis<sup>3</sup>

<sup>1</sup>*Baylor University, Waco TX*

<sup>2</sup>*Army Research Laboratory, Adelphi MD*

<sup>3</sup>*Purdue 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*

**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\*

*Dept. of Electrical Engineering, University of Notre Dame, Notre Dame, IN*

**14:00 D1-3**

ASSESSMENT OF VO<sub>2</sub> 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\*<sup>1</sup>, Charles Baylis<sup>1</sup>, Robert Marks<sup>1</sup>, Edward Viveiros<sup>2</sup>

<sup>1</sup>*Baylor University, Waco, TX*

<sup>2</sup>*Army 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

*Dept. of Electrical, Computer, and Energy Engineering, University of Colorado Boulder,  
Boulder, Colorado*

**15:00 Break**

**15:20 D1-6**

FIELD-PROGRAMMABLE JOSEPHSON AMPLIFIER

Leonardo M. Ranzani\*<sup>1</sup>, Florent Lecocq<sup>2</sup>, Gabe A. Peterson<sup>2</sup>, Katarina Cicak<sup>2</sup>,  
Raymond W. Simmonds<sup>2</sup>, John D. Teufel<sup>2</sup>, Jose Aumentado<sup>2</sup>

<sup>1</sup>*Raytheon BBN Technologies, Cambridge, MA*

<sup>2</sup>*National 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 Saqueeb\*, Kubilay Sertel

*The Ohio State University, Columbus, OH*

**Session F6: Remote Sensing from Small Satellites II  
(Special Session)**

**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\*<sup>1</sup>, Shannon Statham<sup>1</sup>, Simone Tanelli<sup>1</sup>, Doug Price<sup>1</sup>, Jonathan Sauder<sup>1</sup>, Nacer Chahat<sup>1</sup>,  
Travis Imken<sup>1</sup>, Austin Williams<sup>2</sup>

<sup>1</sup>*Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA*

<sup>2</sup>*Tyvak Nano-Satellite Systems, Inc, Irvine, CA*

**13:40 F6-2**

ROLE OF GPSRO CALIBRATION IN AN OPERATIONAL CAPACITY FOR MIRATA

Bobby Holden\*<sup>1</sup>, Kerri Cahoy<sup>1</sup>, Greg Allan<sup>1</sup>, Erin Main<sup>1</sup>, Thomas Murphy<sup>1</sup>, William Blackwell<sup>2</sup>,  
Dan Cousins<sup>2</sup>, Michael Shields<sup>2</sup>

<sup>1</sup>*Massachusetts Institute of Technology, Boston, MA*

<sup>2</sup>*MIT 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\*<sup>1</sup>, Dale Ward<sup>2</sup>, Angel Otarola<sup>2</sup>

<sup>1</sup>*Space Sciences and Engineering, Golden, CO*

<sup>2</sup>*Atmospheric Sciences, University of Arizona, Tucson, AZ*

**14:20 F6-4**

IN-SITU IONOSPHERE MEASUREMENTS FROM THE COMPACT IONOSPHERE PROBE  
ON INSPIRESAT-1

Amal Chandran\*<sup>1,2</sup>, Loren Chang<sup>3</sup>, Priyadarshan Hari<sup>4</sup>, Kaustubh Kandi<sup>4</sup>, Duann Yi<sup>3</sup>,  
William Evonosky<sup>1</sup>

<sup>1</sup>*Laboratory for Atmospheric and Space Physics, University of Colorado Boulder, Boulder, CO*

<sup>2</sup>*School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore,  
SINGAPORE*

<sup>3</sup>*Graduate Institute for Space Science, National Central University, Jongli, Taiwan, TAIWAN*

<sup>4</sup>*Avionics, Indian Institute of Space Science and Technology, Trivandrum, INDIA*

**Session 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 Oudrhiri  
*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\*<sup>1</sup>, Joseph D. Huba<sup>2</sup>, Aaron J. Ridley<sup>3</sup>, Gregory D. Earle<sup>4</sup>, Lee Kordella<sup>4</sup>

<sup>1</sup>*Space Science Division, U.S. Naval Research Laboratory, Washington, DC*

<sup>2</sup>*Plasma Physics Division, U.S. Naval Research Laboratory, Washington, DC*

<sup>3</sup>*Climate and Space Sciences, The University of Michigan, Ann Arbor, MI*

<sup>4</sup>*Center for Space Science and Engineering Research, Virginia 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\*<sup>1</sup>, Robert A. Marshall<sup>1</sup>, Douglas Drob<sup>2</sup>, Daniel Marsh<sup>3</sup>, Jan Sojka<sup>4</sup>, Don Rice<sup>4</sup>

<sup>1</sup>*Colorado Center for Astrodynamics Research, University of Colorado Boulder, Boulder, CO*

<sup>2</sup>*Space Science Division, Naval Research Laboratory, Washington, DC*

<sup>3</sup>*National Center for Atmospheric Research, Boulder, CO*

<sup>4</sup>*Physics Department, 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\*<sup>1</sup>, Paul A. Bernhardt<sup>2</sup>, Robert A. Farrow<sup>3</sup>, H G. James<sup>1</sup>, Andrew D. Howarth<sup>1</sup>, Andrew W. Yau<sup>1</sup>

<sup>1</sup>*Physics and Astronomy, University of Calgary, Calgary, Alberta, CANADA*

<sup>2</sup>*Plasma Physics Division, Naval Research Laboratory, Washington, D.C.*

<sup>3</sup>*Unaffiliated*

**14:40 G3-5**

FIRST-LOOK ANALYSIS OF ECLIPSEMOB CROWDSOURCED DATA COLLECTION

Kiersten C. Kerby-Patel\*<sup>1</sup>, Jill K. Nelson<sup>2</sup>, William C. Liles<sup>3</sup>, Laura A. Lukes<sup>2</sup>

<sup>1</sup>*Engineering Department, Univ. of Mass. Boston, Boston, MA*

<sup>2</sup>*George Mason Univ., Fairfax, VA*

<sup>3</sup>*Independent 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. Bernhardt\*<sup>1</sup>, Joe D. Huba<sup>1</sup>, Stan J. Briczinski<sup>1</sup>, Carl L. Siefring<sup>1</sup>, Kevin Sterne<sup>2</sup>,

Mike Ruohoniemi<sup>2</sup>, Simon Shepherd<sup>3</sup>, Ethan Miller<sup>4</sup>, Gareth Perry<sup>5</sup>, Robert Farrow<sup>6</sup>

<sup>1</sup>*NRL, Washington, DC*

<sup>2</sup>*Electical and Computer Eng., Virginia Tech, Blacksburg, VA*

<sup>3</sup>*Engineering, Dartmouth, Hanover, MA*

<sup>4</sup>*Applied Physics Lab, Johns Hopkins University, Laurel, MD*

<sup>5</sup>*Physics and Astronomy, University of Calgary, Calgary, Alberta, CANADA*

<sup>6</sup>*Amateur 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 Zabotin\*<sup>1</sup>, Huan Song<sup>1,2</sup>, Terence Bullett<sup>3,4</sup>, Justin Mabie<sup>3,4</sup>

<sup>1</sup>*ECEE, University of Colorado Boulder, Boulder, CO*

<sup>2</sup>*Wuhan University, Wuhan, CHINA*

<sup>3</sup>*NCEI, NOAA, Boulder, CO*

<sup>4</sup>*CIRES, University of Colorado Boulder, Boulder, CO*

**16:20 G3-9**

MEASURING WAVES GENERATED BY SOLAR TERMINATOR WITH DYNASONDE TECHNIQUES

Nikolay Zabotin\*<sup>1</sup>, Huan Song<sup>1,2</sup>, Terence Bullett<sup>3</sup>

<sup>1</sup>*ECEE, University of Colorado Boulder, Boulder, CO*

<sup>2</sup>*Wuhan University, Wuhan, CHINA*

<sup>3</sup>*NCEI, NOAA, Boulder, CO*

**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*

**13:20**

**H4-1 RADIO AND PLASMA WAVE OBSERVATIONS AT SATURN AND JUPITER**

William S. Kurth\*<sup>1</sup>, D A. Gurnett<sup>1</sup>, G B. Hospodarsky<sup>1</sup>, S Ye<sup>1</sup>, J D. Menietti<sup>1</sup>, A M. Persoon<sup>1</sup>,  
A Sulaiman<sup>1</sup>, M Imai<sup>1</sup>, S Tetrick<sup>1</sup>, P Zarka<sup>2</sup>, L Lamy<sup>2</sup>, B Cecconi<sup>2</sup>, C Louis<sup>2</sup>, A Lecacheux<sup>2</sup>,  
W M. Farrell<sup>3</sup>, G Fischer<sup>4</sup>, J E. Wahlund<sup>5</sup>, M Morooka<sup>5</sup>, L Hadid<sup>5</sup>, S J. Bolton<sup>6</sup>,  
J E. P. Connerney<sup>3</sup>, S M. Levin<sup>7</sup>, P Valek<sup>6</sup>, F Allegrini<sup>6</sup>, P Louarn<sup>8</sup>, B H. Mauk<sup>9</sup>

