

**National Radio Science Meeting**  
**4-7 January 2017**  
**University of Colorado Boulder**  
**Sponsored by USNC-URSI**

**TUESDAY EVENING, 3 January 2017**

**19:00 – 23:00 USNC-URSI Business Meeting, Marriott Hotel**

**WEDNESDAY MORNING, 4 January 2017**

**Session B1: Advanced Theory and Applications of Metamaterials**  
**(Special Session)**  
**Room 1B40**

Co-Chairs: Ashwin Iyer, *University of Alberta*;  
Filippo Capolino, *University of California Irvine*

**08:20 B1-1**

**BINARY HUYGENS' METASURFACE: A SIMPLE AND EFFICIENT RETROREFLECTOR AT NEAR-GRAZING ANGLES**

Alex M. H. Wong\*, Philip Christian, George V. Eleftheriades  
*Electrical and Computer Engineering, University of Toronto, Toronto, CANADA*

**08:40 B1-2**

**PERTURBATION THEORY APPLIED TO DIELECTRIC METAMATERIAL RESONATORS**

Salvatore Campione, Larry K. Warne\*, Lorena I. Basilio, William L. Langston,  
Michael B. Sinclair  
*Sandia National Laboratories, Albuquerque, NM*

**09:00 B1-3**

**BROADBAND METAMATERIAL ABSORBERS IN THE VISIBLE SPECTRUM: EFFECT OF NANOPARTICLE SHAPE**

Chinmay Garud\*<sup>1</sup>, Ahmed M. Hassan<sup>1</sup>, Edward Garboczi<sup>2</sup>  
<sup>1</sup>*Computer Science and Electrical Engineering, University of Missouri Kansas City, Kansas City, MO*  
<sup>2</sup>*Applied Chemicals and Materials Division, National Institute of Standards and Technology, Boulder, CO*

**09:20 B1-4**

**ENHANCED TRANSMISSION INTO LAYERED-PLASMONIC METAMATERIALS THROUGH K-SPACE HARMONIC COUPLING**

Iman Aghanejad, Kenneth J. Chau, Loic Markley\*

*School of Engineering, University of British Columbia, Kelowna, BC, CANADA*

**09:40 B1-5**

**UNIVERSAL SPIN-MOMENTUM LOCKING OF LIGHT**

Zubin Jacob\*, Todd V. Mechelen

*Electrical and Computer Engineering, Purdue University, West Lafayette, IN*

**10:00 Break**

**10:20 B1-6**

**NOVEL PROPAGATION MODEL OF DEGENERATE BAND EDGE MODES USING DUAL NON-IDENTICAL PAIR OF COUPLED TRANSMISSION LINES**

Muhammed R. Zuboraj\*, Kubilay Sertel, John L. Volakis

*Electrical and Computer Engineering, Electroscience Laboratory, The Ohio State University, Columbus, OH*

**10:40 B1-7**

**THEORY OF EXCEPTIONAL POINTS OF DEGENERACY IN COUPLED WAVEGUIDES WITH BALANCED GAIN AND LOSS**

Mohamed Othman\*, Filippo Capolino

*Electrical Engineering and Computer Science, University of California Irvine, Irvine, CA*

**11:00 B1-8**

**BOUNDARY CONDITIONS FOR MULTIPOLAR MEDIA DETERMINED FROM MAXWELL'S EQUATIONS AND CONSTITUTIVE RELATIONS**

Arthur D. Yaghjian\*

*Electromagnetics Research Consultant, Concord, MA*

**11:20 B1-9**

**DESIGN OF DUAL-BAND LINEARLY AND CIRCULARLY POLARIZED MICROSTRIP PATCH ANTENNAS USING UNIPLANAR METAMATERIAL-BASED EBGs**

Stuart Barth, Braden P. Smyth, Ashwin K. Iyer\*

*Electrical and Computer Engineering, University of Alberta, Edmonton, AB, CANADA*

**11:40 B1-10**

**RF CONTROLLED ATOM-VAPOR BASED MATERIAL FOR ELECTRIC FIELD METROLOGY**

Christopher L. Holloway\*, Matt T. Simons, Josh A. Gordon

*National Institute of Standards and Technology, Boulder, CO*

**Session B2: Advances in CEM and Emerging Applications  
(Special Session)**

## Room 200

Co-Chairs: Branislav Notaros, *Colorado State University*;  
Yahya Rahmat-Samii, *University of California Los Angeles*

### 08:20 B2-1

#### SURFACE INTEGRAL EQUATION DISCONTINUOUS GALERKIN (IEDG) METHOD WITH IMPEDANCE BOUNDARY CONDITION

Xuezhe Tien, Yongpin Chen, Jin-Fa Lee\*

*Electrical and Computer Engineering, The Ohio State University, Columbus, Ohio*

### 08:40 B2-2

#### COMPUTATIONAL ELECTROMAGNETICS WITH DISCRETE EXTERIOR CALCULUS

Shu Chen\*<sup>1</sup>, Weng C. Chew<sup>2</sup>

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

<sup>2</sup>*Electrical and Computer Engineering, University of Illinois Urbana-Champaign, Champaign, IL*

### 09:00 B2-3

#### TOWARD NEXT-GENERATION BENCHMARKING OF CEM METHODS: COMPARING COMPUTATIONAL COSTS

Jackson W. Massey, Anton Menshov, Ali E. Yilmaz\*

*Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX*

### 09:20 B2-4

#### FDTD ACCELERATION USING MATLAB AND PARALLEL COMPUTING TOOLBOX ON GPU CARDS

Joseph E. Diener\*, Atef Z. Elsherbeni

*Electrical Engineering and Computer Science, Colorado School of Mines, Golden, CO*

### 09:40 B2-5

#### SYNTHESIZING THIN DIELECTRIC LENSES FOR CONICAL SCANNING BEAMS: A HYBRID NUMERICAL ALGORITHM

Jordan F. Budhu\*, Yahya Rahmat-Samii

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

### 10:00 Break

### 10:20 B2-6

#### CHAOTIC HIGH-FIDELITY AND QUANTITATIVE STATISTICAL ANALYSIS IN WAVE SYSTEMS

Zhen Peng\*<sup>1</sup>, Shen Lin<sup>1</sup>, Thomas Antonsen<sup>2</sup>

<sup>1</sup>*Electrical and Computer Engineering, University of New Mexico, Albuquerque, NM*

<sup>2</sup>*University of Maryland College Park, MD*

### 10:40 B2-7

#### FIGURE OF MERIT FOR COMPUTATIONAL ELECTROMAGNETICS SOLVERS

Tayfun Ozdemir\*<sup>1</sup>, Robert J. Burkholder<sup>2</sup>

<sup>1</sup>*Virtual EM Inc., Ann Arbor, MI*

<sup>2</sup>*Electrical and Computer Engineering, The Ohio State University, Columbus, OH*

**11:00 B2-8**

**PARALLEL COMPUTATION IN HIERARCHICALLY SEMISEPERABLE METHODS FOR SURFACE INTEGRAL EQUATIONS**

Aaron P. Smull\*, Ana B. Manic, Branislav M. Notaros

*Electrical and Computer Engineering, Colorado State University, Fort Collins, CO*

**11:20 B2-9**

**DIAGNOSING SPURIOUS CHERENKOV RADIATION FROM NUMERICAL DISPERSION ON UNSTRUCTURED GRIDS**

Dong-Yeop Na\*<sup>1</sup>, Fernando L. Teixeira<sup>1</sup>, Yuri A. Omelchenko<sup>2</sup>

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

<sup>2</sup>*Trinum Research Inc., San Diego CA*

**11:40 B2-10**

**FULL-WAVE SIMULATION OF METALLIC NANOPARTICLES USING QUADRILATERAL BARYCENTRIC BASIS FUNCTIONS**

Michael Wei\*, Weng C. Chew

*Electrical and Computer Engineering, University of Illinois Urbana-Champaign, Champaign, IL*

**Session B3: Antennas**

**Room 245**

Co-Chairs: Dejan Filipovic, *University of Colorado Boulder*;

Karl Warnick, *Brigham Young University*

**08:20 B3-1**

**TRANSMITTING A BASEBAND SIGNAL THROUGH AN ELECTRICALLY SMALL ANTENNA**

Majid Manteghi\*

*Virginia Tech, Blacksburg, VA*

**08:40 B3-2**

**A REMOTE RADIATION PATTERN MEASUREMENT TECHNIQUE FOR ELECTRICALLY SMALL ANTENNAS**

Majid Manteghi\*

*Virginia Tech, Blacksburg, VA*

**09:00 B3-3**

**EXPERIMENTAL DEMONSTRATION OF A SUPERDIRECTIVE HORN ANTENNA DESIGNED BY POYNTING STREAMLINE METHOD**

Junming Diao\*, Karl F. Warnick

*Electrical and Computer Engineering, Brigham Young University, Provo, UT*

**09:20 B3-4**

**QUALITY FACTOR CALCULATIONS FOR THE CHARACTERISTIC MODES OF DIELECTRIC RESONATOR ANTENNAS**

Binbin Yang\*, Jacob J. Adams

*Electrical and Computer Engineering, North Carolina State University, Raleigh, NC*

**09:40 B3-5**

**TUNABLE SIW CAVITY BACKED ACTIVE ANTENNA WITH CIRCULAR POLARIZATION**

Farhad Farzami\*, Seiran Khaledian, Besma Smida, Danilo Erricolo

*Electrical and Computer Engineering, University of Illinois at Chicago, Chicago, IL*

**10:00 Break**

**10:20 B3-6**

**MULTI-DIRECTIONAL, MULTI-POLARIZATION, AND MULTI-BAND RF ENERGY HARVESTING: MODELING AND DEVELOPMENT OF A HEMISPHERICAL MONOPOLE ARRAY**

Bohan Zhang\*, Joshua M. Kovitz, Yahya Rahmat-Samii

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

**10:40 B3-7**

**FEED STUDY FOR WIDEBAND MILLIMETER-WAVE LUNEBURG LENS**

Milica Notaros\*, Carlos Mulero Hernandez, Maxim Ignatenko, Dejan S. Filipovic

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

**11:00 B3-8**

**NOVEL LOW-PROFILE SURFACE-CONFORMING LEAKY-WAVE ANTENNAS FOR VERY HIGH PEAK POWER APPLICATIONS**

Robert A. Koslover\*<sup>1</sup>, Sammuel M. Jalali<sup>2</sup>, Greg R. Raith<sup>3</sup>

<sup>1</sup>*Scientific Applications & Research Associates (SARA), Inc., Tyler, TX*

<sup>2</sup>*Scientific Applications & Research Associates (SARA), Inc., Cypress, CA*

<sup>3</sup>*Scientific Applications & Research Associates (SARA), Inc., Irvine, CA*

**11:20 B3-9**

**MODIFICATION, MODELING, AND MEASUREMENT OF A BALANCED ANTIPODAL VIVALDI FOR A MULTI-CHANNEL RECEIVER**

Seth A. McCormick\*<sup>1</sup>, William O. Coburn<sup>2</sup>

<sup>1</sup>*United States Army Research Laboratory, Adelphi, MD*

<sup>2</sup>*General Technical Services LLC, Wall, NJ*

**11:40 B3-10**

**COUPLING REDUCTION TECHNIQUES FOR WIDEBAND SIMULTANEOUS TRANSMIT AND RECEIVE ANTENNA SUBSYSTEMS**

Prathap Valale Prasannakumar\*, Mohamed A. Elmansouri, Dejan S. Filipovic

*University of Colorado Boulder, Boulder, CO*

**Session B4: Scattering**

**Room 151**

Co-Chairs: Alex Yuffa, *National Institute of Standards and Technology*;  
Piergiorgio Uslenghi, *University of Illinois at Chicago*

**08:20 B4-1**

**ELECTROMAGNETIC SCATTERING BY A TRUNCATED CONCAVE PARABOLIC CYLINDER**

Piergiorgio L. E. Uslenghi\*

*Electrical and Computer Engineering, University of Illinois at Chicago, Chicago, IL*

**08:40 B4-2**

**SCATTERING OF SHORT PULSES BY CANONICAL METALLIC OBJECTS**

D V. Giri<sup>\*1</sup>, F M. Tesche<sup>2</sup>, W D. Prather<sup>3</sup>

<sup>1</sup>*PRO-TECH, ALAMO*

<sup>2</sup>*EM Consultant (Retired), Lakeville, CT*

<sup>3</sup>*Air Force Research Laboratory, Kirtland AFB, NM*

**09:00 B4-3**

**SCATTERING BY A SKEW TRIHEDRAL REFLECTOR**

Piergiorgio L. E. Uslenghi\*

*Electrical and Computer Engineering, University of Illinois at Chicago, Chicago, IL*

**09:20 B4-4**

**SURFACE INTEGRAL EQUATION FORMULATION OF ELECTROMAGNETIC SCATTERING FOR CLOAKING APPLICATIONS**

Alex J. Yuffa\*

*RF Technology Division, National Institute of Standards and Technology, Boulder, CO*

**09:40 B4-5**

**METALLIC OGIVAL RESONATORS PARTIALLY FILLED WITH DNG METAMATERIAL**

Piergiorgio L. E. Uslenghi\*

*Electrical and Computer Engineering, University of Illinois at Chicago, Chicago, IL*

**Session B5: Liquid Metal Antennas**

**Room 151**

Co-Chairs: Jacob Adams, *North Carolina State University*;  
William Davis, *Virginia Tech*

**10:20 B5-1**

**DESIGN AND ANALYSIS OF FEED TECHNIQUES FOR RECONFIGURABLE LIQUID-METAL MONOPOLE ANTENNAS**

Jonathan T. Thews\*<sup>1</sup>, Alan J. Michaels<sup>1</sup>, William Davis<sup>2</sup>

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

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

**10:40 B5-2**

**ANALYSIS OF THE LINEARITY AND TUNING RANGE OF FREQUENCY RECONFIGURABLE ANTENNAS USING LIQUID METALS**

Meng Wang\*, Ian Kilgore, Michael B. Steer, Jacob J. Adams

*Electrical and Computer Engineering, North Carolina State University, Raleigh, NC*

**11:00 B5-3**

**HIGHLY TUNABLE, ULTRASTRETCHABLE LIQUID METAL WIRE ANTENNAS**

Clifford A. Muchler\*<sup>1</sup>, Ying Liu<sup>2</sup>, Michael D. Dickey<sup>2</sup>, Jacob J. Adams<sup>1</sup>

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

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

**11:20 B5-4**

**ANALYSIS OF PARASITIC EFFECTS OF SODIUM HYDROXIDE (NAOH) ELECTROLYTE ON LIQUID-METAL MONOPOLE ANTENNAS**

Jonathan T. Thews\*, Alan J. Michaels

*Hume Center, Virginia Tech, Blacksburg, VA*

**11:40 B5-5**

**CONFORMAL LOG PERIODIC FOLDED SLOT ARRAY ANTENNA WITH FRESH WATER FILLED CAVITY BACKING FOR OPERATION IN GLACIAL ICE**

Omkar P. Pradhan\*, Albin J. Gasiewski, Srikumar Sandeep

*University of Colorado Boulder, Boulder, CO*

**Session D1: Solid-State RF Power Amplifiers**

**Room 135**

Co-Chairs: Zoya Popovic, *University of Colorado Boulder*;