<sup>1</sup>*University of Iowa, Iowa City, IA*

<sup>2</sup>*Observatoire de Paris, Meudon, FRANCE*

<sup>3</sup>*NASA/Goddard Space Flight Center, Greenbelt, MD*

<sup>4</sup>*Austrian Academy of Sciences, Graz, AUSTRIA*

<sup>5</sup>*IRF-U, Uppsala, SWEDEN*

<sup>6</sup>*Southwest Research Institute, San Antonio, TX*

<sup>7</sup>*Jet Propulsion Laboratory, Pasadena, CA*

<sup>8</sup>*IRAP, Toulouse, FRANCE*

<sup>9</sup>*Applied Physics Lab, Johns Hopkins University, Laurel, MD*

**13:40 H4-2**

**MMS ANALYSIS OF EMIC WAVES IN THE MAGNETOSHEATH**

Scott A. Boardsen\*<sup>1,2</sup>, Adolfo F. Vinas<sup>2</sup>, Frederick D. Wilder<sup>3</sup>, Alex Glocer<sup>2</sup>,  
William R. Paterson<sup>2</sup>, Alex C. Barrie<sup>2</sup>, Dan J. Gershman<sup>2</sup>, Barbara L. Giles<sup>2</sup>, Thomas E. Moore<sup>2</sup>,  
D. A. Roberts<sup>2</sup>, Christopher T. Russell<sup>4</sup>

<sup>1</sup>*Goddard Planetary and Heliophysics Institute, UMBC, Greenbelt, MD*

<sup>2</sup>*Heliophysics Division, NASA/GSFC, Greenbelt, MD*

<sup>3</sup>*Laboratory of Atmospheric and Space Physics, University of Colorado Boulder, Boulder, CO*

<sup>4</sup>*Department of Earth, 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\*<sup>1</sup>, David J. Knudsen<sup>1</sup>, Johnathan K. Burchill<sup>1</sup>, Andrew Howarth<sup>1</sup>, Andrew Yau<sup>1</sup>,  
Gareth Perry<sup>1</sup>, Gordon James<sup>1</sup>, David Miles<sup>2</sup>, Leroy Cogger<sup>1</sup>

<sup>1</sup>*University of Calgary, Calgary, AB, CANADA*

<sup>2</sup>*University 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  
*Radiophysical Research Institute,, Nizhny Novgorod State University, Nizhny Novgorod,  
RUSSIAN FEDERATION*

**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\*<sup>1</sup>, G. G. Howes<sup>1</sup>, F. Skiff<sup>1</sup>, C. A. Kletzing<sup>1</sup>, T. A. Carter<sup>2</sup>, S. Vincena<sup>2</sup>,  
S. Dorfman<sup>2</sup>

<sup>1</sup>*Department of Physics and Astronomy, University of Iowa, Iowa City, IA*

<sup>2</sup>*Department of 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. Streltsov  
*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  
*Department of 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 Moullet, *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\*<sup>1</sup>, Richard J. Lacasse<sup>1</sup>, Raymond P. Escoffier<sup>2</sup>, Joseph H. Greenberg<sup>1</sup>,  
Alejandro F. Saez<sup>1</sup>, Alain Baudry<sup>3</sup>, John C. Webber<sup>2</sup>

<sup>1</sup>*National Radio Astronomy Observatory, Charlottesville, VA*

<sup>2</sup>*National Radio Astronomy Observatory (retired), USA, Charlottesville, VA*

<sup>3</sup>*Laboratoire d'Astrophysique de Bordeaux, OASU, Universit? de Bordeaux, Bordeaux, Nouvelle-Aquitaine, FRANCE*

**14:00 J3-3**

THE NEXT GENERATION ALMA CORRELATOR

Jonathan Weintraub\*

*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\*<sup>1</sup>, Geoffrey B. Crew<sup>1</sup>, Michael H. Hecht<sup>1</sup>, Sheperd S. Doeleman<sup>2</sup>,  
Vincent L. Fish<sup>1</sup>, Walter Alef<sup>3</sup>, Richard Lacasse<sup>4</sup>, Ivan Marti-Vidal<sup>5</sup>, Neil M. Nagar<sup>6</sup>,  
Helge Rottmann<sup>3</sup>, Alan L. Roy<sup>3</sup>, Alejandro F. Saez<sup>7</sup>

<sup>1</sup>*Haystack Observatory, Massachusetts Institute of Technology, Westford, MA*

<sup>2</sup>*Harvard-Smithsonian Center for Astrophysics, Cambridge, MA*

<sup>3</sup>*Max-Planck-Institut fur Radioastronomie, Bonn, GERMANY*

<sup>4</sup>*NRAO Technology Center, National Radio Astronomy Observatory, Charlottesville, VA*

<sup>5</sup>*Onsala Space Observatory, Chalmers University of Technology, Onsala, SWEDEN*

<sup>6</sup>*Universidad de Concepcion, Concepcion, CHILE*

<sup>7</sup>*Joint ALMA Observatory, Santiago, CHILE*

**14:40 J3-5**

THE ALMA BAND 1 RECEIVER: BUILDING THE LOWER FREQUENCY END OF ALMA

Oscar Morata\*

*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\*<sup>1</sup>, Anthony R. Kerr<sup>1</sup>, Jeffrey G. Mangum<sup>1</sup>, Peter K. Day<sup>2</sup>, Henry G. LeDuc<sup>2</sup>, David P. Woody<sup>3</sup>, Jonas Zmuidzinas<sup>3</sup>, Arthur W. Lichtenberger<sup>4</sup>, Michael E. Cyberey<sup>4</sup>, Robert M. Weikle<sup>4</sup>

<sup>1</sup>*National Radio Astronomy Observatory, Charlottesville, VA*

<sup>2</sup>*Jet Propulsion Laboratory, NASA, Pasadena, CA*

<sup>3</sup>*California Institute of Technology, Charlottesville, VA*

<sup>4</sup>*University of Virginia, Charlottesville, VA*

### **15:40 J3-7**

PLANS FOR AN ALMA BAND-6 RECEIVER UPGRADE

Anthony R. Kerr<sup>1</sup>, Omid Noroozian\*<sup>1</sup>, Sivasankaran Srikanth<sup>1</sup>, Arthur W. Lichtenberger<sup>2</sup>, Joel Schlee<sup>3</sup>, Neal R. Erickson<sup>4</sup>

<sup>1</sup>*Central Development Laboratory, NRAO, Charlottesville, VA*

<sup>2</sup>*EECS, University of Virginia, Charlottesville, VA*

<sup>3</sup>*Low Noise Factory, Gothenburg, SWEDEN*

<sup>4</sup>*Astronomy, University of Massachusetts, Amherst, MA*

### **16:00 J3-8**

DISCOVERY FROM HYPERSPECTRAL ALMA IMAGERY WITH NEUROSCOPE

Erzsébet Merényi\*<sup>1,2</sup>, Andrea Isella<sup>3</sup>, Joshua Taylor<sup>1</sup>

<sup>1</sup>*Dept. of Statistics, Rice University, Houston, TX*

<sup>2</sup>*Dept. of Electrical and Computer Engineering, Rice University, Houston, TX*

<sup>3</sup>*Dept. of Physics and Astronomy, 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\*<sup>1</sup>, Yang Li<sup>1</sup>, Youngwook Kim<sup>2</sup>

<sup>1</sup>*Electrical and Computer Engineering, Baylor University, Waco, TX*

<sup>2</sup>*Electrical 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\*<sup>1</sup>, Narasimhan Rajaram<sup>2</sup>, Keith Bailey<sup>3</sup>, Magda El-Shenawee<sup>1</sup>

<sup>1</sup>*Department of Electrical Engineering, University of Arkansas, Fayetteville, AR*

<sup>2</sup>*Department of Biomedical Engineering, University of Arkansas, Fayetteville, AR*

<sup>3</sup>*Oklahoma 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\*<sup>1</sup>, Milan M. Ilic<sup>1,2</sup>, Branislav M. Notaros<sup>1</sup>

<sup>1</sup>*Electrical & Computer Engineering Department, Colorado State University, Fort Collins, CO*

<sup>2</sup>*School 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\*<sup>1</sup>, Chandler J. Bauder<sup>1</sup>, Paul T. Theilmann<sup>2</sup>, Aly E. Fathy<sup>1</sup>

<sup>1</sup>*Electrical Engineering and Computer Science, The University of Tennessee, Knoxville, TN*

<sup>2</sup>*MaXentric 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, Wisconsin*

**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\*<sup>1</sup>, Ryan Green<sup>2</sup>, Martin Mangino<sup>3</sup>, Erdem Topsakal<sup>2</sup>

<sup>1</sup>*Department of Biomedical Engineering, Virginia Commonwealth University, Richmond, VA*

<sup>2</sup>*Department of Electrical and Computer Engineering, Virginia Commonwealth University, Richmond, VA*

<sup>3</sup>*Department of Surgery, VCU School of Medicine, Richmond, VA*

**Commission Business Meetings**

|                           |           |
|---------------------------|-----------|
| <b>17:00</b> Commission B | Room 1B40 |
| <b>17:00</b> Commission G | Room 151  |
| <b>18:00</b> Commission D | Room 1B51 |
| <b>18:00</b> Commission H | Room 245  |
| <b>18:00</b> 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**

**SHAPED-PROFILED 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\*<sup>1</sup>, Blake Troksa<sup>1</sup>, Slobodan Savić<sup>1,2</sup>, Milan M. Ilić<sup>1,2</sup>, Branislav M. Notaros<sup>1</sup>

<sup>1</sup>*Electrical & Computer Engineering Department, Colorado State University, Fort Collins, CO*

<sup>2</sup>*School of Electrical Engineering, University of Belgrade, Belgrade, Serbia, YUGOSLAVIA*

**09:00 B11-3**

**SEEING THE INVISIBLE: IMAGING HIDDEN FEATURES WITH MULTIPLE-SCATTERING RECONSTRUCTIONS**

Mert Hidayetoglu\*<sup>1</sup>, Wen-Mei Hwu<sup>1</sup>, Weng C. Chew<sup>2</sup>

<sup>1</sup>*Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, Urbana, IL*

<sup>2</sup>*Electrical 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, Los Angeles, California*

**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\*<sup>1</sup>, Mohammed F. Hadi<sup>1,2</sup>, Melinda J. Piket-May<sup>1</sup>, Atef Z. Elsherbeni<sup>2</sup>

<sup>1</sup>*ECEE, University of Colorado Boulder, Boulder, CO*

<sup>2</sup>*EE, Colorado School of Mines, Golden, CO*

**10:40 B11-7**

A FINITE VOLUMES-BASED FDTD MATERIAL DISPERSION MODELING

Neeti P. Sonth\*<sup>1</sup>, Ravi C. Bollimuntha<sup>1</sup>, Mohammed F. Hadi<sup>1,2</sup>, Melinda J. Piket-May<sup>1</sup>,  
Atef Z. Elsherbeni<sup>2</sup>

<sup>1</sup>*ECEE, University of Colorado Boulder, Boulder, CO*

<sup>2</sup>*Electrical 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

Md Khadimul Islam\*<sup>1</sup>, Ahmed M. Hassan<sup>1</sup>, Fernando Vargas-Lara<sup>2</sup>, Jack F. Douglas<sup>2</sup>,  
Edward J. Garboczi<sup>3</sup>

<sup>1</sup>*Computer Science and Electrical Engineering, University of Missouri-Kansas City, Kansas  
City, MO*

<sup>2</sup>*Materials Science and Engineering Division, National Institute of Standards and Technology,  
Gaithersburg, MD*

<sup>3</sup>*Applied 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\*<sup>1</sup>, Richard E. Hodges<sup>2</sup>

<sup>1</sup>*Electrical and Computer Engineering, California State University, Northridge, CA*

<sup>2</sup>*Jet Propulsion Laboratory, Pasadena, CA*

**08:40 B12-2 A 3600 Scanning Lens Design**

Tuan M. Nguyen\*, Ozlem 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 Tamjid\*<sup>1</sup>, Chris M. Thomas<sup>2</sup>, Aly E. Fathy<sup>1</sup>

<sup>1</sup>*Electrical Engineering and Computer Science, University of Tennessee Knoxville, Knoxville, TN*

<sup>2</sup>*MaXentric 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*

**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 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 Islam\*<sup>1</sup>, Spencer On<sup>1</sup>, Ahmed M. Hassan<sup>1</sup>, Bharath Natarajan<sup>2</sup>, Itai Y. Stein<sup>3</sup>,  
Estelle Cohen<sup>3</sup>, Brian L. Wardle<sup>3</sup>, Renu Sharma<sup>4</sup>, J. Alexander Liddle<sup>4</sup>, Edward J. Garboczi<sup>5</sup>

<sup>1</sup>*Computer Science and Electrical Engineering, University of Missouri-Kansas City, Kansas City, MO*

<sup>2</sup>*Materials Science and Engineering Division, National Institute of Standards and Technology, Gaithersburg, MD*

<sup>3</sup>*Department of Aeronautics and Astronautics, Massachusetts Institute of Technology, Cambridge, MA*

<sup>4</sup>*Center for Nanoscale Science and Technology, National Institute of Standards and Technology, Gaithersburg, MD*

<sup>5</sup>*Applied 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

*Department of 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. Duncan<sup>1</sup>, Frank A. Vassallo\*<sup>2</sup>, Daniel T. Bennett<sup>1</sup>, Juan C. Correa<sup>3</sup>,  
Thomas P. Ketterl<sup>4</sup>, Thomas M. Weller<sup>4</sup>

<sup>1</sup>*EECS, United States Military Academy, West Point NY*

<sup>2</sup>*TECOMSYS, Clearwater, FL*

<sup>3</sup>*Department of Defense, Baltimore MD*

<sup>4</sup>*EECS, 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

*Dept. of 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 Liu\*<sup>1</sup>, David R. Jackson<sup>1</sup>, Ji Chen<sup>1</sup>, Murilo H. Seko<sup>2</sup>

<sup>1</sup>*Electrical and Computer Engineering, University of Houston, Houston, TX*

<sup>2</sup>*Electronic 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-ELLIPTIC-TYPE DIFFERENTIAL-  
MODE PASSBAND AND MULTI-NOTCH COMMON-MODE SUPPRESSION

Dakotah J. Simpson\*, Dimitra Psychogiou

*Dept. of 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\*<sup>1</sup>, Roberto Gomez-Garcia<sup>2</sup>, Jose-Maria Munoz-Ferreras<sup>2</sup>,  
Dimitra Psychogiou<sup>1</sup>

<sup>1</sup>*Electrical, Computer and Energy Engineering, University of Colorado Boulder, Boulder, CO*

<sup>2</sup>*Dpt. of Signal Theory and Communications, University of Alcala, 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

*ECEE, 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. Hays\*<sup>1</sup>, Sarvin Rezayat<sup>1</sup>, Zachary Hays<sup>1</sup>, Austin Egbert<sup>1</sup>, Christopher Kappelmann<sup>1</sup>,  
Charles Baylis<sup>1</sup>, Robert J. Marks<sup>1</sup>, Edward Viveiros<sup>2</sup>, Dimitrios Peroulis<sup>3</sup>, Mohammad Abu-  
Khater<sup>3</sup>, Abbas Semnani<sup>3</sup>

<sup>1</sup>*Department of Electrical and Computer Engineering, Baylor University, Waco, TX*

<sup>2</sup>*Army Research Laboratory, Adelphi, MD*

<sup>3</sup>*Department of Electrical and Computer Engineering, Purdue University, West Lafayette, IN*

**09:40 D2-5**

3D FAST PAE OPTIMIZATION USING AN EVANESCENT-MODE CAVITY TUNER

Zachary Hays\*<sup>1</sup>, Charles Baylis<sup>1</sup>, Mohammad Khater<sup>2</sup>, Edward Viveiros<sup>3</sup>

<sup>1</sup>*Baylor University, Waco*

<sup>2</sup>*Purdue University, West Lafayette, IN*

<sup>3</sup>*Army 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 Rezayat\*<sup>1</sup>, Charles Baylis<sup>1</sup>, Ed Viverios<sup>2</sup>, John Penn<sup>2</sup>, Robert J. Marks II<sup>1</sup>

<sup>1</sup>*Baylor University, Waco, TX*

<sup>2</sup>*Army Research Laboratory, Adelphi, MD*

**10:40 D2-7**

AN EVANESCENT-MODE CAVITY-BASED HIGH-POWER IMPEDANCE TUNER FOR  
ADAPTIVE RADAR APPLICATIONS

Abbas Semnani\*<sup>1</sup>, Mohammad Abu Khater<sup>1</sup>, Dimitrios Peroulis<sup>1</sup>, Charles Charles Baylis<sup>2</sup>,  
Lucilia Hays<sup>2</sup>, Christopher Kappelmann<sup>2</sup>, Zachary Hays<sup>2</sup>

<sup>1</sup>*Purdue University, West Lafayette, IN*

<sup>2</sup>*Baylor University, Waco, TX*

**11:00 D2-8**

RECONFIGURABLE PLANAR DIPOLE USING LIQUID-METAL NODES FOR FREQUENCY-TUNING APPLICATIONS

Anthony W. Combs\*, Kent J. Sarabia, Kareem S. B. Elassy, Aaron T. Ohta, Wayne A. Shiroma  
*Department of 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, *Naval Surface Warfare Center Dahlgren Division*