Charles Baylis, *Baylor University*

**08:20 D1-1**

**DEVELOPMENT OF A WIDEBAND CLASS-E POWER AMPLIFIER WITH HIGH EFFICIENCY**

Farshid Tamjid\*, Matthew Richardson, Ahmadreza Ghahremani, Aly E. Fathy

*Electrical Engineering and Computer Science, University of Tennessee Knoxville, Knoxville, TN*

**08:40 D1-2**

**OPTIMIZATION OF LOAD IMPEDANCE AND BIAS VOLTAGE FOR POWER-ADDED EFFICIENCY, DELIVERED POWER, AND ADJACENT-CHANNEL POWER RATIO USING THE BIAS SMITH TUBE**

Matthew W. Fellows\*<sup>1</sup>, Sarvin Rezaayat<sup>1</sup>, Alicia Magee<sup>1</sup>, Charles Baylis<sup>1</sup>, Lawrence Cohen<sup>2</sup>, Robert J. Marks II<sup>1</sup>

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

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

**09:00 D1-3**

**A 52GHZ MMIC POWER AMPLIFIER WITH 28DBM OUTPUT POWER USING 90-NM GAN-ON-SIC TECHNOLOGY**

Mauricio E. Pinto\*, Zoya Popovic

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

**09:20 D1-4**

**CAVITY AND AMPLIFIER DESIGN FOR A SOLID-STATE MICROWAVE OVEN**

Dubari Borah, Priya Vemparala Guruswamy, Patrick Bluem, Matthew Cullen\*, Zoya Popovic

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

**09:40 D1-5**

**HIGH POWER TEST OF X-BAND ACCELERATOR CAVITY POWERED BY SOLID STATE RF SOURCE**

Mohamed Othman\*<sup>1,2</sup>, Emilio A. Nanni<sup>2</sup>, Valery Dolgashev<sup>2</sup>, Sami Tantawi<sup>2</sup>, Jeff Neilson<sup>2</sup>

<sup>1</sup>University of California Irvine, Irvine, CA

<sup>2</sup>SLAC National Accelerator Laboratory, Menlo Park, CA

**Session D2: Linear and Nonlinear Devices**

**Room 135**

Co-Chairs: Zoya Popovic, *University of Colorado Boulder*;

Leonardo Ranzani, *Raytheon BBN Technologies*

**10:20 D2-1**

**SUPERCONDUCTING PARAMETRIC DEVICES FOR QUANTUM INFORMATION PROCESSING**

Leonardo M. Ranzani\*, Kin C. Fong, Thomas A. Ohki

*Raytheon BBN Technologies, Cambridge, MA*

**10:40 D2-2**

**ENHANCEMENT OF BACKSCATTER TAGS EFFICIENCY BY MEANS OF LOW-POWER TRANSISTOR-BASED REFLECTION AMPLIFIER AND QPSK MODULATOR**

Seiran Khaledain\*, Farhad Farzami, Besma Smida, Danilo Erricolo

*Electrical and Computer Engineering, University of Illinois at Chicago, Chicago, Illinois*

**11:00 D2-3**

**STUDY OF NONLINEAR TRANSMISSION LINE PARAMETERS AND THEIR EFFECT ON OUTPUT HARMONIC GENERATION**

Caitlyn Cooke, Philip Zurek\*, Zoya Popovic

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

**11:20 D2-4**



**COMPARISON OF GAIN OPTIMIZATION TECHNIQUES ON RECONFIGURABLE POWER AMPLIFIERS WITH A REAL-TIME VARACTOR TUNING NETWORK**

Zachary Hays\*<sup>1</sup>, Lucilia Lamers<sup>1</sup>, Charles Baylis<sup>1</sup>, Robert Marks<sup>1</sup>, Ed Viveiros<sup>2</sup>, Ali Darwish<sup>2</sup>, John Penn<sup>2</sup>, Abigail Hedden<sup>2</sup>

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

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

**11:40 D2-5**

**PARITY-TIME-RECIPROCAL SYMMETRY IN RADIO-FREQUENCY ELECTRONICS**

Maryam Sakhdari\*, Pai-Yen Chen

*Electrical and Computer Engineering, Wayne State University, Detroit, MI*

**12:00 D2-6**

**BREAKDOWN LIMITED CAPACITORS**

Richard W. Kenyon\*, Frank Barnes

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

**Session F1: RF Propagation Utilizing Numerical Weather Prediction  
(Special Session)**

**Room 150**

Co-Chairs: Katherine Horgan, *Naval Surface Warfare Center Dahlgren Division;*

Tracy Haack, *Naval Research Laboratory - Marine Meteorology Division*

**08:20 F1-1**

**RADIO FREQUENCY PROPAGATION MEASUREMENTS AND MODELING DURING THE TAPS 2013 FIELD CAMPAIGN**

Tracy Haack\*<sup>1</sup>, Rachel Norris<sup>1,2</sup>, Hedley Hansen<sup>3</sup>, Andrew Kulesa<sup>3,4</sup>

<sup>1</sup>*Marine Meteorology Division, Naval Research Laboratory, Monterey, CA*

<sup>2</sup>*Electrical and Computer Engineering, University of Michigan, Ann Arbor, MI*

<sup>3</sup>*Cyber and Electronic Warfare Division, Defence Science and Technology Organisation, Adelaide, Queensland, AUSTRALIA*

<sup>4</sup>*Airborne Research Australia, Adelaide, Queensland, AUSTRALIA*

**08:40 F1-2**

**MULTI-WAVELENGTH STUDY OF SPATIO-TEMPORAL RADIO FREQUENCY EMITTER DETECTION RANGE USING NUMERICAL WEATHER PREDICTION FORECASTS OF NON-STANDARD PROPAGATION**

Rob Marshall\*

*Mount Pleasant Meteorology, Woodford, VA*

**09:00 F1-3**

**ANALYSIS OF US NAVY EM AND NWP MODELS USING WALLOPS 2000 EXPERIMENTATION DATA**

Steven Strang\*<sup>1</sup>, Tracy Haack<sup>2</sup>, Zach Liebowitz<sup>1</sup>

<sup>1</sup>Naval Research Laboratory, Washington, DC

<sup>2</sup>Naval Research Laboratory, Monterey, CA

**09:20 F1-4**

**A REVIEW OF REFRACTIVITY STRUCTURE MATCHING AS A PRE-PROCESSING COMPONENT WHEN CONSIDERING ITS USE WITH NUMERICAL WEATHER PREDICTION**

Katherine Horgan\*, Edward Burgess, William Thornton, Victor Wiss  
*Naval Surface Warfare Center Dahlgren Division, Dahlgren, VA*

**09:40 F1-5**

**UPDATES AND VALIDATION FOR THE NAVY ATMOSPHERIC VERTICAL SURFACE LAYER MODEL (NAVSLAM)**

Paul A. Frederickson\*  
*Meteorology, Naval Postgraduate School, Monterey, CA*

**10:00 Break**

**10:20 F1-6**

**HULL-MOUNTED SEA SURFACE MEASUREMENTS IN THE NORTH ATLANTIC FOR RF PERFORMANCE PREDICTIONS**

Rick L. Navarro\*<sup>1</sup>, Amalia Barrios<sup>1</sup>, Katherine Horgan<sup>2</sup>, Vincent van Leijen<sup>3</sup>, Erik van de Pol<sup>3</sup>, Tjarda Wilbrink<sup>3</sup>, Fok Bolderheij<sup>4</sup>, Earl M. Williams<sup>1</sup>

<sup>1</sup>*Space and Naval Warfare Systems Center Pacific, San Diego, CA*

<sup>2</sup>*Naval Surface Warfare Center Dahlgren Division, Dahlgren, VA*

<sup>3</sup>*Knowledge, Innovation, eXperimentation and Simulation (KIXS), Defense Material Organisation, Den Helder, NL, NETHERLANDS*

<sup>4</sup>*Netherlands Defense Academy, Den Helder, NL, NETHERLANDS*

**10:40 F1-7**

**ROUGH OCEAN SURFACE EFFECTS ON GENETIC ALGORITHM INVERSIONS FOR ESTIMATING EVAPORATION DUCT REFRACTIVITY PROFILES**

Stephen E. Penton\*, Erin E. Hackett  
*Coastal and Marine Systems Science, Coastal Carolina University, Conway, SC*

**11:00 F1-8**

**FURTHER STUDIES OF THE X-BAND BEACON-RECEIVER PHASED ARRAY AND EVAPORATION DUCT HEIGHT ESTIMATION**

Jonathan M. Pozderac\*<sup>1</sup>, Joel T. Johnson<sup>1</sup>, Caglar Yardim<sup>1</sup>, Craig F. Merrill<sup>2</sup>, Tom Cook<sup>3</sup>, Tony de Paolo<sup>3</sup>, Eric Terrill<sup>3</sup>, Frank J. Ryan<sup>4</sup>, Paul Frederickson<sup>5</sup>

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

<sup>2</sup>*Carderock Division, NSWC, West Bethesda, MD*

<sup>3</sup>*UC San Diego, Scripps Institution of Oceanography, San Diego, CA*

<sup>4</sup>*Applied Technology Inc., San Diego, CA*

<sup>5</sup>*Meteorology, Naval Postgraduate School, Monterey, CA*

**11:20 F1-9**

**A TECHNIQUE TO EVALUATE NUMERICAL WEATHER PREDICTION PERFORMANCE: AN ENGINEERING PERSPECTIVE**

Matt Wilbanks\*<sup>1</sup>, Stephanie Billingsley<sup>1</sup>, Katherine Horgan<sup>1</sup>, William Thornton<sup>1</sup>, Qing Wang<sup>2</sup>, Tracey Haack<sup>3</sup>

<sup>1</sup>Naval Surface Warfare Center Dahlgren Division, Dahlgren, VA

<sup>2</sup>Naval Postgraduate School, Monterey, CA

<sup>3</sup>Marine Meteorology Division, Naval Research Laboratory, Monterey, CA

**11:40 F1-10**

**NUMERICAL COMPUTATION OF FADING DEPTH FOR TROPOSPHERIC SCINTILLATION**

Swagato Mukherjee\*<sup>1</sup>, Caglar Yardim<sup>1</sup>, Qing Wang<sup>2</sup>

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

<sup>2</sup>Naval Postgraduate School, Monterey, CA

**Session FGH1: GNSS and Radio Beacon Remote Sensing I  
(Special Session)**

**Room 105**

Co-Chairs: Clara Chew, *NASA Jet Propulsion Laboratory*;

Carl Sieftring, *Naval Research Laboratory*;

Atila Komjathy, *NASA Jet Propulsion Laboratory*

**08:20 FGH1-1**

**JOINT ESTIMATION OF IONOSPHERE TEC, RECEIVER INTER-FREQUENCY BIASES, AND CARRIER AMBIGUITIES USING 3-FREQUENCY GPS MEASUREMENTS**

Brian Breitsch\*, Jade Morton

*Electrical and Computer Engineering, Colorado State University, Fort Collins, CO*

**08:40 FGH1-2**

**MULTI-CONSTELLATION GNSS TEC MEASUREMENTS**

YuXiang Peng\*<sup>1,2</sup>, Xavier E. Gomez<sup>1</sup>, Wayne A. Scales<sup>1,2</sup>

<sup>1</sup>Electrical and Computer Engineering, Virginia Tech, Blacksburg, VA

<sup>2</sup>Center for Space Science and Engineering Research, Virginia Tech, Blacksburg, VA

**09:00 FGH1-3**

**PFISR GPS TRACKING MODE FOR RESEARCHING HIGH-LATITUDE IONOSPHERIC ELECTRON DENSITY GRADIENTS ASSOCIATED WITH GPS SCINTILLATION**

Diana C. Loucks\*<sup>1</sup>, Scott Palo<sup>1</sup>, Marcin Pilinski<sup>2</sup>, Geoff Crowley<sup>2</sup>, Irfan Azeem<sup>2</sup>, Don Hampton<sup>3</sup>

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

<sup>2</sup>Atmospheric & Space Technology Research Associates (ASTRA), Boulder, CO

<sup>3</sup>Geophysical Institute, University of Alaska Fairbanks, Fairbanks, AK

**09:20 FGH1-4**

USING GPS TEC MEASUREMENTS TO PROBE IONOSPHERIC STRUCTURE  
ASSOCIATED WITH SCINTILLATION

Erin H. Lay\*<sup>1</sup>, Peter A. Parker<sup>1</sup>, Max E. Light<sup>2</sup>

<sup>1</sup>*ISR-2, Los Alamos National Laboratory, Los Alamos, NM*

<sup>2</sup>*AOT-AE, Los Alamos National Laboratory, Los Alamos, NM*

**09:40 FGH1-5**

ESTIMATION OF IONOSPHERIC IRREGULARITIES WITH A SCINTILLATION  
AURORAL GPS ARRAY

Yang Su\*<sup>1</sup>, Seebany Datta-Barua<sup>1</sup>, Gary Bust<sup>2</sup>, Kshitija Deshpande<sup>3</sup>

<sup>1</sup>*Illinois Institute of Technology, Chicago, IL*

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

<sup>3</sup>*Virginia Tech, Blacksburg, VA*

**10:00 Break**

**10:20 FGH1-6**

THE RAMIFICATIONS OF CONFIGURATION-SPACE MODELS FOR GNSS  
SCINTILLATION

Charles L. Rino\*, Charles S. Carrano, Keith M. Groves

*Institute for Scientific Research, Boston, MA*

**10:40 FGH1-7**

ASSESSMENT OF THE IMPACT OF FORMOSAT-7/COSMIC-2 GNSS RO  
OBSERVATIONS ON IONOSPHERE SPECIFICATION AND FORECAST USING  
OBSERVING SYSTEM SIMULATION EXPERIMENTS

Chih-Ting Hsu\*<sup>1</sup>, Tomoko Matsuo<sup>2,3</sup>, Xinan Yue<sup>4</sup>, Jann-Yenq Liu<sup>1</sup>

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

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

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

<sup>4</sup>*Chinese Academy of Sciences, Institute of Geology and Geophysics, Beijing, CHINA*

**11:00 FGH1-8**

AIRBORNE MEASUREMENT OF SEA SURFACE MEAN SQUARE SLOPE IN 2008  
HURRICANE IKE USING GNSS REFLECTIONS AND WIDE-SWATH RADAR  
ALTIMETER

Scott Gleason\*<sup>1</sup>, Valery Zavorotny<sup>2</sup>, Dennis Akos<sup>3</sup>, Edward Walsh<sup>2</sup>

<sup>1</sup>*Southwest Research Institute, Boulder, CO*

<sup>2</sup>*NOAA Earth System Research Laboratory, Boulder, CO*

<sup>3</sup>*University of Colorado Boulder, Boulder, CO*

**11:20 FGH1-9**

BEHAVIOR OF GNSS SIGNALS REFLECTED FROM AN OCEAN SURFACE AT WEAK  
WINDS

Valery U. Zavorotny\*, Alexander G. Voronovich  
NOAA Earth System Research Laboratory, Boulder, CO

**Session G1: Space-based Ionospheric Measurements  
(Special Session)  
Room 155**

Co-Chairs: Paul Bernhardt, *Naval Research Laboratory*;  
Nicolas Lee, *Stanford University*

**08:20 G1-1**

**A PROPAGATION MODEL FOR GEOLOCATING IONOSPHERIC IRREGULARITIES  
ALONG RADIO OCCULTATION RAY-PATHS**

Charles S. Carrano\*, Keith M. Groves, Charles L. Rino, William J. McNeil  
*Boston College, Chestnut Hill, MA*