**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**

ESTIMATING THE REFRACTIVE ENVIRONMENT FROM RADAR READINGS WITH A NEURAL NETWORK CONDITIONED ON A DEEP BELIEF NETWORK

Nima Mirzaee\*<sup>1</sup>, Mark Wagner<sup>1</sup>, Peter Gerstoft<sup>1</sup>, Ted Rogers<sup>2</sup>  
<sup>1</sup>*SIO, University of California - San Diego, San Diego, CA*  
<sup>2</sup>*Pacific, SPAWAR, San Diego, CA*

**09:00 F8-3**

PRELIMINARY STUDY ON USE OF ENSEMBLE WEATHER PREDICTION DATA FOR INVERSELY DETERMINING ATMOSPHERIC REFRACTIVITY IN SURFACE DUCTING CONDITIONS

Daniel P. Greenway<sup>1</sup>, Tracy Haack<sup>2</sup>, Erin E. Hackett\*<sup>3</sup>  
<sup>1</sup>*Departments of Geography and Computer Science, Ball State University, Muncie, IN*  
<sup>2</sup>*Marine Meteorology Division, Naval Research Laboratory, Monterey, CA*  
<sup>3</sup>*Department of Coastal and Marine Systems Science, Coastal Carolina University, Conway, SC*

**09:20 F8-4**

AN EVALUATION OF SURFACE LAYER MODELS AND THE EVAPORATION DUCTS USING RADIO FREQUENCY LOSS INVERSIONS

Tracy Haack\*<sup>1</sup>, Andrew Kammerer<sup>2</sup>, Robert Burkholder<sup>3</sup>, Qi Wang<sup>3</sup>, Caglar Yardim<sup>3</sup>, Luyao Xu<sup>3</sup>, Paul Frederickson<sup>4</sup>  
<sup>1</sup>*Marine Meteorology Division, Naval Research Laboratory - Marine Meteorology Division, Monterey, CA*  
<sup>2</sup>*ONR Naval Research Enterprise Internship Program, Washington D.C.*  
<sup>3</sup>*Electircal and Computer Engineering Department, The Ohio State University, Electroscience*

*Laboratory, Columbus, OH*

*<sup>4</sup>Meteorology/Oceanography Department, Naval Postgraduate School, Monterey, CA*

**09:40 F8-5**

FURTHER IMPROVEMENTS AND VALIDATION FOR THE NAVY ATMOSPHERIC VERTICAL SURFACE LAYER MODEL (NAVSLAM)

Paul A. Frederickson\*

*Department of Meteorology, Naval Postgraduate School, Monterey, CA*

**10:00 Break**

**10:20 F8-6**

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, VA*

**10:40 F8-7**

OVERVIEW OF CASPER-WEST FIELD CAMPAIGN

Qing Wang\*

*Naval Postgraduate School, Monterey, CA*

**11:00 F8-8**

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 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\*<sup>1</sup>, Mahta Moghaddam<sup>1</sup>, Arvind Bhat<sup>2</sup>

<sup>1</sup>*Ming Hsieh Department of Electrical Engineering, University of Southern California, Los Angeles, CA*

<sup>2</sup>*Intelligent Automation, Inc. (IAI), Rockville, MD*

**09:20 FGH1-4**

P-BAND SIGNALS OF OPPORTUNITY REFLECTOMETRY FOR SNOW AND SOIL MOISTURE

Xiaolan Xu\*<sup>1</sup>, Rashmi Shah<sup>1</sup>, Simon Yueh<sup>1</sup>, Kelly Elder<sup>2</sup>

<sup>1</sup>*Jet Propulsion Lab, Pasadena, CA*

<sup>2</sup>*USDA Forest Service, Fort Collins, CO*

**09:40 FGH1-5**

RESULTS FROM A WETLANDS GNSS-R AIRCRAFT CAMPAIGN

Stephen T. Lowe\*<sup>1</sup>, Clara C. Chew<sup>2</sup>, Jesal Shah<sup>1</sup>, Michael Kilzer<sup>1</sup>, Son Nghiem<sup>1</sup>

<sup>1</sup>*Jet Propulsion Laboratory, La Cañada, CA*

<sup>2</sup>*UCAR, Boulder, CO*

**10:00 Break**

**10:20 FGH1-6**

GPS STOCHASTIC TEC AND PHASE SCINTILLATION

Charles L. Rino\*<sup>1</sup>, Brian Breitsch<sup>1</sup>, Yu Morton<sup>1</sup>, Charles Carrano<sup>2</sup>

<sup>1</sup>*Smead Aerospace Engineering Sciences Department, University of Colorado Boulder, Boulder, CO*

<sup>2</sup>*Institute of Scientific Research, Boston College, Boston, MA*

**10:40 FGH1-7**

COMPARISON OF SIMULATED AND REAL-WORLD DIFFRACTION EFFECTS IN GNSS PHASE MEASUREMENTS USING THE GEOMETRY-IONOSPHERE-FREE COMBINATION

Brian Breitsch\*<sup>1</sup>, Charles Rino<sup>2</sup>, Jade Morton<sup>1</sup>

<sup>1</sup>*Aerospace / Remote-Sensing, University of Colorado Boulder, Boulder, CO*

<sup>2</sup>*Institute for Scientific Research, Boston College, Boston, MA*

**11:00 FGH1-8**

CHARACTERIZATION OF GNSS SCINTILLATIONS OVER THREE NIGERIAN STATIONS; NSUKKA, ILE-IFE AND ILORIN DURING 2010-2012

Andrew Akala\*<sup>1</sup>, Patricia Doherty<sup>2</sup>, Keith Groves<sup>2</sup>, Charles Carrano<sup>2</sup>, Christopher Bridgwood<sup>2</sup>

<sup>1</sup>*University of Lagos, Lagos, NIGERIA*

<sup>2</sup>*ISR, Boston College, Boston, MA*

**11:20 FGH1-9**

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*

**11:40 FGH1-10**

PRELIMINARY SIMULTANEOUS OBSERVATIONS OF THE IONOSPHERE WITH BEACONS, IN-SITU HF RECEIVER AND INCOHERENT SCATTER RADAR IN THE POLAR CAP

Carl L. Siefring\*<sup>1</sup>, Paul A. Bernhardt<sup>1</sup>, H. Gordon James<sup>2</sup>, Andrew W. Yau<sup>2</sup>, Roger H. Varney<sup>3</sup>

<sup>1</sup>*Plasma Physics Division, Naval Research Laboratory, Washington, DC*

<sup>2</sup>*Department of Physics and Astronomy, University of Calgary, Calgary, AB, CANADA*

<sup>3</sup>*Center 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*

**08:20 G4-1**

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*

**08:40 G4-2**

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\*<sup>1</sup>, Tomoko Matsuo<sup>2</sup>, Xinan Yue<sup>3</sup>, Tzu-Wei Fang<sup>4</sup>, Timothy Fuller-Rowell<sup>4</sup>, Kayo Ide<sup>5</sup>, Jann-Yenq Liu<sup>1</sup>

<sup>1</sup>*Institute of Space Science, National Central University of Taiwan, Taoyuan, TAIWAN*

<sup>2</sup>*Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, Colorado*

<sup>3</sup>*Chinese Academy of Sciences, Beijing, CHINA*

<sup>4</sup>*Space Weather Prediction Center, National Oceanic and Atmospheric Administration, Boulder, CO*

<sup>5</sup>*Department of Atmospheric and Oceanic Science, University of Maryland, College Park, MD*

**09:00 G4-3**

MEASUREMENT OF IONOSPHERIC SCINTILLATION PARAMETERS FROM SYNTHETIC APERTURE RADAR AND THEIR COMPARISON

Shradha Mohanty\*<sup>1</sup>, Charles S. Carrano<sup>2</sup>, Gulab Singh<sup>1</sup>

<sup>1</sup>CSRE, Indian Institute of Technology Bombay, Mumbai, Maharashtra, INDIA

<sup>2</sup>ISR, Boston College, Boston, MA

**09:20 G4-4**

COLLABORATIVE SPACE AND GROUND-BASED OBSERVATIONS USING THE PUERTO RICO CUBESAT, THE AGUADILLA RADIO ARRAY, AND ARECIBO OBSERVATORY

Brett Isham\*<sup>1</sup>, Jan Bergman<sup>2</sup>, Alireza Mahmoudian<sup>1</sup>, Amilcar Rincon-Charris<sup>1</sup>, Fredrik Bruhn<sup>3</sup>, Peter Funk<sup>3</sup>, Bjorn Gustavsson<sup>4</sup>, Terence Bullett<sup>5</sup>, Linda Krause<sup>6</sup>

<sup>1</sup>Interamerican University of Puerto Rico, Bayamon, PR

<sup>2</sup>Swedish Institute of Space Physics, Uppsala, SWEDEN

<sup>3</sup>Malardalen University, Vasteras, SWEDEN

<sup>4</sup>University of Tromso, Tromso, NORWAY

<sup>5</sup>University of Colorado, Boulder, CO

<sup>6</sup>NASA Marshall Space Flight Center, Huntsville, AL

**09:40 G4-5**

MULTI-DIAGNOSTIC OBSERVATIONS OF EQUATORIAL IONOSPHERIC TURBULENCE

Rezy Pradipta, Endawoke Yizengaw, Patricia H. Doherty\*

*Institute 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*

**10:20 GH2-1**

RECENT RESULTS OF STIMULATED ELECTROMAGNETIC EMISSION MEASUREMENTS AT HAARP

Wayne Scales\*<sup>1</sup>, Augustine Yellu<sup>1</sup>, Alireza Mahmoudian<sup>2</sup>, Carl Sieftring<sup>3</sup>, Paul Bernhardt<sup>3</sup>

<sup>1</sup>Virginia Tech, Blacksburg, VA

<sup>2</sup>Interamerican University, Puerto Rico

<sup>3</sup>Naval Research Laboratory, Washington, DC

**10:40 GH2-2**

RECENT OBSERVATIONS AND MODELING OF IONOSPHERIC STIMULATED ELECTROMAGNETIC EMISSIONS

Alireza A. Mahmoudian\*<sup>1</sup>, Brett Isham<sup>1</sup>, Wayne Scales<sup>2</sup>, Paul Bernhardt<sup>3</sup>, Eliana Nossa<sup>4</sup>, Stan Briczinski<sup>3</sup>

<sup>1</sup>Electrical and Computer Engineering, InterAmerican University of Puerto Rico, Bayamon, Puerto Rico

<sup>2</sup>*Electrical and Computer Engineering, Virginia Tech, Blacksburg, VA*

<sup>3</sup>*Plasma Physics Division, Naval Research Laboratory, Washington, D.C*

<sup>4</sup>*Arecibo Observatory, Arecibo, PR*

**11:00 GH2-3**

**FDTD MODELING OF IONOSPHERIC HF HEATING**

Anthony J. Erdman\*, Robert C. Moore

*Electrical and Computer Engineering, University of Florida, Gainesville, FL*

**11:20 GH2-4**

**STATISTICAL ANALYSIS OF ULF SIGNALS GENERATED BY SURA FACILITY IN THE UPPER IONOSPHERE**

Dmitry S. Kotik\*, Alexander V. Ryabov, Elena N. Ermakova

*Radiophysical Research Institute, Nizhny Novgorod State University, Nizhny Novgorod, RUSSIAN FEDERATION*

**11:40 GH2-5**

**RESULTS FROM FIRST CAMPAIGN FROM MODULATED HEATING OF THE IONOSPHERE AT USING THE NEW HF HEATER AT ARECIBO OBSERVATORY**

Mark Golkowski\*<sup>1</sup>, Morris B. Cohen<sup>2</sup>, Robert C. Moore<sup>3</sup>, Ashanthi S. Maxworth<sup>1</sup>, J. McCormick<sup>2</sup>, James Bittle<sup>1</sup>, Poorya Hosseini<sup>1</sup>

<sup>1</sup>*Department of Electrical Engineering, University of Colorado Denver, Denver, CO*

<sup>2</sup>*School of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA*

<sup>3</sup>*Department of Electrical and Computer Engineering, University of Florida, Gainesville, FL*

**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**

## LIEFSI - LABORATORY INVESTIGATION OF E FIELD SENSOR INSTABILITIES

John W. Bonnell\*

*Space Sciences Laboratory, University of California, Berkeley, Berkeley, CA*

### **09:20 H5-4**

STUDIES OF THE MODIFICATION OF LANGMUIR PROBE TRACES IN STRONGLY MAGNETIZED PLASMAS USING THE MAGNETIZED DUSTY PLASMA EXPERIMENT (MDPX) DEVICE

Edward Thomas\*<sup>1</sup>, Spencer LeBlanc<sup>1</sup>, Taylor Hall<sup>1</sup>, Uwe Konopka<sup>1</sup>, Robert L. Merlino<sup>2</sup>, Marlene Rosenberg<sup>3</sup>

<sup>1</sup>*Physics, Auburn University, Auburn, AL*

<sup>2</sup>*Physics and Astronomy, University of Iowa, Iowa City, IA*

<sup>3</sup>*Electrical and Computer Engineering, University of California - San Diego, La Jolla, CA*

### **10:00 Break**

### **10:20 H5-5**

LOW FREQUENCY WAVE EMISSION AND TRANSPORT IN THE PRESENCE OF SINGLE AND MULTIPLE INTERACTING MAGNETIZED TEMPERATURE STRIATIONS

Richard Sydora\*<sup>1</sup>, Scott Karbasheski<sup>1</sup>, Bart Van Compernelle<sup>2</sup>, Matt Poulos<sup>2</sup>, George Morales<sup>2</sup>

<sup>1</sup>*Physics, University of Alberta, Edmonton, Alberta, CANADA*

<sup>2</sup>*Physics and Astronomy, University of California, Los Angeles, California*

### **10:40 H5-6**

DIRECT IN SITU OBSERVATIONS OF WHISTLER-MODE CHORUS MODULATION OF 500EV EDI ELECTRONS BY MMS

Kristoff Paulson\*<sup>1</sup>, Matthew Argall<sup>1</sup>, Narges Ahmadi<sup>2</sup>, Hiroshi Matsui<sup>1</sup>, Charlie Farrugia<sup>1</sup>, Terry Forbes<sup>1</sup>, Roy Torbert<sup>3</sup>, Hans Vaith<sup>1</sup>, Olivier Le Contel<sup>4</sup>, Hugo Breuillard<sup>4</sup>

<sup>1</sup>*Space Science Center, University of New Hampshire, Durham, NH*

<sup>2</sup>*LASP, University of Colorado Boulder, Boulder, CO*

<sup>3</sup>*Southwest Research Institute, Durham, NH*

<sup>4</sup>*Laboratory of Plasma Physics, Paris, FRANCE*

### **11:00 H5-7**

ONSET OF WHISTLER CHORUS IN THE MAGNETOSPHERE

Ge Wang\*, Herb L. Berk

*Physics, University of Texas at Austin, TX*

## **Session J4: The VLBA at 25: Recent Accomplishments and Future Directions (Special Session)**

**Room 265**

Session Co-Chairs: Greg Taylor, *University of New Mexico*;

Walter Brisken, *LBO*

### **08:20 J4-1**

CONCEPTS FOR A NEXT-GENERATION VLBA

Jonathan D. Romney\*

*Long Baseline Observatory, Socorro, NM*

**08:40 J4-2**

THE NEXT GENERATION VERY LARGE ARRAY LONG BASELINE OPTION

Robert J. Selina, Steven Durand\*

*National Radio Astronomy Observatory, Socorro, NM*

**09:00 J4-3**

VLBA SCIENCE HIGHLIGHTS

Greg B. Taylor\*

*Physics and Astronomy, University of New Mexico, Albuquerque, NM*

**09:20 J4-4**

VERY LONG BASELINE INTERFEROMETRY (VLBI) IN THE AGE OF FERMI AND GAIA

Frank K. Schinzel\*<sup>1</sup>, Leonid Petrov<sup>2</sup>

<sup>1</sup>*National Radio Astronomy Observatory, Socorro, NM*

<sup>2</sup>*Astrogeo Center, Falls Church, VA*

**09:40 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*

**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\*<sup>1</sup>, Gregory B. Taylor<sup>2</sup>

<sup>1</sup>*US Naval Observatory Flagstaff Station, Flagstaff, AZ*

<sup>2</sup>*Department of Astronomy, University of New Mexico, Albuquerque, NM*

**11:20 J4-9**

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 Department, 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\*<sup>1</sup>, Karl F. Warnick<sup>1</sup>, Brian D. Jeffs<sup>1</sup>, Richard A. Black<sup>1</sup>, Mitchell Burnett<sup>1</sup>, D.j. Pisano<sup>2</sup>, Duncan R. Lorimer<sup>2</sup>, Nicholas Pingel<sup>2</sup>, Kaustubh Rajwade<sup>2</sup>, Richard M. Prestage<sup>3</sup>, Steve White<sup>3</sup>, Bob Simon<sup>3</sup>, Luke Hawkins<sup>3</sup>, William Shillue<sup>4</sup>, D A. Roshi<sup>4</sup>

<sup>1</sup>*Electrical/Computer Engineering, Brigham Young University, Provo, UT*

<sup>2</sup>*Physics and Astronomy, West Virginia University, Morgantown, WV*

<sup>3</sup>*Green Bank Observatory, Green Bank, WV*

<sup>4</sup>*National Radio Astronomy Observatory CDL, Charlottesville, VA*

**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\*<sup>1</sup>, Robert Selina<sup>2</sup>, Bryan Butler<sup>2</sup>

<sup>1</sup>*Dept. of Electrical and Computer Engineering, University of Toronto, Toronto, Ontario, CANADA*