**08:40 G1-2**

**OVERVIEW OF DATA RECORDED TO-DATE BY THE E-POP RADIO RECEIVER  
INSTRUMENT (RRI)**

Gordon James\*<sup>1</sup>, Gareth Perry<sup>2</sup>, Andrew Yau<sup>2</sup>

<sup>1</sup>*Retired, Ottawa, ON, CANADA*

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

**09:00 G1-3**

**DETECTION OF SMALL-SCALE PLASMA DENSITY IRREGULARITIES WITH E-POP  
RRI**

Gareth W. Perry\*, Harry G. James, Robert G. Gillies, Andrew W. Yau

*Physics and Astronomy, University of Calgary, Calgary, Alberta, CANADA*

**09:20 G1-4**

**HF RADAR FOR LARGE AREA SEA MAPPING WITH GROUND-IONOSPHERE-OCEAN-  
SPACE (GIOS)**

Paul A. Bernhardt\*<sup>1</sup>, Stanley J. Briczinski<sup>1</sup>, Carl L. Siefring<sup>1</sup>, Donald E. Barrick<sup>2</sup>, Jehu Bryant<sup>3</sup>,  
Andrew Howarth<sup>4</sup>, H G. James<sup>4</sup>, Andrew Yau<sup>4</sup>

<sup>1</sup>*Code 6754, Naval Research Laboratory, Washington, DC*

<sup>2</sup>*Code Oceans Systems, Menlo Park, CA*

<sup>3</sup>*Raytheon IIS, Chesapeake, VA*

<sup>4</sup>*Physics and Astronomy, University of Calgary, Calgary, AB, CANADA*

**09:40 G1-5**

**THE INFLUENCE OF ATMOSPHERIC GRAVITY WAVES EXCITED BY DEEP  
CONVECTION ON THE IONOSPHERE**

Sharon Vadas\*

*CoRA, NorthWest Research Associates/CoRA, Boulder, CO*

**10:00 Break**

**10:20 G1-6**

**THE IONOSPHERIC CONNECTION EXPLORER: MISSION DESIGN AND PERFORMANCE**

Thomas J. Immel\*

*University of California Berkeley, Berkeley, CA*

**10:40 G1-7**

**GLOBAL-SCALE QUANTIFICATION OF IONOSPHERIC STATE FROM UV REMOTE SENSING ONBOARD THE IONOSPHERIC CONNECTION EXPLORER (ICON)**

Farzad Kamalabadi\*<sup>1</sup>, Andrew W. Stephan<sup>2</sup>, Robert R. Meier<sup>2</sup>, Jianqi Qin<sup>1</sup>, Jonathan J. Makela<sup>1</sup>, Stephen B. Mende<sup>3</sup>, Harald U. Frey<sup>3</sup>, Jerry Edelstein<sup>3</sup>, Eric Korpela<sup>3</sup>, Scott England<sup>3</sup>, Thomas J. Immel<sup>3</sup>

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

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

<sup>3</sup>*University of California Berkeley, Berkeley, CA*

**11:00 G1-8**

**ADVANCING IONOSPHERIC OBSERVATIONS WITH THE GLOBAL-SCALE OBSERVATIONS OF THE LIMB AND DISK (GOLD) MISSION**

Richard W. Eastes\*<sup>1</sup>, Alan G. Burns<sup>2</sup>, Stanley C. Solomon<sup>2</sup>, William E. McClintock<sup>3</sup>

<sup>1</sup>*Florida Space Institute, University of Central Florida, Orlando, FL*

<sup>2</sup>*High Altitude Observatory, National Center for Atmospheric Research, Boulder, CO*

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

**11:20 G1-9**

**IT-SPINS: A CUBESAT MISSION TO IMAGE THE NOCTURNAL IONOSPHERE**

Gary S. Bust<sup>1</sup>, Romina Nikoukar\*<sup>1</sup>, Rick Doe<sup>2</sup>, David M. Klumpar<sup>3</sup>

<sup>1</sup>*Johns Hopkins University Applied Physics Laboratory, Laurel, MD*

<sup>2</sup>*SRI International, Menlo Park, CA*

<sup>3</sup>*Montana State University, Bozeman, MT*

**11:40 G1-10**

**DETAILED CHARACTERISTICS OF RADIATION BELT ELECTRONS REVEALED BY CSSWE/REPTILE MEASUREMENTS**

Kun Zhang\*<sup>1,2</sup>, Xinlin Li<sup>1,2</sup>, Quintin Schiller<sup>3</sup>, David Gerhardt<sup>2</sup>, Hong Zhao<sup>1</sup>, Robyn Millan<sup>4</sup>

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

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

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

<sup>4</sup>*Physics and Astronomy, Dartmouth College, Hanover, NH*

**Session H1: Waves and Turbulence in Space and Laboratory Plasmas I  
(Special Session)**

**Room 265**

Co-Chairs: Bill Amatucci, *Naval Research Laboratory*;  
Stephen Vincena, *University of California Los Angeles*

**08:20 H1-1**

**KINETIC ALFVEN WAVES AND THE ACCELERATION OF AURORAL PARTICLES**

Robert L. Lysak\*, Yan Song

*School of Physics and Astronomy, University of Minnesota, Minneapolis, MN*

**08:40 H1-2**

**ELECTROMAGNETIC TURBULENCE AND TRANSPORT IN HIGH  $\beta$  LABORATORY PLASMAS**

Troy Carter\*<sup>1</sup>, Giovanni Rossi<sup>1</sup>, Mj Pueschel<sup>2</sup>, Paul Terry<sup>2</sup>, Frank Jenko<sup>1</sup>

<sup>1</sup>*Physics and Astronomy, University of California Los Angeles, Los Angeles, CA*

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

**09:00 H1-3**

**GENERATION OF ALFVENIC QUASI-STATIONARY ELECTROMAGNETIC PLASMA STRUCTURES AND AURORAL PARTICLE ACCELERATION**

Yan Song\*, Robert L. Lysak

*School of Physics and Astronomy, University of Minnesota, Minneapolis, MN*

**09:20 H1-4**

**NONLINEAR INTERACTIONS OF KINK-UNSTABLE FLUX ROPES AND SHEAR ALFVEN WAVES**

Stephen Vincena\*

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

**09:40 H1-5**

**ELECTRON SLOSHING ASSOCIATED WITH INERTIAL ALFVEN WAVES**

J. W. R. Schroeder\*<sup>1</sup>, F. Skiff<sup>1</sup>, G. G. Howes<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>*Physics and Astronomy, University of Iowa, Iowa City, IA*

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

**10:00 Break**

**10:20 H1-6**

**TWO DIMENSIONAL LIF MEASUREMENTS AND POTENTIAL STRUCTURE OF ION BEAM FORMATION IN AN ARGON HELICON PLASMA**

Evan M. Aguirre\*<sup>1</sup>, Timothy Good<sup>2</sup>, Earl E. Scime<sup>1</sup>

<sup>1</sup>*Physics and Astronomy, West Virginia University, Morgantown, WV*

<sup>2</sup>*Physics, Gettysburg College, Gettysburg, PA*

**10:40 H1-7**

**IN-FLIGHT INSTABILITIES OF DOUBLE PROBE ELECTRIC FIELD INSTRUMENTS: A SURVEY OF OBSERVATIONS AND ANALYSES**

John W. Bonnell\*

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

**11:00 H1-8**

**MAGNETOHYDRODYNAMIC INSTABILITIES IN JETS AND BUBBLES USING A COMPACT COAXIAL PLASMA GUN IN A BACKGROUND MAGNETIZED PLASMA**

Mark Gilmore\*<sup>1</sup>, Yue Zhang<sup>1</sup>, Dustin M. Fisher<sup>1</sup>, Ben Walllace<sup>1</sup>, Scott C. Hsu<sup>2</sup>

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

<sup>2</sup>*Los Alamos National Laboratory, Los Alamos, NM*

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

**Math 100**

Co-Chairs: David DeBoer, *University of California Berkeley*;

Jeffery Mangum, *National Radio Astronomy Observatory*

**08:20 J1-1**

**MURCHISON WIDEFIELD ARRAY: HIGHLIGHTS AND PLANS**

Randall B. Wayth, Adrian Sutinjo\*

*ICRAR/Curtin Institute of Radio Astronomy, Curtin University, Perth, WA, AUSTRALIA*

**08:40 J1-2**

**ENABLING DETECTION OF THE EPOCH OF REIONIZATION WITH NEXT-GENERATION RADIO INSTRUMENTS**

Nithyanandan Thyagarajan\*<sup>1</sup>, Aaron R. Parsons<sup>2</sup>, David R. DeBoer<sup>2</sup>, Judd D. Bowman<sup>1</sup>

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

<sup>2</sup>*Astronomy, University of California Berkeley, Berkeley, CA*

**09:00 J1-3**

**MEERKAT STATUS UPDATE**

Schalk W. Esterhuyse\*

*Engineering, SKA South Africa, Pinelands, SOUTH AFRICA*

**09:20 J1-4**

**PROGRESS ON HIRAX, THE HYDROGEN INTENSITY AND REAL-TIME ANALYSIS EXPERIMENT**

Benjamin R. Saliwanchik\*

*Mathematics, Statistics, and Computer Science, University of KwaZulu-Natal, Durban, KwaZulu-Natal, SOUTH AFRICA*

**09:40 J1-5**

**ADVANCES IN 21CM EOR IMAGING PIPELINES**

Adam P. Beardsley\*

*Arizona State University, Tempe, AZ*



**10:00 Break**

**10:20 J1-6**

**MITIGATING SPECTRAL LEAKAGE IN DELAY FILTERED PAPER-64 VISIBILITIES USING FOREGROUND SUBTRACTION**

Joshua R. Kerrigan\*, Jonathan C. Pober  
*Physics, Brown University, Providence, RI*

**10:40 J1-7**

**INTERFEROMETRIC BANDPASS CALIBRATION WITH REDUNDANT BASELINES FOR 21 CM COSMOLOGY**

Joshua S. Dillon\*, Hydrogen Epoch of Reionization Array (HERA) Collaboration  
*University of California Berkeley, Berkeley, CA*

**11:00 J1-8**

**PRECISION COSMOLOGICAL MEASUREMENTS WITH DARE AND EDGES**

Raul A. Monsalve\*<sup>1</sup>, Jack O. Burns<sup>1</sup>, Richard F. Bradley<sup>2</sup>, Keith Tauscher<sup>1</sup>, Bang Nhan<sup>1</sup>, Judd D. Bowman<sup>3</sup>, David Newell<sup>4</sup>, David Draper<sup>4</sup>, David Drapetti<sup>1</sup>, Alan E. E. Rogers<sup>5</sup>, Thomas J. Mozdzen<sup>3</sup>

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

<sup>2</sup>*National Radio Astronomy Observatory, Charlottesville, VA*

<sup>3</sup>*Arizona State University, Tempe, AZ*

<sup>4</sup>*Ball Aerospace & Technologies, Boulder, CO*

<sup>5</sup>*MIT Haystack Observatory, Westford, MA*

**11:20 J1-9**

**CALIBRATION REQUIREMENTS FOR DETECTING THE 21CM EPOCH OF REIONIZATION POWER SPECTRUM AND IMPLICATIONS FOR THE SKA**

Nichole Barry\*<sup>1</sup>, Bryna Hazelton<sup>1,2</sup>, Ian Sullivan<sup>3</sup>, Miguel F. Morales<sup>1</sup>, Jonathan C. Pober<sup>4</sup>

<sup>1</sup>*Physics, University of Washington, Seattle, WA*

<sup>2</sup>*eScience Institute, University of Washington, Seattle, WA*

<sup>3</sup>*Astronomy, University of Washington, Seattle, WA*

<sup>4</sup>*Physics, Brown University, Providence, RI*

**11:40 J1-10**

**SEARCHING FOR COSMIC DAWN FROM THE SUB-ANTARCTIC WITH SCI-HI**

Hsin C. Chiang\*  
*University of KwaZulu-Natal, Durban, SOUTH AFRICA*

**12:00 J1-11**

**RESULTS FROM THE LATEST COMMISSIONING RUN OF A CRYOGENICALLY COOLED PHASED ARRAY FEED FOR THE GREEN BANK TELESCOPE**

Nickolas M. Pingel\*<sup>1</sup>, Richard Black<sup>2</sup>, Dj Pisano<sup>1</sup>, Brian Jeffs<sup>2</sup>

<sup>1</sup>*Astronomy, West Virginia University, Morgantown, WV*

<sup>2</sup>*Electrical and Computer Engineering, Brigham Young University, Provo, UT*

## WEDNESDAY AFTERNOON, 4 January 2017

### Session B6: Complex Media and Nanoelectromagnetics Room 1B40

Co-Chairs: Edward Kuester, *University of Colorado Boulder*;  
Christos Argyropoulos, *University of Nebraska-Lincoln*

#### 13:20 B6-1

##### A NOVEL V-BAND SINGLE-LAYER CP-FPC MADE OF CIRCULAR-POLARIZED CAPACITIVE-METALLIC FSS WITH A LINEAR-POLARIZED FEEDING ANTENNA

Saman Kabiri\*, Alister Hosseini, Evangelos Kornaros, Franco De Flaviis  
*University of California Irvine, Irvine, CA*

#### 13:40 B6-2

##### POLARIZATION-INSENSITIVE KU-BAND FREQUENCY SELECTIVE SURFACE (FSS)

Atieh Talebzadeh\*<sup>1</sup>, Ali Foudazi<sup>2</sup>, Kristen M. Donnell<sup>2</sup>, David J. Pommerenke<sup>1</sup>

<sup>1</sup>*Electrical and Computer Engineering, Missouri University of Science and Technology, EMC Lab, Rolla, MO*

<sup>2</sup>*Electrical and Computer Engineering, Missouri University of Science and Technology, Applied Microwave Nondestructive Testing Laboratory (AMNTL), Rolla, MO*

#### 14:00 B6-3

##### GRAPHENE METASURFACES TO DESIGN BROADBAND POLARIZERS AND NON-RECIPROCAL DEVICES

Tianjing Guo\*, Christos Argyropoulos

*Electrical and Computer Engineering, University of Nebraska-Lincoln, Lincoln, NE*

#### 14:20 B6-4

##### MUTUAL COUPLING REDUCTION IN APERTURE-COUPLED PATCH ANTENNAS FED BY ORTHOGONAL SIW LINE BY METASURFACE

Ali Foudazi\*, Kristen M. Donnell

*Electrical and Computer Engineering, Missouri University of Science and Technology, Applied Microwave Nondestructive Testing Laboratory (AMNTL), Rolla, MO*

#### 14:40 B6-5

##### NONLINEAR PLASMONIC METASURFACES TO ENHANCE FOUR-WAVE MIXING

Boyuan Jin\*, Christos Argyropoulos

*Electrical and Computer Engineering, University of Nebraska-Lincoln, Lincoln, NE*

#### 15:00 Break

#### 15:20 B6-6

##### GIANT FIELD AND RADIATIVE EMISSION ENHANCEMENT IN ANISOTROPIC EPSILON-NEAR-ZERO SLABS

Mohammad Kamandi\*, Caner Guclu, Filippo Capolino

*University of California Irvine, Irvine, CA*

**15:40 B6-7**

**EXTRAORDINARY TRANSMISSION OF AN ELECTROMAGNETIC WAVE THROUGH A DIELECTRIC -LOADED SLOT IN A METALLIC SHIELD OF FINITE THICKNESS**

Abdulaziz Haddab\*, Edward Kuester

*University of Colorado Boulder, Boulder, CO*

**16:00 B6-8**

**MAGNETIC NANOANTENNAS EXCITED BY AZIMUTHALLY POLARIZED BEAMS**

Mehdi Veysi\*, Caner Guclu, Mahsa Darvishzadeh-Varcheie, Filippo Capolino

*University of California Irvine, Irvine, CA*

**16:20 B6-9**

**SUPERRADIANCE, SUBRADIANCE AND PT-SYMMETRY WITH PLASMONIC NANOCHANNELS**

Ying Li\*, Christos Argyropoulos

*Electrical and Computer Engineering, University of Nebraska-Lincoln, Lincoln, NE*

**16:40 B6-10**

**CHARACTERISTIC MODE ANALYSIS OF CONDUCTIVE NANOWIRES AND MICROWIRES**

Daniel S. Kiddle\*<sup>1</sup>, Ethan J. Wilcox<sup>1</sup>, Ahmed M. Hassan<sup>1</sup>, Edward J. Garboczi<sup>2</sup>

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

<sup>2</sup>*Applied Chemicals and Materials Division, National Institute of Standards and Technology, Boulder, CO*

**17:00 B6-11**

**ELECTROMAGNETIC SCATTERING FROM CRUMPLED GRAPHENE FLAKES**

Kalyan C. Durbhakula\*<sup>1</sup>, Ahmed M. Hassan<sup>1</sup>, Deb Chatterjee<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 B7: Magnetic Resonance Imaging  
(Special Session)**

**Room 200**

Co-Chairs: Branislav Notaros, *Colorado State University*;

Zoya Popovic, *University of Colorado Boulder*;

Erdem Topsakal, *Virginia Commonwealth University*

**13:20 B7-1**

**HIGH POWER, HIGH SPEED CONTROL DEVICE MODELS FOR MRI APPLICATIONS**

Robert Caverly\*

*Villanova University, Villanova, PA*

**13:40 B7-2**

**ELECTROMAGNETIC ANALYSIS OF ACTIVE IMPLANTABLE MEDICAL DEVICES DURING MRI EXPOSURE USING A SCHUR-COMPLEMENT INTEGRAL-EQUATION METHOD**

Jackson W. Massey\*<sup>1</sup>, Yaniv Brick<sup>2</sup>, Ali E. Yilmaz<sup>1,2</sup>

<sup>1</sup>*Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX*

<sup>2</sup>*Institute of Computational Engineering and Sciences, The University of Texas at Austin, Austin, TX*

**14:00 B7-3**

**STANDARDIZED PHANTOMS FOR QUANTITATIVE MRI**

Kathryn E. Keenan\*, Michael A. Boss, Karl F. Stupic, Stephen E. Russek

*National Institute of Standards and Technology, Boulder, CO*

**14:20 B7-4**

**UNCONVENTIONAL DESIGNS OF RF PROBES FOR HIGH-FIELD MRI TO ENHANCE MAGNETIC FIELD UNIFORMITY**

Elena Semouchkina\*<sup>1</sup>, Navid Gandji<sup>1</sup>, Bahram Seifi<sup>1</sup>, Gangchea Lee<sup>2</sup>, Seokwon Jung<sup>2</sup>, Michael Lanagan<sup>2</sup>, Thomas Neuberger<sup>2</sup>

<sup>1</sup>*Michigan Technological University, Houghton, MI*

<sup>2</sup>*Pennsylvania State University, University Park, PA*

**14:40 B7-5**

**EXCITATION PROBES FOR ULTRA-HIGH FIELD MAGNETIC RESONANCE IMAGING**

Patrick Bluem\*<sup>1</sup>, Andrew Kiruluta<sup>2</sup>, Pierre-Francois Van de Moortele<sup>3</sup>, Gregor Adriany<sup>3</sup>, Zoya Popovic<sup>1</sup>

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

<sup>2</sup>*Harvard University, Cambridge, MA*

<sup>3</sup>*Center for Magnetic Resonance Research, University of Minnesota, Minneapolis, MN*

**15:00 Break**

**15:20 B7-6**

**MAGNETIC RESONANCE IMAGING AT THE BOUNDARY OF QUASI-STATIC TO FAR-FIELD RF REGIME**

Andrew M. Kiruluta\*<sup>1</sup>, Patrick Bluem<sup>2</sup>, Zoya Popovic<sup>2</sup>, Pierre-Francois Van de Moortel<sup>3</sup>, Branislav M. Notaros<sup>4</sup>

<sup>1</sup>*Physics, Harvard University, Cambridge, MA*

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

<sup>3</sup>Radiology, University of Minnesota, Minneapolis, MN

<sup>4</sup>Electrical and Computer Engineering, Colorado State University, Fort Collins, CO

**15:40 B7-7**

**IMPROVEMENTS TO TRAVELING-WAVE MRI SENSITIVITY AND HOMOGENEITY USING THIN METAMATERIAL BORE LINERS**

Justin G. Pollock<sup>1</sup>, Navid Hosseini<sup>2</sup>, Nicola De Zanche<sup>1</sup>, Ashwin K. Iyer\*<sup>1</sup>

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

<sup>2</sup>Electrical and Electronics Engineering, Middle East Technical University, Ankara, TURKEY

**16:00 B7-8**

**ELECTRO-TEXTILES AS POTENTIAL CANDIDATE OF FLEXIBLE MRI RF COIL FOR STROKE PREVENTION**

Daisong Zhang\*, Yahya Rahmat-Samii

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

**16:20 B7-9**

**HIGH AND ULTRA-HIGH FIELD MAGNETIC RESONANCE IMAGING RF COIL DESIGNS AND OPTIMIZATION**

Pranav S. Athalye\*<sup>1</sup>, Milan M. Ilic<sup>1,2</sup>, Andrew J. M. Kiruluta<sup>3</sup>, Pierre-Francois Van de Moortele<sup>4</sup>, Branislav M. Notaros<sup>1</sup>

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

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

<sup>3</sup>Radiology, Massachusetts General Hospital, Harvard Medical School, Boston, MA

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

**Session B8: Inverse Scattering and Remote Sensing  
Room 245**

Co-Chairs: Piergiorgio Uslenghi, University of Illinois at Chicago;

Pai-Yen Chen, University of Texas at Austin

**13:20 B8-1**

**EFFICIENT MICROWAVE BIOMEDICAL IMAGING THROUGH SPARSE RECONSTRUCTION OF FREQUENCY INDEPENDENT PARAMETERS**

Md Asiful Islam\*, Asimina Kiourti, John L. Volakis

Electrical and Computer Engineering, Electrosience Laboratory, The Ohio State University, Columbus, OH

**13:40 B8-2**

**INCORPORATING MULTIPLE SCATTERING IN IMAGING WITH ITERATIVE BORN METHODS**

Mert Hidayetoglu\*, Anthony Podkowa, Michael L. Oelze, Levent Gurel, Wen-Mei Hwu, Weng Cho Chew

Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, Urbana, IL

**14:00 B8-3**

**IMAGING PERFORMANCE COMPARISON IN REINFORCED CONCRETE PILLARS USING GROUND PENETRATING RADAR AND RADIO FREQUENCY TOMOGRAPHY**

Tadahiro Negishi<sup>1</sup>, Gianluca Gennarelli<sup>2</sup>, Yangqing Liu<sup>1</sup>, Danilo Erricolo\*<sup>1</sup>,  
Francesco Soldovieri<sup>2</sup>

<sup>1</sup>*Electrical and Computer Engineering, University of Illinois Chicago, Chicago, IL*

<sup>2</sup>*Institute for Electromagnetic Sensing of the Environment, National Research Council, Napoli, ITALY*

**14:20 B8-4**

**ULTRASENSITIVE PARITY-TIME SYMMETRIC WIRELESS MICROSENSORS**

Mehdi Hajizadegan\*, Pai-Yen Chen  
*Wayne State University, Detroit, MI*

**14:40 B8-5**

**NOVEL MULTI-FREQUENCY ELECTROMAGNETIC COUPLER FOR POWER AND DATA TRANSMISSION**

Christopher S. Deloglos\*, Afroditi V. Filippas  
*Virginia Commonwealth University, Richmond, VA*

**Session B9: Antenna Arrays I**

**Room 105**

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

**13:20 B9-1**

**ARRAY OF SLOT PAIRS IN A RECTANGULAR WAVEGUIDE FOR OMNIDIRECTIONAL RADIATION**

Sembiam R. Rengarajan\*<sup>1</sup>, Jeffrey Pawlan<sup>2</sup>  
<sup>1</sup>*California State University, Northridge, CA*  
<sup>2</sup>*Pawlan Communications, San Jose, CA*

**13:40 B9-2**

**INVESTIGATION AND MEASUREMENT OF A SEA WATER ANTENNA ARRAY**

Kristopher R. Buchanan, Timi Adeyemi\*, Carlos Flores  
*Electromagnetics Technology Branch, SSC Pacific, San Diego CA*

**14:00 B9-3**

**INVESTIGATION OF THE HIGH FREQUENCY RADIATIVE CAPABILITIES OF A TWO MAST CANONICAL SUPERSTRUCTURE**

Kristopher R. Buchanan, Carlos Flores\*, Timi Adeyemi, Sara Wheeland  
*Electromagnetics Technology Branch, SSC Pacific, San Diego CA*

**14:20 B9-4**

**A DUAL POLARIZATION MASSIVE MIMO PANEL ARRAY ANTENNA AT KA-BAND WITH BEAMFORMING CAPABILITY**

Sandhya Krishna, Satish K. Sharma\*

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

**14:40 B9-5**

**PULSE DISPERSION IN PHASED AND TIMED ARRAYS**

Payam Nayeri\*, Randy L. Haupt

*Colorado School of Mines, Golden, CO*

**15:00 Break**

**15:20 B9-6**

**COMPROMISE BETWEEN PEAK SIDELobe LEVEL AND ELEMENT NUMBER AND DENSITY FOR ELECTRICALLY SCANNED ROTATIONAL APERIODIC SUBARRAYS**

Junming Diao\*, Jakob W. Kunzler, Karl F. Warnick

*Electrical and Computer Engineering, Brigham Young University, Provo, UT*

**15:40 B9-7**

**UAV SWARM-BASED ANTENNA SYSTEM**

Tsotne Kvelashvili\*, Ozlem Kilic, Baris C. Secim, Erion Plaku

*Electrical Engineering and Computer Science, The Catholic University of America, Washington, DC*

**16:00 B9-8**

**HIGH GAIN OMNIDIRECTIONAL ARRAY ANTENNA WITH LOW SIDE LOBE LEVELS IN THE ELEVATION PLANE**

Omid Manoochchri<sup>1</sup>, Amin Darvazehban<sup>2</sup>, Farhad Farzami<sup>1</sup>, Danilo Erricolo<sup>1</sup>

<sup>1</sup>*Electrical and Computer Engineering, University of Illinois Chicago, Chicago, IL*

<sup>2</sup>*Electrical and Computer Engineering, Amirkabir University of Technology, Tehran, IRAN*

**16:20 B9-9**

**HIGH GAIN MINIATURIZED MULTI-BEAM LUNEBURG LENS ANTENNA FOR SATELLITE COMMUNICATIONS**

Omid Manoochchri<sup>1</sup>, Amin Darvazehban<sup>2</sup>, Farhad Farzami<sup>1</sup>, Danilo Erricolo<sup>1</sup>

<sup>1</sup>*Electrical and Computer Engineering, University of Illinois Chicago, Chicago, IL*

<sup>2</sup>*Electrical and Computer Engineering, Amirkabir University of Technology, Tehran, IRAN*

**Session B10: Antennas for Small Satellites  
(Special Session)**

**Room 245**

Co-Chairs: Reyhan Baktur, *Utah State University;*

David Jackson, *University of Houston*

**15:20 B10-1**

**DEVELOPMENT AND CHARACTERIZATION OF A KA BAND MESH REFLECTOR ANTENNA FOR EMERGING HIGH PERFORMANCE CUBESATS**

Vignesh Manohar\*, Joshua M. Kovitz, Yahya Rahmat-Samii  
*Electrical Engineering, University of California Los Angeles, Los Angeles, CA*

**15:40 B10-2**

**OPTICALLY TRANSPARENT CIRCULARLY POLARIZED X BAND REFLECTARRAY FOR SOLAR PANEL INTEGRATION**

Salahuddin Tariq\*, Reyhan Baktur  
*Electrical and Computer Engineering, Utah State University, Logan, UT*

**16:00 B10-3**

**INKJET PRINTED ANTENNAS ON GLASS**

Muhammadeziz Tursunniyaz\*, Reyhan Baktur  
*Electrical and Computer Engineering, Utah State University, Logan, UT*

**16:20 B10-4**

**A COMPARISON OF TWO TECHNIQUES FOR MAKING TRANSPARENT MICROSTRIP ANTENNAS FOR CUBESATS**

Xinyu Liu\*, David R. Jackson, Ji Chen  
*Electrical and Computer Engineering, University of Houston, Houston, TX*

**Session C1: Advances in Imaging, Detection, and Localization Systems  
Room 151**

Co-Chairs: Ozlem Kilic, *The Catholic University of America*;  
Eric Mokole, *Consultant*

**13:20 C1-1**

**POLARIMETRIC INTERFERENCE ALIGNMENT IN MIMO BROADCAST CHANNELS**

Carlos A. Viteri-Mera\*<sup>1,2</sup>, Fernando L. Teixeira<sup>1</sup>  
<sup>1</sup>*ElectroScience Laboratory, The Ohio State University, Columbus, OH*  
<sup>2</sup>*Electronics Engineering, Universidad de Narino, Pasto, Narino, COLOMBIA*

**13:40 C1-2**

**THE ISOLATION BOOTH**

Keaton Brown\*, Jean-Francois Chamberland, Gregory H. Huff  
*Electrical and Computer Engineering, Texas A&M, College Station, TX*

**14:00 C1-3**

**MICROWAVE IMAGING WITH A DYNAMIC METASURFACE ANTENNA**

Timothy Sleasman\*<sup>1</sup>, Mohammadreza F. Imani<sup>1</sup>, Michael Boyarsky<sup>1</sup>, Laura Pulido<sup>1</sup>,  
Thomas Fromenteze<sup>1</sup>, Jonah N. Gollub<sup>1</sup>, Matthew S. Reynolds<sup>2</sup>, David R. Smith<sup>1</sup>  
<sup>1</sup>*Electrical and Computer Engineering, Duke University, Durham, NC*  
<sup>2</sup>*Electrical Engineering, University of Washington, Seattle, WA*