<sup>2</sup>*National Radio Astronomy Observatory, Socorro, NM*

**09:20 J5-4**

NEXT GENERATION SETI AND CASPER EXPERIMENTS

Dan Werthimer\*

*Astronomy Dept., University of California, Berkeley, CA*

**09:40 J5-5**

21-CM POWER-SPECTRUM ANALYSES OF THE 3C196 FLANKING FIELD

Nivedita Mahesh\*<sup>1</sup>, Andre R. Offringa<sup>2</sup>

<sup>1</sup>*School of Earth & Space Exploration, Arizona State University, Tempe, Arizona*

<sup>2</sup>*Netherlands Institute of Radio Astronomy, Dwingeloo, NETHERLANDS*

**10:00 Break**

**10:20 J5-6**

SCATTERING STUDY OF PULSARS BELOW 100 MHZ

Karishma Bansal\*<sup>1</sup>, Greg Taylor<sup>1</sup>, Kevin Stovall<sup>2</sup>

<sup>1</sup>*Physics & Astronomy, University of New Mexico, Albuquerque, NM*

<sup>2</sup>*NRAO, Socorro, NM*

**10:40 J5-7**

COMPLEMENTARY STUDY OF JUNO/MWR INVESTIGATION OF JUPITER'S  
SYNCHROTRON EMISSION FROM GROUND-BASED OBSERVATIONS AT LOW  
FREQUENCIES

Daniel Santos-Costa\*<sup>1</sup>, Masafumi Imai<sup>2</sup>, Scott J. Bolton<sup>1</sup>, Steve M. Levin<sup>3</sup>, Mike A. Janssen<sup>3</sup>,  
Philippe Zarka<sup>4</sup>, Julien Girard<sup>5</sup>, Cyril Tasse<sup>6</sup>, Hajime Kita<sup>7</sup>, Fuminori Tsuchiya<sup>7</sup>,  
Hiroaki Misawa<sup>7</sup>, Jack E. Connerney<sup>8</sup>

<sup>1</sup>*Southwest Research Institute, San Antonio, Texas*

<sup>2</sup>*University of Iowa, Iowa City, IA*

<sup>3</sup>*Jet Propulsion Laboratory / Caltech, Pasadena, CA*

<sup>4</sup>*LESIA, Observatoire de Paris, Meudon, FRANCE*

<sup>5</sup>*DSM/IRFU, CEA-Saclay, Gif sur Yvette, FRANCE*

<sup>6</sup>*GEPI, Observatoire de Paris, Meudon, FRANCE*

<sup>7</sup>*University of Tohoku, Sendai, JAPAN*

<sup>8</sup>*SRC & NASA GSFC, MD*

**11:00 J5-8**

SAMPLE VARIANCE IN REALISTIC 21 CM EOR SIMULATIONS

Adam E. Lanman\*, Jonathan C. Pober

*Brown University, Providence, RI*

**11:20 J5-9**

FRB121102: FIRST DETECTIONS AT 8-GHZ AND BROADBAND PROPERTIES

Vishal Gajjar\*

*Space Science Laboratory, University of California, Berkeley, Berkeley, 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**

**Fourth 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*

**SATURDAY AFTERNOON, 6 January 2018**

**Session B15: Antenna Arrays  
Room 1B40**

Session Co-Chairs: Randy Haupt, Colorado School of Mines;  
Dimitra Psychogiou, *University of Colorado Boulder*

**13:20 B15-1**

CONCENTRIC RING ARRAY OF CONNECTING SPIRALS WITH INTERLEAVED WAVES

Pedro Mendes Ruiz\*<sup>1</sup>, Israel Hinostriza<sup>1</sup>, Regis Guinvarc'h<sup>1</sup>, Randy Haupt<sup>2</sup>

<sup>1</sup>*SONDRA, CentraleSupélec, Gif-sur-yvette, FRANCE*

<sup>2</sup>*Department of Electrical Engineering, Colorado School of Mines, Golden, CO*

**13:40 B15-2**

REVIEW OF MODERN THINNED ARRAY METHODS FOR OPTIMIZING RANDOMLY SCATTERED ELEMENTS

Alan L. O'Donnell\*, Robert McGwier

*Hume Center, Virginia Tech, Blacksburg, VA*

**14:00 B15-3**

ASSUMPTIONS NEEDED FOR A VALID AVERAGE ELEMENT PATTERN IN A THREE DIMENSIONAL ARRAY

Alan L. O'Donnell\*, Robert McGwier

*Virginia Tech, Blacksburg, VA*

**14:20 B15-4**

AVERAGE ELEMENT PATTERN FOR A THREE DIMENSIONAL ARRAY

Alan L. O'Donnell\*, Robert McGwier

*Virginia Tech, Blacksburg, VA*

**14:40 B15-5**

WIDEBAND MONOSTATIC CO-POLARIZED CO-CHANNEL SIMULTANEOUS TRANSMIT AND RECEIVE OMNIDIRECTIONAL AND BROADSIDE ANTENNA ARRAYS

Ehab Etellisi\*, Mohamed Elmansouri, Dejan Filipović

*University of Colorado Boulder, Boulder, CO*

**15:00 Break**

**15:20 B15-6**

**BROADBAND ANTENNA ARRAYS USING FREQUENCY SELECTIVE FEEDING NETWORKS**

Matthew Cullen, Christopher G. Gay\*, Dimitra Psychogiou

*Electrical, Computer, and Energy Engineering, University of Colorado Boulder, Boulder, CO*

**15:40 B15-7**

**MM-WAVE BEAM-SCANNING FOCAL PLANE ARRAYS WITH MICROFLUIDICALLY SWITCHED FEED NETWORKS**

Enrique J. Gonzalez\*, Gokhan Mumcu

*Electrical Engineering, University of South Florida, Tampa, FL*

**16:00 B15-8**

**ANALYTICAL EFFECTIVE LENGTH COMPARISONS OF CIRCULARLY DISTRIBUTED ANTENNA ARRAYS**

Timi Adeyemi\*, Kristopher Buchanan, Carlos Flores-Molina, Sara Wheeland, Drew Overturf

*Electromagnetics Technology Branch, Space and Naval Warfare Systems Center Pacific, San Diego, CA*

**16:20 B15-9**

**SIDELOBE BEHAVIOR AND BANDWIDTH CHARACTERISTICS OF DISTRIBUTED ANTENNA ARRAYS**

Kristopher R. Buchanan, Timi Adeyemi\*, Carlos Flores-Molina, Sara Wheeland, Drew Overturf

*Electromagnetics Technology Branch, Space and Naval Warfare Systems Center Pacific, San Diego, CA*

**16:40 B15-10**

**COMPACT WIDE-ANGLE CIRCULAR POLARIZED SEQUENTIAL ROTATED QUARTER SECTOR PATCH ANTENNA WITH NOTCHES FOR PHASED ARRAY APPLICATIONS**

Ghanshyam Mishra\*, Satish K. Sharma

*Department of Electrical and Computer Engineering, San Diego State University, San Diego, CA*

**Session B16: Antenna Development using Additive Manufacturing**

**Room 105**

Session Co-Chairs: Steven Weiss, *US Army Research Lab*;

Seth McCormick, *US Army Research Lab*

**13:20 B16-1**

**LOW-DIELECTRIC CONSTANT MATERIALS IN ADDITIVE MANUFACTURING FOR IMPROVED AIR INTERFACE MATCHING IN HIGH FREQUENCY APPLICATIONS**

Paul E. Parsons\*<sup>1</sup>, Zachary J. Larimore<sup>2</sup>, Mark S. Mirotznik<sup>2</sup>

<sup>1</sup>*Materials Science and Engineering, University of Delaware, Newark, DE*

<sup>2</sup>*Electrical and Computer Engineering, University of Delaware, Newark, DE*

**13:40 B16-2**

STACKED PATCH APPROACH FOR INCREASED BANDWIDTH OF A DUAL-BAND AND DUAL-POLARIZATION ANTENNA

Gregory Mitchell\*, Amir Zaghloul

*U.S. Army Research Laboratory, Adelphi, MD*

**14:00 B16-3**

MEASURED PERFORMANCE OF AN ELECTRICALLY THIN BROADBAND ANTENNA

Steven Weiss\*

*US Army Research Lab, Adelphi, MD*

**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 Bhardwaj, *Florida International University*;

Joshua Kovitz, *Georgia Tech Research Institute*

**15:20 B17-1**

ANTENNAS FOR 5G: TRENDS, CHALLENGES, AND POTENTIAL SOLUTIONS

Joshua M. Kovitz\*<sup>1</sup>, Shubhendu Bhardwaj<sup>2</sup>

<sup>1</sup>*Advanced Concepts Laboratory, Georgia Tech Research Institute, Atlanta*

<sup>2</sup>*Electrical and Computer Engineering Department, Florida International University, Miami, FL*

**15:40 B17-2**

INTERFERENCE MITIGATION FOR 5G MILLIMETER WAVE COMMUNICATIONS

Dimitrios Sifarakis\*, 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\*<sup>1</sup>, Cedric W. L. Lee<sup>1</sup>, Asimina Kiourti<sup>1</sup>, Satheesh Bojja Venkatakrishnan<sup>2</sup>,  
John L. Volakis<sup>2</sup>