**14:20 C1-4**

**MAXIMIZING THE SHANNON INFORMATION OF MILLIMETER-WAVE COMPUTATIONAL IMAGING SYSTEMS**

Naren Viswanathan\*, Suresh Venkatesh, David Schurig

*Electrical and Computer Engineering, University of Utah, Salt Lake City, UT*

**14:40 C1-5**

**NON-CAUSAL FILTERING APPLIED TO NUMERICAL WHISTLER MODE RAYTRACING**

Ashanthi S. Maxworth\*, Titsa Papantoni, Mark Golkowski

*Electrical Engineering, University of Colorado Denver, Denver, CO*

**15:00 Break**

**15:20 C1-6**

**ANOMALY DETECTION AND IMAGE CLASSIFICATION FOR MULTISPECTRAL AND HYPERSPECTRAL IMAGES**

Travis Taghavi\*, Jean-Francois Chamberland, Gregory H. Huff

*Electrical and Computer Engineering, Texas A&M University, College Station, TX*

**15:40 C1-7**

**DYNAMIC METASURFACE ANTENNAS AS AN ENABLING PLATFORM FOR ALTERNATIVE SYNTHETIC APERTURE RADAR (SAR) MODALITIES**

Michael Boyarsky\*<sup>1</sup>, Timothy Sleasman<sup>1</sup>, Laura Pulido-Mancera<sup>1</sup>, Mohammadreza F. Imani<sup>1</sup>, Matthew S. Reynolds<sup>2</sup>, David R. Smith<sup>1</sup>

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

<sup>2</sup>*Electrical Engineering, University of Washington, Seattle, WA*

**16:00 C1-8**

**ON THE DESIGN OF UNIVERSAL SCHEMES FOR MASSIVE UNCOORDINATED MULTIPLE ACCESS**

Austin A. Taghavi\*, Avinash Vem, Jean-Francois Chamberland, Krishna R. Narayanan

*Texas A&M University, College Station, TX*

**16:20 C1-9**

**PRELIMINARY SPECTRAL ANALYSIS OF TAPS AIRBORNE MEASUREMENTS**

Eric Hallenborg\*<sup>1</sup>, Ted Rogers<sup>1</sup>, Stephen Hammel<sup>1</sup>, Tracy Haack<sup>2</sup>

<sup>1</sup>*SPAWAR Systems Center, San Diego*

<sup>2</sup>*Naval Research Laboratory, Monterey, CA*

**Session F2: RF Propagation Modeling and Measurements**

**Room 135**

Co-Chairs: Michael Newkirk, *Johns Hopkins University Applied Physics Laboratory*;  
Nicholas DeMinco, *Institute for Telecommunication Sciences*

**15:20 F2-1**

**A STATISTICAL SHORT-RANGE, LOW-ANTENNA HEIGHT PROPAGATION MODEL  
BASE ON ELECTROMAGNETIC THEORY AND MEASUREMENTS**

Nicholas N. DeMinco\*, Paul M. McKenna, Robert T. Johnk  
*Institute for Telecommunication Sciences, Boulder, CO*

**15:40 F2-2**

**SPREAD SPECTRUM RF CHANNEL SOUNDING IN A MOUNTAIN SHADOW ZONE**

Samuel S. Streeter\*<sup>1</sup>, Daniel J. Breton<sup>1</sup>, Johnathan M. Corgan<sup>2</sup>  
<sup>1</sup>*Signature Physics Branch, Cold Regions Research and Engineering Laboratory, Hanover, NH*  
<sup>2</sup>*Corgan Labs, San Jose, CA*

**16:00 F2-3**

**TEMPORAL AND SPATIAL CHANGES IN MOUNTAIN REFLECTIVITY: MULTIPATH  
EFFECTS ON A WIDEBAND UHF RADIO LINK IN MOUNTAINOUS TERRAIN**

Daniel J. Breton\*, Samuel S. Streeter, Steven A. Arcone  
*Signature Physics, Cold Regions Research and Engineering Laboratory, Hanover, NH*

**16:20 F2-4**

**HIGH ANGLE, X-BAND SHIP RCS OVER ROUGH SEA SURFACES IN DUCTING  
ENVIRONMENTS USING PO-PTD AND PWE METHODS**

Frank Ryan\*<sup>1</sup>, Dale Zolnick<sup>2</sup>  
<sup>1</sup>*Applied Technology, Inc., San Diego, CA*  
<sup>2</sup>*Radar Analysis Branch, Radar Division, Naval Research Laboratory, Washington, DC*

**16:40 F2-5**

**THE CURRENT STATE OF RADAR AND COMMUNICATION ELECTROMAGNETIC  
PROPAGATION MODELS**

Abby Anderson\*  
*NSWC Dahlgren, Dahlgren, VA*

**17:00 F2-6**

**ESTIMATING REFRACTIVITY FROM PROPAGATION LOSS IN TURBULENT MEDIA**

Mark A. Wagner\*<sup>1</sup>, Peter Gerstoft<sup>1</sup>, Ted Rogers<sup>2</sup>  
<sup>1</sup>*Electrical and Computer Engineering, University of California San Diego, La Jolla, CA*  
<sup>2</sup>*SPAWAR, Point Loma, CA*

**Session FGH2: GNSS and Radio Beacon Remote Sensing II  
(Special Session)**

**Room 135**

Co-Chairs: Clara Chew, *NASA Jet Propulsion Laboratory*;  
Carl Sieftring, *Naval Research Laboratory*;  
Atilla Komjathy, *NASA Jet Propulsion Laboratory*

**13:20 FGH2-1**

## ASSESSMENT OF OCEAN-REFLECTED GNSS SIGNALS RECEIVED FROM SMAP

Matthew L. Buchanan\*, Andrew J. O'Brien, Joel T. Johnson  
*The Ohio State University, Columbus, OH*

### 13:40 FGH2-2

#### TECHDEMOSAT-1 LAND ALTIMETRY AND SEA ICE BOUNDARY DETECTION

Jake R. Mashburn\*<sup>1</sup>, Penina Axelrad<sup>1</sup>, Kristine Larson<sup>1</sup>, Stephen Lowe<sup>2</sup>

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

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

### 14:00 FGH2-3

#### EARTH REMOTE SENSING OF VEGETATION USING GPS-REFLECTED SIGNALS COLLECTED FROM SMAP

Hugo Carreno-Luengo\*, Stephen Lowe, Cinzia Zuffada, Clara Chew, Rashmi Shah  
*NASA Jet Propulsion Laboratory, Pasadena, CA*

### 14:20 FGH2-4

#### THE FROST DYNAMICS OBSERVATORY (FRODO) CONCEPT

Clara C. Chew\*<sup>1</sup>, Kyle C. McDonald<sup>1,2</sup>, Cinzia Zuffada<sup>1</sup>, Erika Podest<sup>1</sup>, Nick Steiner<sup>2</sup>

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

<sup>2</sup>*Earth and Atmospheric Sciences, The City College of New York, New York, NY*

### 14:40 FGH2-5

#### SNOWCUBE MISSION CONCEPT: P-BAND SIGNAL OF OPPORTUNITY FOR REMOTE SENSING OF SNOW

Simon Yueh\*<sup>1</sup>, Steve Margulis<sup>2</sup>, Chris Derksen<sup>3</sup>, Michael Durand<sup>4</sup>, Kelly Elder<sup>5</sup>,  
Andreadis Konstantinos<sup>1</sup>, Glen Liston<sup>6</sup>, Rashmi Shah<sup>1</sup>, Xiaolan Xu<sup>1</sup>, Chun-Sik Chae<sup>1</sup>

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

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

<sup>3</sup>*Environment and Climate Change Canada, Toronto, CANADA*

<sup>4</sup>*The Ohio State University, Columbus, OH*

<sup>5</sup>*United States Forest Service, Fort Collins, CO*

<sup>6</sup>*Colorado State University, Fort Collins, CO*

## Session G2: Space Plasma Measurement Techniques (Special Session)

### Room 155

Co-Chairs: Tom Gaussiran, *ARL:UT*;  
Terry Bullett, *University of Colorado Boulder*

### 15:20 G2-1

#### THIRD GENERATION MF-HF RADAR FOR IONOSPHERE RADIO SCIENCE

Robert C. Livingston<sup>1</sup>, Richard N. Grubb<sup>2</sup>, Terence W. Bullett\*<sup>2</sup>

<sup>1</sup>*Scion Associates, Port Townsend, WA*

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

**15:40 G2-2**

**D-REGION IONOSPHERIC REMOTE SENSING USING LF/MF SIGNALS OF OPPORTUNITY**

Marc A. Higginson-Rollins\*, Morris B. Cohen

*School of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA*

**16:00 G2-3**

**ESTIMATING THE D-REGION IONOSPHERIC ELECTRON DENSITY PROFILE USING VLF NARROWBAND TRANSMITTERS**

Nicholas C. Gross\*, Morris B. Cohen

*Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA*

**16:20 G2-4**

**ON THE SPECTRAL FEATURES OF EQUATORIAL SPREAD F ECHOES OBSERVED BY MELISSA**

Weijia Zhan\*<sup>1</sup>, Fabiano S. Rodrigues<sup>1</sup>, Eurico R. de Paula<sup>2</sup>

<sup>1</sup>*The University of Texas at Dallas, Richardson, TX*

<sup>2</sup>*Instituto Nacional de Pesquisas Espaciais, Sao Jose Dos Campos, BRAZIL*

**16:40 G2-5**

**OBSERVATION OF ACOUSTIC WAVES AND OTHER TRANSIENT DISTURBANCES USING VIPIR IONOSONDE.**

Justin J. Mabee\*<sup>1,2</sup>, Terence Bullett<sup>1,2</sup>

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

<sup>2</sup>*NCEI, NOAA, Boulder, CO*

**17:00 G2-6**

**DOING SCIENCE WITH UNIVERSITY CUBESATS**

John W. Meriwether\*, Therese M. Jorgensen

*National Science Foundation, Arlington, VA*

**17:20 G2-7**

**TWO-DIMENSIONAL UHF RADAR OBSERVATIONS OF EQUATORIAL SPREAD F EVENTS IN THE AMERICAN SECTOR**

Fabiano S. Rodrigues\*<sup>1</sup>, Marco A. Milla<sup>2</sup>, Karim K. Kuyeng<sup>2</sup>, Ramiro Yanque<sup>2</sup>, Juan Arratia<sup>3</sup>

<sup>1</sup>*The University of Texas at Dallas, Richardson, TX*

<sup>2</sup>*Jicamarca Radio Observatory, Lima, PERU*

<sup>3</sup>*Ana G. Mendez University System, Student Research Development Center, San Juan, PR*

**Session H2: Physics of the Radiation Belts I  
(Special Session)**

**Room 265**

Co-Chairs: Christopher Crabtree, *Naval Research Laboratory*;

Craig Kletzing, *University of Iowa*

**13:20 H2-1**

**OBSERVATIONS OF ENERGETIC ELECTRON PRECIPITATION BY THE BARREL BALLOON CAMPAIGNS**

John Sample\*<sup>1</sup>, Robyn Millan<sup>2</sup>

<sup>1</sup>Montana State University, Bozeman, MT

<sup>2</sup>Dartmouth College, Hanover, NH

**13:40 H2-2**

**VAN ALLEN PROBE MULTIPOINT MEASUREMENTS OF THE SPATIAL AND COHERENCE SCALES OF EMIC WAVES**

Lauren W. Blum\*<sup>1</sup>, John W. Bonnell<sup>2</sup>, Oleksiy Agapitov<sup>2</sup>

<sup>1</sup>NASA/GSFC, Greenbelt, MD

<sup>2</sup>Space Sciences Laboratory, University of California Berkeley, Berkeley, CA

**14:00 H2-3**

**VAN ALLEN PROBES OBSERVATIONS OF OXYGEN CYCLOTRON HARMONIC WAVES IN THE INNER MAGNETOSPHERE**

Maria E. Usanova\*<sup>1</sup>, David M. Malaspina<sup>1</sup>, Allison N. Jaynes<sup>1</sup>, Robert Bruder<sup>2</sup>, Ian R. Mann<sup>3</sup>, John R. Wygant<sup>4</sup>, Robert E. Ergun<sup>1</sup>

<sup>1</sup>LASP, Boulder, CO

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

<sup>3</sup>University of Alberta, Edmonton, AB, CANADA

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

**14:20 H2-4**

**THE VIRTUES OF PARAMETERIZING PLASMASPHERIC HISS (AND OTHER INNER MAGNETOSPHERE WAVE MODES) BY PLASMAPAUSE LOCATION**

David M. Malaspina\*<sup>1</sup>, Allison N. Jaynes<sup>1</sup>, Jacob Bortnik<sup>2</sup>, Robert E. Ergun<sup>1</sup>, Craig Kletzing<sup>3</sup>, John R. Wygant<sup>4</sup>

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

<sup>2</sup>Atmospheric and Oceanic Sciences, University of California Los Angeles, Los Angeles, CA

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

<sup>4</sup>Physics and Astronomy, University of Minnesota, Minneapolis, MN

**14:40 H2-5**

**USING COLD PLASMA THEORY AND WHISTLER MODE WAVES TO CHARACTERIZE THE ANTENNA-SHEATH IMPEDANCE OF THE VAN ALLEN PROBES EFW INSTRUMENT**

David P. Hartley\*<sup>1</sup>, Craig A. Kletzing<sup>1</sup>, William S. Kurth<sup>1</sup>, George B. Hospodarsky<sup>1</sup>, Scott R. Bounds<sup>1</sup>, Terrance F. Averkamp<sup>1</sup>, John W. Bonnell<sup>2</sup>, Ondrej Santolik<sup>3,4</sup>, John R. Wygant<sup>5</sup>

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

<sup>2</sup>Space Sciences Laboratory, University of California Berkeley, Berkeley, CA

<sup>3</sup>Space Physics, Institute of Atmospheric Physics, Prague, CZECH REPUBLIC

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

<sup>5</sup>Physics and Astronomy, University of Minnesota, Minneapolis, MN

**15:00 Break**

**15:20 H2-6**

**MODELING VERY LOW FREQUENCY RADIO INPUTS TO THE RADIATION BELTS**

Michael J. Starks\*<sup>1</sup>, Alan G. Ling<sup>2</sup>, Steven M. O'Malley<sup>2</sup>

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

<sup>2</sup>*Atmospheric and Environmental Research, Inc, Lexington, MA*

**15:40 H2-7**

**WARM PLASMA RAYTRACING OF WHISTLER MODE WAVES IN THE EARTH'S MAGNETOSPHERE**

Ashanthi S. Maxworth\*, Mark Golkowski

*Electrical Engineering, University of Colorado Denver, Denver, CO*

**16:00 H2-8**

**WHISTLER-MODE WAVES DETECTED BY THE VAN ALLEN PROBES SATELLITES INSIDE DENSITY DUCTS IN THE MAGNETOSPHERE**

Anatoly V. Streltsov\*, Miles T. Bengtson

*Physical Sciences, Embry-Riddle Aeronautical University, Daytona Beach, FL*

**16:20 H2-9**

**A NEW APPROACH TO LOCATE IONOSPHERIC EXIT POINTS OF MAGNETOSPHERIC WHISTLER MODE EMISSIONS**

Poorya Hosseini\*, Hamid Chorsi, Mark Golkowski, Stephen Gedney

*Electrical Engineering, University of Colorado Denver, Denver, CO*

**16:40 H2-10**

**STUDYING THE RELATIONSHIP BETWEEN ENERGETIC PARTICLE INJECTIONS, CHORUS, AND OUTER RADIATION BELT ELECTRONS WITH NASA'S MMS AND VAN ALLEN PROBES**

Drew L. Turner\*<sup>1</sup>, Joe Fennell<sup>1</sup>, J. Bernard Blake<sup>1</sup>, Allison Jaynes<sup>2</sup>, Dan Baker<sup>2</sup>, Rick Wilder<sup>2</sup>, Geoff Reeves<sup>3</sup>, Wen Li<sup>4</sup>, Craig Kletzing<sup>5</sup>, Ian Cohen<sup>6</sup>, Barry Mauk<sup>6</sup>