<sup>1</sup>*ECE, The Ohio State University, Columbus, OH*

<sup>2</sup>*CEC, 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*

**17:20 B17-6**

CIRCULARLY POLARIZED METAL ANTENNAS AND CHARACTERIZATION-METHODS FOR SUB-MM-WAVE AND TERAHERTZ FREQUENCIES

Shubhendu Bhardwaj\*

*Electrical and Computer Engineering Dept., 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

*Department of 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\*<sup>1</sup>, Milan M. Ilic<sup>1,2</sup>, Branislav M. Notaros<sup>1</sup>

<sup>1</sup>*Electrical and Computer Engineering, Colorado State University, Fort Collins, Colorado*

<sup>2</sup>*School 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

Vahid Foroutan\*, Omid Manoochehri, Farhad Farzami

*ECE, University of Illinois at Chicago, Chicago, IL*

**16:40 B18-5**

DOWNHOLE WIRELESS COMMUNICATION USING MAGNETIC INDUCTION  
TECHNIQUE

Li Yan\*, Debing Wei, Miao Pan, Jiefu Chen

*Dept. of Electrical and Computer Engineering, University of Houston, Houston, TX*

**17:20 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*

**13:20 BGH1-1**

NUMERICAL MODELING OF ULF WAVES IN EARTH'S MAGNETOSPHERE:  
IONOSPHERIC EFFECTS

Robert L. Lysak\*<sup>1</sup>, Yan Song<sup>1</sup>, Colin L. Waters<sup>2</sup>, Murray D. Sciffer<sup>2</sup>

<sup>1</sup>*University of Minnesota, Minneapolis, MN*

<sup>2</sup>*University 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, Colorado*

**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

*ECEE, 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

Gregory H. Huff\*, Abhay Anand Anand, Francisco Espinal, Rajarshi Bhattacharyya,  
Vasudev Gohil, Srinivas Shakkottai, Jean-Francois Chamberland  
*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. Lind<sup>1</sup>, Philip J. Erickson<sup>1</sup>, William Rideout<sup>1</sup>, Ryan Volz<sup>1</sup>, John P. Swoboda\*<sup>1</sup>,  
Juha Vierinen<sup>2</sup>

<sup>1</sup>*Atmospheric Sciences Group, MIT Haystack Observatory, Westford, MA*

<sup>2</sup>*Department of Physics, 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\*<sup>1</sup>, Paul E. Racette<sup>2</sup>, Lihua Li<sup>2</sup>

<sup>1</sup>*University at Albany, SUNY, Albany, NY*

<sup>2</sup>*NASA Goddard Space Flight Center, Greenbelt, MD*

**16:40 C1-10**

ARTIFICIAL NEURAL NETWORK POWER AMPLIFIER INPUT SIGNAL SYNTHESIS FOR RADAR JOINT CIRCUIT AND WAVEFORM OPTIMIZATION

Pedro A. Rodriguez-Garcia\*<sup>1</sup>, Casey Latham<sup>1</sup>, Austin Egbert<sup>1</sup>, Charles Baylis<sup>1</sup>,  
Robert Marks II<sup>1</sup>, Lawrence Cohen<sup>2</sup>

<sup>1</sup>*Department of Electrical & Computer Engineering/Wireless and Microwave Circuits and Systems Program, Baylor University, Waco, TX*

<sup>2</sup>*Naval Research Laboratory, Washington DC*

**Session FEJ1: RFI Mitigation for Remote Sensing  
(Special Session)**

**Room 155**

Session Co-Chairs: David Kunkee, *The Aerospace Corporation*;  
Sidharth Misra, *Jet Propulsion Laboratory*

**13:20 FEJ1-1**

SMAP: ANALYSIS OF RESIDUAL RADIO FREQUENCY INTERFERENCE SOURCES

Alexandra Bringer\*<sup>1</sup>, Caglar Yardim<sup>1</sup>, Joel T. Johnson<sup>1</sup>, Priscilla Mohammed<sup>2</sup>,  
Jeffrey R. Piepmeier<sup>2</sup>

<sup>1</sup>*ElectroScience Laboratory, The Ohio State University, Columbus, OH*

<sup>2</sup>*NASA's Goddard Space Flight Center, Greenbelt, MD*

**13:40 FEJ1-2**

A STUDY OF SPECTRAL KURTOSIS OF CROSS SPECTRA FOR RFI DETECTION AND MITIGATION IN CORRELATION RADIOMETRY

Aravind Venkitasubramony\*<sup>1</sup>, Albin J. Gasiewski<sup>1</sup>, Eryan Dai<sup>1</sup>, Maciej Stachura<sup>2</sup>, Jack Elston<sup>2</sup>

<sup>1</sup>*Dept of ECEE, University of Colorado, Boulder*

<sup>2</sup>*Blackswift Technologies LLC, Boulder*

**14:00 FEJ1-3**

AN RFI MITIGATION STRATEGY TO IMPROVE PROTECTION OF GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) RADIO OCCULTATION (RO) MEASUREMENTS FOR EARTH OBSERVATION

David B. Kunkee\*, David G. Lubar, Paul H. Kim

*The Aerospace Corporation, Los Angeles, CA*

**14:20 FEJ1-4**

A MINATURE NULLSTEERING GPS ANTENNA

Yue Zheng\*, Yikun Huang, Yuanxun E. Wang

*University of California, Los Angeles, Los Angeles, CA*

**14:40 FEJ1-5**

IMPACTS OF RADIO FREQUENCY INTERFERENCE IN SYNTHETIC APERTURE RADAR DATA

Mingliang Tao\*, Jia Su, Ling Wang

*School of Electronics and Information, Northwestern Polytechnical University, Xi'an, Shaanxi, CHINA*

**15:00 Break**

**15:20 FEJ1-6**

AUTOMATED TUNING OF RFI IDENTIFICATION AND FLAGGING ALGORITHMS

Urvashi Rau\*<sup>1</sup>, Bruno J. Martins<sup>2</sup>

<sup>1</sup>*National Radio Astronomy Observatory, Socorro, New Mexico*

<sup>2</sup>*UNISUL, Tubarao,, BRAZIL*

**15:40 FEJ1-7**

A PROTOTYPE FOR REAL-TIME RFI MITIGATION FOR SINGLE-DISH RADIO TELESCOPES

Nick Joslyn\*<sup>1</sup>, Emily Ramey<sup>2</sup>, Richard Prestage<sup>3</sup>, Tim Blattner<sup>4</sup>, Cedric Viou<sup>5</sup>, Jessica Masson<sup>5</sup>, Luke Hawkins<sup>3</sup>, Michael Lam<sup>6</sup>, Mark Whitehead<sup>3</sup>

<sup>1</sup>*Simpson College, Indianola, IA*

<sup>2</sup>*Washington University in St. Louis, St. Louis, MO*

<sup>3</sup>*Green Bank Observatory, Green Bank, WV*

<sup>4</sup>*National Institute of Standards and Technology, Gaithersburg, MD*

<sup>5</sup>*Station de radioastronomie de Nançay, Nançay, FRANCE*

<sup>6</sup>*West Virginia University, Morgantown, WV*



**16:00 FEJ1-8**

**RADIO FREQUENCY INTERFERENCE (RFI) DETECTION BASED ON CYCLIC SPECTRUM ANALYSIS**

Gonzalo A. Cucho-Padin\*<sup>1</sup>, Lara Waldrop<sup>1</sup>, Farzad Kamalabadi<sup>1</sup>, Tian Zhi<sup>2</sup>, Wang Yue<sup>2</sup>

<sup>1</sup>*Electrical and Computer Engineering, University of Illinois at Urbana Champaign, Champaign, Illinois*

<sup>2</sup>*Electrical and Computer Engineering, George Mason University, Fairfax, Virginia*

**Session G5: Space Plasma Measurement Techniques**

**(Special Session)**

**Room 151**

Session Co-Chairs: Tom Gaussiran, *ARL:UT*;

Terry Bullett, *University of Colorado Boulder*

**15:20 G5-1**

**WHAT IS NEEDED TO FORECAST SPORADIC E?**

Douglas P. Drob\*<sup>1</sup>, Joseph D. Huba<sup>2</sup>, Katherine A. Zawdie<sup>1</sup>, Clayton Coker<sup>1</sup>, David E. Siskind<sup>1</sup>

<sup>1</sup>*Space Science Division, U.S. Naval Research Laboratory, Washington, DC*

<sup>2</sup>*Plasma Physics Division, U.S. Naval Research Laboratory, Washington, DC*

**15:40 G5-2**

**THE IONOSPHERIC FORECAST SYSTEM BY ASSIMILATING GNSS OBSERVATIONS**

Chia-Hung K. Chen\*<sup>1</sup>, Charles Lin<sup>1</sup>, Tomoko Matsuo<sup>2,3</sup>, Jann-Yenq Liu<sup>4,5</sup>