<sup>1</sup>*The Aerospace Corporation, El Segundo, CA*

<sup>2</sup>*Laboratory for Atmospheric and Space Physics, University of Colorado Boulder, Boulder, CO*

<sup>3</sup>*Los Alamos National Laboratory, Los Alamos, NM*

<sup>4</sup>*University of California Los Angeles, Los Angeles, CA*

<sup>5</sup>*University of Iowa, Iowa City, IA*

<sup>6</sup>*Applied Physics Lab, Laurel, MD*

**Session H3: Waves and Turbulence in Space and Laboratory Plasmas II  
(Special Session)**

**Room 155**

Co-Chairs: Bill Amatucci, *Naval Research Laboratory*;  
Stephen Vincena, *University of California Los Angeles*

**13:20 H3-1**

**RADIO EMISSIONS OF AURORAL ORIGIN, LATEST RESULTS**

James W. LaBelle\*

*Physics and Astronomy, Dartmouth College, Hanover, NH*

**13:40 H3-2**

**SIMULATION OF ELECTRON BERNSTEIN WAVES BY CHARGE-CONSERVING EMPIC ON IRREGULAR MESHES**

Dong-Yeop Na\*<sup>1</sup>, Fernando L. Teixeira<sup>1</sup>, Yuri A. Omelchenko<sup>2</sup>

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

<sup>2</sup>*Trinum Research Inc., San Diego, CA*

**14:00 H3-3**

**SIMULATION OF MAGNETOSPHERIC MAGNETOSONIC WAVE PROPAGATION IN INHOMOGENEOUS MAGNETIZED PLASMA**

Xu Liu\*, Lunjin Chen

*W. B. Hanson Center for Space Sciences, Physics, University of Texas Dallas, Richardson, TX*

**14:20 H3-4**

**GLOBAL RATES OF ALFVENIC ENERGY DEPOSITION, ELECTRON PRECIPITATION, AND ION OUTFLOW DURING GEOMAGNETIC STORMS**

Spencer M. Hatch\*, James W. LaBelle

*Physics and Astronomy, Dartmouth College, Hanover, NH*

**Session J2: Next Generation Very Large Array  
(Special Session)**

**Math 100**

Co-Chairs: Bryan Butler, *National Radio Astronomy Observatory*;

Steve Durand, *National Radio Astronomy Observatory*

**13:20 J2-1**

**NEXT GENERATION VERY LARGE ARRAY: SCIENCE OVERVIEW AND COMMUNITY STUDIES**

Chris Carilli\*, Eric Murphy, Mark Mckinnon

*National Radio Astronomy Observatory, Socorro, NM*

**13:40 J2-2**

**NEXT GENERATION VERY LARGE ARRAY - AN OVERVIEW**

Bryan Butler\*, Chris Carilli, Mark McKinnon, Eric Murphy

*National Radio Astronomy Observatory, Socorro, NM*

**14:00 J2-3**

**STRAWMAN SPECIFICATIONS FOR THE NEXT-GENERATION VERY LARGE ARRAY**

Robert J. Selina\*, Chris Carilli

*National Radio Astronomy Observatory, Socorro, NM*

**14:20 J2-4**

**DESIGN CONSIDERATIONS FOR THE NGVLA ANTENNAS**

David P. Woody\*

*Owens Valley Radio Observatory, Caltech, Big Pine, CA*

**14:40 J2-5**

**TOWARDS OPTICS DESIGN FOR THE NEXT GENERATION VERY LARGE ARRAY**

Sivasankaran Srikanth\*

*National Radio Astronomy Observatory, Charlottesville, VA*

**15:00 Break**

**15:20 J2-6**

**NGVLA CRYOGENIC SUBSYSTEM CONCEPT**

Denis R. Urbain\*, Wes Grammer, Steven Durand

*National Radio Astronomy Observatory, Socorro, NM*

**15:40 J2-7**

**NGVLA BASELINE RECEIVER SYSTEM CONCEPTUAL DESIGN**

Wes Grammer<sup>1</sup>, Sivasankaran Srikanth<sup>2</sup>, Marian Pospieszalski<sup>2</sup>, Silver Sturgis<sup>1</sup>

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

<sup>2</sup>*Central Development Laboratory, National Radio Astronomy Observatory, Charlottesville, VA*

**16:00 J2-8**

**IMPLEMENTATION STATUS OF THE ULTRA-WIDEBAND RECEIVER PACKAGE FOR THE NORTH AMERICAN ARRAY**

Jose E. Velazco\*, Melissa Soriano, Daniel Hoppe, Damon Russell, Larry D'Addario, Ezra Long, Jim Bowen, Lorene Samoska, Andrew Janzen, Joseph Lazio

*NASA Jet Propulsion Laboratory, Pasadena, CA*

**16:20 J2-9**

**ANTENNA ELECTRONICS CONCEPT FOR THE NEXT-GENERATION VERY LARGE ARRAY**

James M. Jackson\*, Robert Selina

*Electronics Division, National Radio Astronomy Observatory, Socorro, NM*

**16:40 J2-10**

**THEORY AND MEASUREMENTS OF WIDE-BAND FIBER-OPTIC LINKS**

James W. Lamb\*

*Owens Valley Radio Observatory, California Institute of Technology, Big Pine, CA*

**17:00 J2-11**

**ARRAY PROCESSING METHODS FOR RADIO ASTRONOMICAL RFI MITIGATION: A CASE STUDY FOR THE NGVLA**



Brian D. Jeffs\*, Richard A. Black, Karl F. Warnick  
*Electrical and Computer Engineering, Brigham Young University, Provo, UT*

**17:20 J2-12**

**EXPERIMENTS IN ADVANCED FAULT DETECTION IN THE JANSKY VERY LARGE ARRAY**

Alan Erickson\*, Kerry Shores  
*EE, National Radio Astronomy Observatory, Socorro, NM*

**Session K1: Electromagnetic Imaging and Sensing Applications in Medicine**

**Room 150**

Co-Chairs: Magda El-Shenawi, *University of Arkansas*;  
Mahta Moghaddam, *University of Southern California*

**13:20 K1-1**

**NANOPARTICLE-ENHANCED TERAHERTZ IMAGING OF BREAST CANCER PHANTOMS**

Tyler Bowman\*<sup>1</sup>, Alec Walter<sup>1</sup>, Olga Shenderova<sup>2</sup>, Nicholas Nunn<sup>2</sup>, Gary McGuire<sup>2</sup>, Magda El-Shenawee<sup>1</sup>

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

<sup>2</sup>*Adamas Nanotechnologies, Inc., Raleigh, NC*

**13:40 K1-2**

**TERAHERTZ IMAGING OF FRESHLY EXCISED MURINE BREAST CANCER TUMORS**

Tyler Bowman\*<sup>1</sup>, Sruthi Ravindranathan<sup>2</sup>, David Zaharoff<sup>2</sup>, Narasimhan Rajaram<sup>2</sup>, Keith Bailey<sup>3</sup>, Magda El-Shenawee<sup>1</sup>

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

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

<sup>3</sup>*Oklahoma Animal Disease Diagnostics Laboratory, Oklahoma State University, Stillwater, OK*

**14:00 K1-3**

**TERAHERTZ SPECTROSCOPY FOR THE CHARACTERIZATION OF MICRODIAMOND AND NANO-ONION PARTICLES**

Alec Walter\*<sup>1</sup>, Tyler Bowman<sup>1</sup>, Olga Shenderova<sup>2</sup>, Nicholas Nunn<sup>2</sup>, Gary McGuire<sup>2</sup>, Magda El-Shenawee<sup>1</sup>

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

<sup>2</sup>*Adamas Nanotechnologies, Inc., Raleigh, NC*

**14:20 K1-4**

**TERAHERTZ IMAGING FOR DEFECT IDENTIFICATION IN LIQUID-STERILIZING MEMBRANE DEVICES**

Nathan Burford<sup>1</sup>, Tyler Bowman\*<sup>2</sup>, Robert Beitle<sup>3</sup>, Magda El-Shenawee<sup>2</sup>

<sup>1</sup>*Microelectronics-Photonics Program, University of Arkansas, Fayetteville, AR*

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

<sup>3</sup>*Chemical Engineering, University of Arkansas, Fayetteville, AR*

**14:40 K1-5**

**POLARIMETRIC THZ IMAGING OF HUMAN BRAIN TISSUES EXHIBITING ALZHEIMER'S DISEASE**

Nandhini Srinivasan\*, Cosan Caglayan, Kubilay Sertel  
*The Ohio State University, Columbus, OH*

**15:00 Break**

**15:20 K1-6**

**THREE DIMENSIONAL LEVEL SET METHOD FOR MICROWAVE IMAGING**

Andre C. Batista\*<sup>1</sup>, Pratik Shah<sup>2</sup>, Guanbo Chen<sup>2</sup>, John Stang<sup>2</sup>

<sup>1</sup>*Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, BRAZIL*

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

**15:40 K1-7**

**RECTENNA FOR WIRELESS POWERING OF IMPLANTABLE GLUCOSE SENSOR**

Ryan B. Green\*, Panagiotis Efthymakis, Arthur French, Afroditi V. Filippas, Erdem Topsakal  
*Electrical and Computer Engineering, Virginia Commonwealth University, Richmond, VA*

**16:00 K1-8**

**THE EFFECT OF GLUCOSE ON THE ELECTRICAL PROPERTIES OF BLOOD PLASMA**

Arthur W. French\*<sup>1</sup>, Afroditi V. Filippas<sup>1</sup>, Erdem Topsakal<sup>1</sup>, Anastasios C. Karles<sup>2</sup>

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

<sup>2</sup>*Henrico High School, Henricho, VA*

**16:20 K1-9**

**ANALYSIS OF MICRO-DOPPLER SIGNATURE OF HUMANOID ROBOT MOTIONS FOR HEALTH MONITORING**

Nghia H. Tran\*, Ankit Bhargava, Ozlem Kilic

*Electrical Engineering and Computer Science, The Catholic University of America, Washington, DC*

**Commission Business Meetings**

<b>17:00</b> Commission A	Room 105
<b>17:00</b> Commission E	Room 245
<b>18:00</b> Commission C	Room 200
<b>18:00</b> Commission F	Room 265
<b>18:00</b> Commission J	Math 100

**THURSDAY MORNING, 5 January 2017**

**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 Future of the Electromagnetic Spectrum**

**(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 FUTURE OF THE ELECTROMAGNETIC SPECTRUM

William Chappell\*

*Director, Microsystems Technology Office, Defense Advanced Research Projects Agency,  
Arlington, VA*

**10:50 P1-2**

FAST RADIO BURSTS: THE STORY SO FAR

Duncan Lorimer\*

*Physics and Astronomy, West Virginia University, Morgantown, WV*

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

**12:00 Lunch for Student Travel Awardees, USNC Officers and Commission Chairs**

Colorado Room in the Center for Community

**THURSDAY AFTERNOON, 5 January 2017**

**Session A1: Microwave and Millimeter Wave Propagation and Measurement  
Room 155**

Co-Chairs: Steven Weiss, *US Army Research Lab*;  
Kristopher Buchanan, *SPAWAR*

**13:20 A1-1**

**TERRESTRIAL LINK RAIN ATTENUATION MEASUREMENTS AT 84 GHZ**

Eugene Hong<sup>\*1</sup>, Steven Lane<sup>1</sup>, David Murrell<sup>1</sup>, Nicholas Tarasenko<sup>1</sup>, Christos Christodoulou<sup>2</sup>

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

<sup>2</sup>*Electrical and Computer Engineering, University of New Mexico, Albuquerque, NM*

**13:40 A1-2**

**NUMERICALLY CALCULATED TRANSFER FUNCTIONS FOR SOLVING ARBITRARY LENGTH SIGNAL PROPAGATION USING FDTD METHOD**

Joseph E. Diener<sup>\*1</sup>, Jeanne T. Quimby<sup>2</sup>, Kate A. Remley<sup>2</sup>, Atef Z. Elsherbeni<sup>1</sup>

<sup>1</sup>*Electrical Engineering and Computer Science, Colorado School of Mines, Golden, CO*

<sup>2</sup>*National Institute of Standards and Technology, Boulder, CO*

**14:00 A1-3**

**A NOVEL V-BAND PRINTED QUASI-PARABOLIC REFLECTOR ANTENNA**

Alister Hosseini, Evangelos Kornaros, Saman Kabiri<sup>\*</sup>, Franco De Flaviis

*University of California Irvine, Irvine, CA*

**14:20 A1-4**

**SEAWATER DIELECTRIC MEASUREMENT BY USING A CAVITY TECHNIQUE: EXIT-HOLE EFFECT ANALYSIS**

Yiwen Zhou<sup>\*</sup>, Roger H. Lang

*Electrical and Computer Engineering, The George Washington University, Washington, DC*

**14:40 A1-5**

**PRECISION PORTABLE CRYOGENIC BLACKBODY TARGET FOR MICROWAVE/MILLIMETER WAVE RECEIVER CALIBRATION**

Fredrick S. Solheim<sup>\*</sup>

*Dakota Ridge R&D, Boulder, CO*

**15:00 Break**

**15:20 A1-6**

**FIBER GLASS-WEAVE SKEW ANALYSIS USING THE FINITE-DIFFERENCE TIME-DOMAIN METHOD**

Ravi C. Bollimuntha<sup>\*1</sup>, Venkata D. Paladugu<sup>1</sup>, Rounak Saha<sup>1</sup>, Melinda J. Picket-May<sup>1</sup>,  
Atef Z. Elsherbeni<sup>2</sup>, Mohammed F. Hadi<sup>1,2,3</sup>

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

<sup>2</sup>*Electrical Engineering and Computer Science, Colorado School of Mines, Golden, CO*

<sup>3</sup>*Electrical Engineering, Kuwait University, Kuwait, KUWAIT*

**15:40 A1-7**

**EXPERIMENTAL DEMONSTRATION OF HIGHER ORDER DISPERSION IN INHOMOGENEOUS SLOW WAVE STRUCTURES FOR BACKWARD WAVE OSCILLATORS**

Ushemadzero Chipengo\*, Niru K. Nahar, John L. Volakis

*Electrical and Computer Engineering, The Ohio State University, Columbus, OH*

**16:00 A1-8**

**CHARACTERIZATION OF METHODS OF REMOVING SURFACE CHARGE FOR REDUCTION OF ELECTROSTATIC DISCHARGE EVENTS**

Khandakar Nusrat Islam\*, Mark Gilomere

*Electrical and Computer Engineering, University of New Mexico, Albuquerque, NM*

**16:20 A1-9**

**ELECTRICAL BREAKDOWN STRENGTHS OF VARIOUS GASSES AND GAS MIXTURES**

D V. Giri\*<sup>1</sup>, V Carbonu<sup>2</sup>, J M. Lehr<sup>3</sup>

<sup>1</sup>*PRO-TECH, ALAMO*

<sup>2</sup>*L3 Communications (Retired), San Leandro, CA*

<sup>3</sup>*University of New Mexico, Albuquerque, NM*

**Session B11: Wearable Antennas and Electronics  
(Special Session)**

**Room 1B40**

Co-Chairs: Asimina Kiourti, *ElectroScience Laboratory, The Ohio State University*;  
Bashir Morshed, *The University of Memphis*