<sup>1</sup>*Department of Earth Sciences, National Cheng Kung University, Tainan, TAIWAN*

<sup>2</sup>*Cooperative Institute for Research in Environmental Sciences, University of Colorado Boulder, Boulder, Colorado*

<sup>3</sup>*Space Weather Prediction Center, National Oceanic and Atmospheric Administration, CO*

<sup>4</sup>*Institute of Space Science, National Central University, Taoyuan, TAIWAN*

<sup>5</sup>*Center for Space and Remote Sensing Research, National Central University, Taoyuan, TAIWAN*

**16:00 G5-3**

**ON THE MORPHOLOGY OF THE EQUATORIAL EVENING VORTEX**

Samuel A. Shidler\*<sup>1</sup>, Fabiano S. Rodrigues<sup>1</sup>, Bela G. Fejer<sup>2</sup>

<sup>1</sup>*Dept. of Physics, University of Texas at Dallas, Plano, TX*

<sup>2</sup>*Utah State University, Logan, UT*

**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, Alaska*

**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*

**17:40 G5-6**

**ISR SPECTRA SIMULATIONS WITH ELECTRON-ION COULOMB COLLISIONS**

William J. Longley\*<sup>1</sup>, Meers M. Oppenheim<sup>1</sup>, Alex C. Fletcher<sup>1,2</sup>, Yakov S. Dimant<sup>1</sup>

<sup>1</sup>*Center for Space Physics, Boston University, Boston, MA*

<sup>2</sup>*Department of Physics, 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\*<sup>1</sup>, Oliver J. Roberts<sup>2</sup>, Matthew Stanbro<sup>1</sup>, Eric S. Cramer<sup>1</sup>,

Robert H. Holzworth<sup>3</sup>, J E. Grove<sup>4</sup>, A Chekhtman<sup>5</sup>, Shelia McBreen<sup>6</sup>

<sup>1</sup>*CSPAR, University of Alabama in Huntsville, Huntsville, AL*

<sup>2</sup>*USRA, USRA, Huntsville, AL*

<sup>3</sup>*Earth and Space Sciences, University of Washington, Seattle, WA*

<sup>4</sup>*Space Science Division, NRL, Washington, DC*

<sup>5</sup>*College of Science, George Mason University, Fairfax, VA*

<sup>6</sup>*School 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\*<sup>1</sup>, Robert A. Marshall<sup>1</sup>, Sebastien Celestin<sup>2</sup>, Victor P. Pasko<sup>3</sup>

<sup>1</sup>*Department of Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO*

<sup>2</sup>*Laboratory of Physics and Chemistry of the Environment and Space (LPC2E), University of Orleans, Orleans, FRANCE*

<sup>3</sup>*Communications 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

*Department of 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\*<sup>1</sup>, Fanchao Lyu<sup>1</sup>, Zilong Qin<sup>2</sup>, Mingli Chen<sup>2</sup>

<sup>1</sup>*Electrical and Computer Engineering, Duke University, Durham, NC*

<sup>2</sup>*Department of Building Service Engineering, The Hong Kong Polytechnic University, Hung Hom, Hong Kong, CHINA*

**14:40 HEG1-5**

OBSERVATIONS OF RED SPRITES FROM SPACE IN THE VICINITY OF LIGHTNING MAPPING NETWORKS

Gaopeng Lu\*<sup>1</sup>, Anjing Huang<sup>1</sup>, Steven A. Cummer<sup>2</sup>, Fanchao Lyu<sup>2</sup>, Alfred B. Chen<sup>3</sup>

<sup>1</sup>*Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, CHINA*

<sup>2</sup>*Electrical and Computer Engineering, Duke University, Durham, NC*

<sup>3</sup>*Department of Physics, National Cheng Kung University, Tainan, TAIWAN*

**15:00 Break**

**15:20 HEG1-6**

SECONDARY EFFECTS OF LIGHTNING-INDUCED ELECTRON PRECIPITATION: CHEMICAL EFFECTS, OPTICAL EMISSIONS, AND X-RAYS

Robert A. Marshall\*<sup>1</sup>, Wei Xu<sup>1</sup>, Austin Sousa<sup>2</sup>, Antti Kero<sup>3</sup>

<sup>1</sup>*Smead Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO*

<sup>2</sup>*Aeronautics and Astronautics, Stanford University, Stanford, CA*

<sup>3</sup>*Sodankyla Geophysical Observatory, University of Oulu, Oulu, FINLAND*

**15:40 HEG1-7**

LWPC MODELING OF VLF PERTURBATIONS FROM LIGHTNING INDUCED ENERGETIC ELECTRON PRECIPITATION ON OVERLAPPING PATHS OF PROPAGATION

Chad M. Renick\*<sup>1</sup>, Mark Golkowski<sup>1</sup>, Sandeep Sarker<sup>1</sup>, Morris Cohen<sup>2</sup>

<sup>1</sup>*Electrical Engineering, University of Colorado Denver, Denver, CO*

<sup>2</sup>*Electrical and Computer Engineering, Georgia Tech, Atlanta, GA*

**16:00 HEG1-8**

PROPAGATION ANALYSIS OF DAYTIME TWEAK ATMOSPHERICS ORIGINATING FROM EUROPEAN NORTH ATLANTIC WINTER THUNDERSTORMS

Ondrej Santolik\*<sup>1,2</sup>, Ivana Kolmasova<sup>1,2</sup>

<sup>1</sup>*Institute of Atmospheric Physics CAS, Prague, CZECH REPUBLIC*

<sup>2</sup>*Faculty of Mathematics and Physics, Charles University, Prague, CZECH REPUBLIC*

**16:20 HEG1-9**

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*

**16:40 HEG1-10**

**IONOSPHERIC D-REGION REMOTE SENSING USING ELF SFERICS**

Mark Golkowski\*<sup>1</sup>, Sandeep Sarker<sup>1</sup>, Chad Renick<sup>1</sup>, Robert C. Moore<sup>2</sup>, Morris B. Cohen<sup>3</sup>

<sup>1</sup>*Department of Electrical Engineering, University of Colorado Denver, Denver, CO*

<sup>2</sup>*Department of Electrical and Computer Engineering, University of Florida, Gainesville, FL*

<sup>3</sup>*School of Electrical 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 Clarke\*<sup>1</sup>, Namir Kassim<sup>1</sup>, Simona Giacintucci<sup>1</sup>, Wendy Peters<sup>1</sup>, Emil Polisensky<sup>1</sup>, Joseph Helmboldt<sup>1</sup>, Emily Richards<sup>2</sup>

<sup>1</sup>*Naval Research Laboratory, Washington, DC*

<sup>2</sup>*National Research Council, Washington, DC*

**14:20 J6-4**

**LATEST RESULTS FROM EDGES**

Judd D. Bowman\*<sup>1</sup>, Alan E. E. Rogers<sup>2</sup>, Raul A. Monsalve<sup>3,1,4</sup>, Thomas J. Mozdzen<sup>1</sup>, Nivedita Mahesh<sup>1</sup>

<sup>1</sup>*School of Earth and Space Exploration, Arizona State University, Tempe, AZ*

<sup>2</sup>*Haystack Observatory, Massachusetts Institute of Technology, Westford, MA*

<sup>3</sup>*Center for Astrophysics and Space Astronomy, University of Colorado, Boulder, CO*

<sup>4</sup>*Facultad de Ingenieria, Universidad Catolica de la Santisima Concepcion, Concepcion, CHILE*

**14:40 J6-5**

**THE LWA1 LOW FREQUENCY SKY SURVEY**

Jayce Dowell\*<sup>1</sup>, Gregory B. Taylor<sup>1</sup>, Frank Schinzel<sup>2,1</sup>, Namir E. Kassim<sup>3</sup>, Kevin Stovall<sup>2,1</sup>

<sup>1</sup>*Physics and Astronomy, University of New Mexico, Albuquerque, NM*

<sup>2</sup>*National Radio Astronomy Observatory, Socorro, NM*

<sup>3</sup>*Radio 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

*Department of 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

Masafumi Imai\*<sup>1</sup>, William S. Kurth<sup>1</sup>, George B. Hospodarsky<sup>1</sup>, Scott J. Bolton<sup>2</sup>, John E. P. Connerney<sup>3</sup>, Steven M. Levin<sup>4</sup>, Alain Lecacheux<sup>5</sup>, Laurent Lamy<sup>5</sup>, Philippe Zarka<sup>5</sup>, Tracy E. Clarke<sup>6</sup>, Charles A. Higgins<sup>7</sup>

<sup>1</sup>*University of Iowa, Iowa City, IA*

<sup>2</sup>*Southwest Research Institute, San Antonio, TX*

<sup>3</sup>*NASA Goddard Space Flight Center, Greenbelt, MD*

<sup>4</sup>*Jet Propulsion Laboratory, Pasadena, CA*

<sup>5</sup>*Observatoire de Paris, Meudon, FRANCE*

<sup>6</sup>*Naval Research Laboratory, Washington, DC*

<sup>7</sup>*Middle 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**