**13:20 B11-1**

**FUTURE OF WIRELESS MEDICAL TELEMETRY**

Erdem Topsakal\*

*Virginia Commonwealth University, Richmond, VA*

**13:40 B11-2**

**IMPEDANCE PHLEBOGRAPHY BASED PULSE SENSING USING INDUCTIVELY-COUPLED INKJET-PRINTED WRAP SENSOR**

Bashir I. Morshed\*

*Electrical and Computer Engineering, The University of Memphis, Memphis, TN*

**14:00 B11-3**

**A LOW POWER WEARABLE RESPIRATION MONITORING SENSOR USING PYROELECTRIC TRANSDUCER**

Ifana Mahbub\*<sup>1</sup>, Syed K. Islam<sup>1</sup>, Salvatore A. Pullano<sup>2</sup>, Antonino S. Fiorillo<sup>2</sup>, Samira Shamsir<sup>1</sup>, Mark S. Gaylord<sup>3</sup>, Vichien Lorch<sup>3</sup>

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

<sup>2</sup>*Health Sciences, University Magna Graecia of Catanzaro, Catanzaro, ITALY*

<sup>3</sup>*Obstetrics and Gynecology, University of Tennessee Knoxville, Knoxville, TN*

**14:20 B11-4**

**AN EXPERIMENTAL STUDY ON THE FEASIBILITY OF FALL PREVENTION USING A WEARABLE K-BAND FMCW RADAR**

Yao Tang\*, Zhengyu Peng, Changzhi Li

*Electrical and Computer Engineering, Texas Tech University, Lubbock, TX*

**14:40 B11-5**

**SIMULATION OF COIL SEPARATION AND ANGLE 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*

**15:00 Break**

**15:20 B11-6**

**A LOW-POWER CMOS ENERGY HARVESTING CIRCUIT FOR WEARABLE SENSORS USING PIEZOELECTRIC TRANSDUCERS**

Taeho Oh\*<sup>1</sup>, Islam K. Syed<sup>1</sup>, Mohamed Mahfouz<sup>2</sup>, Gary To<sup>2</sup>

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

<sup>2</sup>*Mechanical, Aerospace, and Biomedical Engineering, University of Tennessee Knoxville, Knoxville, TN*

**15:40 B11-7**

**WEARABLE ELECTRONICS INTEGRATED WITH FLEXIBLE TEXTILE ANTENNAS**

Navtej S. Saini\*, Asimina Kiourti, John L. Volakis, Robert Lee

*Electrical and Computer Engineering, The Ohio State University, Columbus, OH*

**16:00 B11-8**

**PERFORMANCE ANALYSIS OF TEXTILE AMC ANTENNA ON BODY MODEL**

Ala A. Alemaryeen\*, Sima Noghianian

*Electrical Engineering, University of North Dakota, Grand Forks, ND*

**16:20 B11-9**

**LOW-POWER IMPULSE RADIO ULTRA-WIDEBAND (IR-UWB) TRANSMITTER FOR BIOMEDICAL SENSOR APPLICATIONS**

Ifana Mahbub\*, Syed K. Islam

*University of Tennessee Knoxville, Knoxville, TN*

**Session B12: Terahertz Antennas and Applications  
(Special Session)**

**Room 245**

Co-Chairs: Kubilay Sertel, *The Ohio State University*;  
Georgios Trichopoulos, *Arizona State University*

**13:20 B12-1**

**PLANAR HIGH PERFORMANCE ANTENNAS AT TERAHERTZ FREQUENCIES**

Goutam Chattopadhyay\*

*NASA Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA*

**13:40 B12-2**

**DYNAMICALLY TUNABLE AND RECONFIGURABLE ANTENNAS FOR ADVANCED THZ SENSING AND IMAGING**

Lei Liu\*, Zhenguo Jiang, Itrat Shams, Syed Rahman, Patrick Fay

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

**14:00 B12-3**

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

Enrique J. Gonzalez\*, Gokhan Mumcu

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

**14:20 B12-4**

**MONOLITHIC REALIZATION AND CHARACTERIZATION OF ON-CHIP UWB PHASED ARRAYS FOR MMW AND THZ CONNECTIVITY**

Seckin Sahin\*, Cosan Caglayan, Niru K. Nahar, Kubilay Sertel

*Electrical and Computer Engineering, The Ohio State University, Columbus, OH*

**14:40 B12-5**

**NON-CONTACT, ON-WAFER CHARACTERIZATION OF SCHOTTKY DIODES**

Cosan Caglayan\*, Kubilay Sertel

*ElectroScience Laboratory, The Ohio State University, Columbus, OH*

**15:00 Break**

**15:20 B12-6**

**MULTIPHYSICAL MODELS OF ELECTRON-PLASMA ELECTRONICS FOR TERAHERTZ SOURCES AND DETECTORS**

Shubhendu Bhardwaj\*, John Volakis

*Electrical and Computer Engineering, The Ohio State University, Columbus, OH*

**15:40 B12-7**

**TERAHERTZ IMAGING VIA SINGLE-BIT COMPRESSIVE SENSING**

Syed An Nazmus Saqueb\*, Kubilay Sertel

*The Ohio State University, Columbus, OH*

**16:00 B12-8**

**USING COMPUTERIZED TOMOGRAPHY'S ALGORITHMS FOR REAL TIME THZ IMAGING SYSTEMS**

Panagiotis Theofanopoulos\*, Georgios Trichopoulos

*Arizona State University, Tempe, AZ*

**16:20 B12-9**

**A RADAR AND SPECTROMETER INSTRUMENT PROTOTYPE FOR PLANETARY SCIENCE AT MILLIMETER AND SUBMILLIMETER-WAVE FREQUENCIES**

Tristan Ossama El Bouayadi\*

*NASA Jet Propulsion Laboratory, Pasadena, CA*

**16:40 B12-10**

**A RAPID FILTER BANK DESIGN AND MEASUREMENT SCHEME FOR SUPERSPEC**

George Che\*<sup>1</sup>, Philip Mauskopf<sup>1</sup>, Georgios Trichopoulos<sup>2</sup>, Steven Hailey-Dunsheath<sup>3</sup>, Charles M. Bradford<sup>3,4</sup>, Jason Glenn<sup>5</sup>, Corwin Shiu<sup>6</sup>, Erik Shirokoff<sup>7</sup>, Jordan Wheeler<sup>5</sup>

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

<sup>2</sup> *Electrical, Computer and Energy Engineering, Arizona State University, Tempe, AZ*

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

<sup>4</sup> *Astronomy & Space Sciences, NASA Jet Propulsion Laboratory, Pasadena, CA*

<sup>5</sup> *Astrophysical & Planetary Sciences, University of Colorado Boulder, Boulder, CO*

<sup>6</sup> *Physics, Princeton University, Princeton, NJ*

<sup>7</sup> *Astronomy & Astrophysics, University of Chicago, Chicago, IL*

**Session CDE1: Spectrum Issues, Developments, and Solutions  
(Special Session)**

**Room 105**

Co-Chairs: Charles Baylis, *Baylor University*;  
Zoya Popovic, *University of Colorado Boulder*;  
Eric Mokole, *Consultant*

**13:20 CDE1-1**

**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> *Consultant, Burke, VA*

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

**13:40 CDE1-2**

**SUMMARY OF RECENT RADAR SPECTRUM ACTIVITIES**

Eric L. Mokole<sup>1</sup>, Lawrence Cohen\*<sup>2</sup>

<sup>1</sup> *Consultant, Burke, VA*

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

**14:00 CDE1-3**

**DYNAMIC SPECTRUM COLLABORATION BETWEEN RADAR AND WIRELESS COMMUNICATION: A PROPOSED FRAMEWORK FOR THE SIMULTANEOUS OPTIMIZATION OF POLICY, NETWORKS, AND CIRCUITS**

Charles Baylis\*<sup>1</sup>, Robert J. Marks II<sup>1</sup>, Liang Dong<sup>1</sup>, Andrew Clegg<sup>2</sup>, Lawrence Cohen<sup>3</sup>



<sup>1</sup>*Wireless and Microwave Circuits and Systems Program, Baylor University, Waco, TX*

<sup>2</sup>*Google, Reston, VA*

<sup>3</sup>*Radar Division, Naval Research Laboratory, Washington, DC*

**14:20 CDE1-4**

**DUAL-LOOP JOINT CIRCUIT AND WAVEFORM OPTIMIZATION TECHNIQUE FOR AMBIGUITY FUNCTION, SPECTRAL PERFORMANCE, AND POWER EFFICIENCY**

Casey Latham\*<sup>1</sup>, Alicia Magee<sup>1</sup>, Jacob Boline<sup>1</sup>, Alexander Tsatsoulas<sup>1</sup>, Matthew Fellows<sup>1</sup>, Charles Baylis<sup>1</sup>, Lawrence Cohen<sup>2</sup>, Robert J. Marks II<sup>1</sup>

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

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

**14:40 CDE1-5**

**WIDEBAND RF SELF-INTERFERENCE CANCELLATION FILTER FOR SIMULTANEOUS TRANSMIT/RECEIVE SYSTEMS**

Satheesh Bojja Venkatakrishnan\*, Elias A. Alwan, John Volakis

*The Ohio State University, Columbus, OH*

**15:00 Break**

**15:20 CDE1-6**

**A FREQUENCY-SELECTIVE TUNABLE POWER AMPLIFIER FOR BROADBAND PHASED ARRAY TRANSMITTERS**

Allison Duh\*, Dimitra Psychogiou, Zoya Popovic

*University of Colorado Boulder, Boulder, CO*

**15:40 CDE1-7**

**REAL-TIME AMPLIFIER IMPEDANCE OPTIMIZATION USING A NONLINEAR TUNABLE VARACTOR MATCHING NETWORK WITH POWER-DEPENDENT CHARACTERIZATION**

Sarvin Rezayat\*<sup>1</sup>, Zach Hays<sup>1</sup>, Christopher Kappelmann<sup>1</sup>, Matthew Fellows<sup>1</sup>, Charles Baylis<sup>1</sup>, Robert Marks<sup>1</sup>, Ed Viverios<sup>2</sup>, Abigail Hedden<sup>2</sup>, John Penn<sup>2</sup>, Ali Darwish<sup>2</sup>

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

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

**16:00 CDE1-8**

**IMPROVING CUBESAT TRANSMITTER EIRP TO ENABLE SPACE NETWORK COMMUNICATION CAPABILITIES**

Sushia Rahimizadeh\*<sup>1</sup>, Peter Fetterer<sup>2</sup>, Zoya Popovic<sup>1</sup>, Harry Shaw<sup>2</sup>

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

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

**16:20 CDE1-9**

**MILLIMETER-WAVE TRANSMIT/RECEIVE SYSTEM FOR SECURE HIGH DATA RATE COMMUNICATIONS**

Dimitrios Sifarikas\*, Elias A. Alwan, John L. Volakis

*Electrical and Computer Engineering, The Ohio State University, Columbus, OH*

**16:40 CDE1-10**

**WIDEBAND AND MULTI-BEAM ANGLE OF ARRIVAL ESTIMATION USING ON-SITE CODING**

Satheesh Bojja Venkatakrishnan\*, Elias A. Alwan, John Volakis

*Electrical and Computer Engineering, The Ohio State University, Columbus, OH*

**Session F3: Nanosatellites for Remote Sensing  
(Special Session)**

**Room 150**

Co-Chairs: Albin Gasiewski, *University of Colorado Boulder*;  
Steven C. Reising, *Colorado State University*;  
William Blackwell, *MIT Lincoln Laboratory*

**13:20 F3-1**

**DESIGNING A CLIMATE-MONITORING MICROWAVE RADIOMETER**

Philip W. Rosenkranz\*<sup>1</sup>, William J. Blackwell<sup>1</sup>, Albin J. Gasiewski<sup>2</sup>, R. V. Leslie<sup>1</sup>,  
Carl A. Mears<sup>3</sup>, Jeffrey R. Piepmeier<sup>4</sup>, Paul E. Racette<sup>4</sup>, Benjamin D. Santer<sup>5</sup>

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

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

<sup>3</sup>*Remote Sensing Systems, Santa Rosa, CA*

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

<sup>5</sup>*Lawrence Livermore National Laboratory, Livermore, CA*

**13:40 F3-2**

**MICROWAVE-IR POLARIMETRY AND RADIOMETRY FOR REMOTE SENSING OF CLOUD ICE MICROPHYSICAL PROPERTIES**

Dong L. Wu\*<sup>1</sup>, Jie Gong<sup>1,2</sup>

<sup>1</sup>*NASA Goddard Space Flight Center, Greenbelt, MD*

<sup>2</sup>*Universities Space Research Association, Greenbelt, MD*

**14:00 F3-3**

**TROPOSPHERIC WATER AND CLOUD ICE (TWICE) MILLIMETER- AND SUB-MILLIMETER-WAVE RADIOMETER FOR 6U-CLASS SATELLITES: PERFORMANCE ANALYSIS OF COMMAND AND DATA HANDLING (C&DH) SUBSYSTEM**

Mehmet Ogut\*<sup>1</sup>, Xavier Bosch-Lluis<sup>1</sup>, Steven C. Reising<sup>1</sup>, Yuriy V. Goncharenko<sup>1</sup>,  
Pekka Kangaslahti<sup>2</sup>, Erich Schlecht<sup>2</sup>, Richard Cofield<sup>2</sup>, Nacer Chahat<sup>2</sup>, Sharmila Padmanabhan<sup>2</sup>,  
Jonathan Jiang<sup>2</sup>, Shannon T. Brown<sup>2</sup>, William R. Deal<sup>3</sup>, Alex Zamora<sup>3</sup>, Kevin Leong<sup>3</sup>,  
Sean Shih<sup>3</sup>, Gerry Mei<sup>3</sup>

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

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

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

**14:20 F3-4**

## THE CUBESAT RADIOMETER RADIO FREQUENCY INTERFERENCE TECHNOLOGY VALIDATION (CUBERRT) MISSION

Christa McKelvey\*<sup>1</sup>, Joel T. Johnson<sup>1</sup>, Chi-Chih Chen<sup>1</sup>, Andrew O'Brien<sup>1</sup>, Graeme E. Smith<sup>1</sup>, Mark Andrews<sup>1</sup>, J. Landon Garry<sup>1</sup>, Sidharth Misra<sup>2</sup>, Shannon Brown<sup>2</sup>, Jonathan Kocz<sup>2</sup>, Robert Jarnot<sup>2</sup>, Damon C. Bradley<sup>3</sup>, Priscilla N. Mohammed<sup>3</sup>, Jared F. Lucey<sup>3</sup>, Jeffrey R. Piepmeier<sup>3</sup>, Kevin Horgan<sup>3</sup>, Michael Solly<sup>3</sup>, Joseph Knuble<sup>3</sup>

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

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

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

### 14:40 F3-5

#### CYGNSS: EARLY LAUNCH ENGINEERING AND SCIENCE COMMISSIONING

Scott Gleason\*<sup>1</sup>, Valery Zavorotny<sup>2</sup>, Christopher Ruf<sup>3</sup>, Randy Rose<sup>1</sup>

<sup>1</sup>*Southwest Research Institute, Boulder, CO*

<sup>2</sup>*NOAA Earth System Research Laboratory, Boulder, CO*

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

### 15:00 Break

### 15:20 F3-6

#### PRE-LAUNCH CALIBRATION AND PERFORMANCE STUDY OF THE POLARCUBE 3U TEMPERATURE SOUNDING RADIOMETER MISSION

Lavanya Periasamy\*, Albin J. Gasiewski

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

### 15:40 F3-7

#### RADIOMETER CALIBRATION WITH GPS RADIO OCCULTATION FOR THE MIRATA CUBESAT MISSION

Kerri Cahoy\*<sup>1</sup>, Anne Marinar<sup>1</sup>, Rebecca Bishop<sup>2</sup>, Susan Lui<sup>2</sup>, James Bardeen<sup>2</sup>, Tamitha Skov<sup>2</sup>, William Blackwell<sup>3</sup>, R. Vincent Leslie<sup>3</sup>, Idahosa Osaretin<sup>3</sup>, Michael Shields<sup>3</sup>

<sup>1</sup>*Aeronautics and Astronautics, Massachusetts Institute of Technology, Cambridge, MA*

<sup>2</sup>*The Aerospace Corporation, El Segundo, CA*

<sup>3</sup>*MIT Lincoln Laboratory, Lexington, MA*

### 16:00 F3-8

#### ENABLING TIME-RESOLVED OBSERVATIONS OF CLOUD AND PRECIPITATION PROCESSES FROM 6U-CLASS SATELLITE CONSTELLATIONS: TEMPORAL EXPERIMENT FOR STORMS AND TROPICAL SYSTEMS TECHNOLOGY DEMONSTRATION (TEMPEST-D)

Steven C. Reising\*<sup>1</sup>, Todd C. Gaier<sup>2</sup>, Christian D. Kummerow<sup>3</sup>, V Chandrasekar<sup>1</sup>, Sharmila Padmanabhan<sup>2</sup>, Boon H. Lim<sup>2</sup>, Cate Heneghan<sup>2</sup>, Wesley Berg<sup>3</sup>, Jon P. Olson<sup>1</sup>, Shannon T. Brown<sup>2</sup>, John Carvo<sup>4</sup>, Matthew Pallas<sup>4</sup>

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

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

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

<sup>4</sup>*Blue Canyon Technologies, Boulder, CO*

**16:20 F3-9**

**THE TEMPEST-D DEMONSTRATION RADIOMETER INSTRUMENT FOR MEASUREMENT OF CLOUDS AND PRECIPITATION**

Todd Gaier\*<sup>1</sup>, Sharmila Padmanabhan<sup>1</sup>, Boon Lim<sup>1</sup>, Richard Cofield<sup>1</sup>, Mary Easter<sup>1</sup>, Mary Soria<sup>1</sup>, Heather Owen<sup>1</sup>, Steven C. Reising<sup>2</sup>

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

<sup>2</sup>*Electrical and Computer Engineering, Colorado State University, Fort Collins, CO*

**Session F4: Complex and Random Media  
(Special Session)**

**Room 135**

Co-Chairs: Saba Mudaliar, *Air Force Research Laboratory*;  
Akira Ishimaru, *University of Washington*

**13:20 F4-1**

**IMPROVEMENTS IN THE SINGLE SCATTER SUBTRACTION APPROACH**

Kevin Diomedi, Gary S. Brown\*

*Virginia Tech, Blacksburg, VA*

**13:40 F4-2**

**MODELING OF COHERENT AND DIFFUSE SCATTERING FROM ROUGH SURFACE WITH SMALL AND MODERATE RAYLEIGH PARAMETER**

Alexander G. Voronovich\*, Valery V. Zavorotny

*NOAA Earth System Research Laboratory, Boulder, CO*

**14:00 F4-3**

**COHERENT BISTATIC SCATTERING MODEL FOR VEGETATED LAND COVER IN SUPPORT OF SOIL MOISTURE RETRIEVAL**

Amir Azemati\*, Mahta Moghaddam

*Ming Hsieh Department of Electrical Engineering, University of Southern California, Los Angeles, CA*

**14:20 F4-4**

**ANTENNA BEAMWIDTH EFFECT IN DETECTING MICROWAVE ENHANCED BACKSCATTER FROM A LAYER OF VEGETATION**

Avinash Sharma\*<sup>1</sup>, Roger H. Lang<sup>2</sup>

<sup>1</sup>*Johns Hopkins University Applied Physics Laboratory, Laurel, MD*

<sup>2</sup>*Electrical and Computer Engineering, The George Washington University, Washington, DC*

**14:40 F4-5**

**DESIGNING SOURCES FOR ENHANCEMENT OF EARLY-TIME DIFFUSION IN SHORT PULSE PROPAGATION THROUGH RANDOM PARTICULATE MEDIA**

Elizabeth Bleszynski\*, Marek Bleszynski, Thomas Jaroszewicz  
*Monopole Research, Thousand Oaks, CA*

**15:00 Break**

**15:20 F4-6**

**A RAYLEIGH-RITZ APPROACH TO GREEN'S FUNCTION OF AN INHOMOGENEOUS LAYER**

Saba Mudaliar\*<sup>1</sup>, C. P. Vendhan<sup>2</sup>, C. Prabavathi<sup>3</sup>

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

<sup>2</sup>*Indian Institute of Technology Madras, Chennai, INDIA*

<sup>3</sup>*P.O. Box 24467, Dayton, OH*

**15:40 F4-7**

**PASSIVE INFRARED RETRIEVAL OF TROPOSPHERIC REFRACTIVITY, TEMPERATURE, AND WATER VAPOR PROFILES**

Fredrick S. Solheim\*

*Dakota Ridge R&D, Boulder, CO*

**16:00 F4-8**

**POINT-TO-POINT BACKHAUL SYSTEMS AT 3.5GHZ PREDICTIONS VS. MEASUREMENTS IN A VEGETATED RESIDENTIAL AREA OF WASHINGTON, DC**

Saul A. Torrico\*<sup>1</sup>, Roger H. Lang<sup>2</sup>

<sup>1</sup>*Comsearch, Ashburn, VA*

<sup>2</sup>*Electrical and Computer Engineering, The George Washington University, Washington, DC*

**16:20 F4-9**

**MEASUREMENTS OF WIDEBAND MICROWAVE PROPAGATION WITHIN A SMALL AIRCRAFT FOR REPLACING WIRE HARNESSSES**

Miyuki Hirose\*, Takehiko Kobayashi

*Tokyo Denki University, Tokyo, JAPAN*

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

**Room 151**

Co-Chairs: Eric Gillman, *Naval Research Laboratory*;

Edward Thomas, *Auburn University*;

Julio Urbina, *Penn State*

**13:20 GH1-1**

**ANALYSIS OF PLASMA TURBULENCE ON THE FORMATION OF SPECULAR METEOR ECHOES**

Freddy R. Galindo<sup>1</sup>, Julio V. Urbina\*<sup>1</sup>, Lars P. Dyrud<sup>2</sup>

<sup>1</sup>*Electrical Engineering and Computer Science, Penn State, University Park, PA*

<sup>2</sup>*OmniEarth, Inc., Arlington, VA*

**13:40 GH1-2**

**INVERSION OF METEOR RADAR CROSS SECTION TO PLASMA DENSITY USING AN FDTD NUMERICAL SCATTERING MODEL**

Robert A. Marshall\*<sup>1</sup>, Sigrid Close<sup>2</sup>, Peter Brown<sup>3</sup>, Gunter Stober<sup>4</sup>, Carsten Schult<sup>4</sup>, Jorge Chau<sup>4</sup>

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

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

<sup>3</sup>*University of Western Ontario, London, ON, CANADA*

<sup>4</sup>*Institute of Atmospheric Physics, Kuhlungsborn, GERMANY*

**14:00 GH1-3**

**SIMULTANEOUS UHF/VHF RADAR AND OPTICAL OBSERVATIONS OF METEORS AT ARECIBO**

Michael DeLuca\*<sup>1,2</sup>, Diego Janches<sup>3</sup>, Robert Michell<sup>4,5</sup>, Rebecca Chen<sup>6</sup>, Zoltan Sternovsky<sup>1,2</sup>

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

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

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

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

<sup>5</sup>*Astronomy, University of Maryland, College Park, College Park, MD*

<sup>6</sup>*River Hill High School, Clarksville, MD*

**14:20 GH1-4**

**METEOROID SPUTTERING AS A SOURCE FOR LOWER-THERMOSPHERIC METALS AND THE RADIO SCIENCE OF HIGH-ALTITUDE RADAR METEORS**

John D. Mathews\*<sup>1</sup>, Boyi Gao<sup>1</sup>, Saiveena Kesaraju<sup>1</sup>, Shikha Raizada<sup>2</sup>

<sup>1</sup>*Radar Space Sciences Lab, Penn State University, University Park, PA*

<sup>2</sup>*Space Science Division, Arecibo Observatory, Arecibo, PR*

**15:00 Break**

**15:20 GH1-5**

**LOW-ALTITUDE RADAR METEORS AND BOLIDE LANGMUIR WAVES**

John D. Mathews\*<sup>1</sup>, Qian Zhu<sup>1</sup>, Frank T. Djuth<sup>2</sup>

<sup>1</sup>*Radar Space Sciences Lab, Penn State University, University Park, PA*

<sup>2</sup>*Geospace Research, Inc., El Segundo, CA*

**15:40 GH1-6**

**RADAR DETECTABILITY OF METEOR HEAD ECHOES AND ITS IMPLICATION ON THE ZODIACAL DUST CLOUD POPULATIONS**

Diego Janches\*<sup>1</sup>, Petr Pokorny<sup>2</sup>, Nimalna Swarnalingam<sup>2</sup>, David Nesvorny<sup>3</sup>, John M. C. Plane<sup>4</sup>, Wuhu Feng<sup>4</sup>, Juan Diego Carrillo-Sanchez<sup>4</sup>, Juan Carlos Gomez Martin<sup>4</sup>, David Vokrouhlicky<sup>5</sup>

<sup>1</sup>*Space Weather Laboratory, NASA, Greenbelt, MD*

<sup>2</sup>*Physics, Catholic University of America, Washington, D.C*

<sup>3</sup>*SouthWest Research Institute, Boulder, CO*

<sup>4</sup>*Chemistry, University of Leeds, Leeds, UNITED KINGDOM*

<sup>5</sup>*Institute of Astronomy, Charles University, Prague, CZECH REPUBLIC*

**16:00 GH1-7**

**MICROMETEOROID ABLATION SIMULATED IN THE LABORATORY USING A DUST ACCELERATOR**

Z. Sternovsky<sup>\*1,2,3</sup>, E. Thomas<sup>2,3</sup>, M. DeLuca<sup>1,2</sup>, M. Horanyi<sup>1,3,4</sup>, D. Janches<sup>5</sup>, N. Swarnalingam<sup>5</sup>, R. Marshall<sup>2</sup>, T. Munsat<sup>3,4</sup>, J. M. C. Plane<sup>6</sup>

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

<sup>2</sup>*Aerospace Eng. Sci., University of Colorado Boulder, Boulder, CO*

<sup>3</sup>*IMPACT, University of Colorado Boulder, Boulder, CO*

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

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

<sup>6</sup>*School of Chemistry, University of Leeds, Leeds, UNITED KINGDOM*

**16:20 GH1-8**

**RADIO-FREQUENCY EMISSION DETECTION AND SCALING FROM HYPERVELOCITY IMPACTS ON CHARGED TARGETS**

Andrew Nuttall\*, Sigrid Close

*Stanford University, Stanford, CA*

**16:40 GH1-9**

**HYPERVELOCITY IMPACT PLASMA EXPANSION: SCALING FROM EXPERIMENT TO SPACE**

Nicolas Lee\*, Sigrid Close, Ashish Goel

*Aeronautics and Astronautics, Stanford University, Stanford, CA*

**Session H4: Physics of the Radiation Belts II  
(Special Session)**

**Room 200**

Co-Chairs: Christopher Crabtree, *Naval Research Laboratory*;

Craig Kletzing, *University of Iowa*

**13:20 H4-1**

**MODULATION OF WHISTLER-MODE CHORUS WAVES BY ULF AND THE EFFECTS ON PRECIPITATION**

Allison N. Jaynes<sup>\*1</sup>, Maria Usanova<sup>1</sup>, Marc Lessard<sup>2</sup>, Kazue Takahashi<sup>3</sup>, Ashar Ali<sup>1</sup>, David Malaspina<sup>1</sup>, Robert Michell<sup>4</sup>, Emma Spanswick<sup>5</sup>, Daniel N. Baker<sup>1</sup>, J. B. Blake<sup>6</sup>, Chris Cully<sup>5</sup>, Eric Donovan<sup>5</sup>, Craig Kletzing<sup>7</sup>, Geoff Reeves<sup>8</sup>, Marilia Samara<sup>4</sup>, Harlan Spence<sup>2</sup>, John Wygant<sup>9</sup>

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

<sup>2</sup>*University of New Hampshire, Durham, NH*

<sup>3</sup>*Johns Hopkins University Applied Physics Laboratory, Laurel, MD*

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

<sup>5</sup>*University of Calgary, Calgary, CANADA*

<sup>6</sup>*Aerospace Corporation, El Segundo, CA*

<sup>7</sup>*University of Iowa, Iowa City, IA*



<sup>8</sup>*Los Alamos National Laboratory, Los Alamos, NM*

<sup>9</sup>*University of Minnesota, Minneapolis, MN*

**13:40 H4-2**

**DIAGNOSING PARAMETERS OF NONLINEAR WHISTLER MODE GROWTH IN THE MAGNETOSPHERE FROM OBSERVATIONS OF RELATIVE PHASE OF SIDEBANDS OF TRIGGERED EMISSIONS**

Mark Golkowski\*, Jamie Costabile, Randall Wall

*Electrical Engineering, University of Colorado Denver, Denver, CO*

**14:00 H4-3**

**UNIQUE CONCURRENT OBSERVATIONS OF WHISTLER MODE HISS, CHORUS, AND TRIGGERED EMISSIONS**

Poorya Hosseini\*, Mark Golkowski

*Electrical Engineering, University of Colorado Denver, Denver, CO*

**14:20 H4-4**

**BAYESIAN SPECTRAL ANALYSIS OF CHORUS SUB-ELEMENTS**

Christopher Crabtree\*<sup>1</sup>, Gurudas Ganguli<sup>1</sup>, Erik Tejero<sup>1</sup>, George Hospodarsky<sup>2</sup>, Craig Kletzing<sup>2</sup>

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

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

**14:40 H4-5**

**FIRST DIRECT EVIDENCE OF A ONE-ONE CORRESPONDENCE OF CHORUS WAVE PACKETS AND MICROBURSTS: VAN ALLEN PROBES EFW AND FIREBIRD**

Aaron Breneman\*<sup>1</sup>, Alex Crew<sup>2</sup>

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

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

**Session HEG1: Lightning and its Interaction with the Ionosphere I  
(Special Session)**

**Room 265**

Co-Chairs: Robert Marshall, *University of Colorado Boulder*;

Morris Cohen, *Georgia Institute of Technology*;

Ningyu Liu, *University of New Hampshire*

**13:20 HEG1-1**

**THE ASSOCIATION OF TERRESTRIAL GAMMA-RAY FLASHES WITH ENERGETIC IN-CLOUD LIGHTNING PULSES**

Steven A. Cummer\*<sup>1</sup>, Fanchao Lyu<sup>1</sup>, Michael S. Briggs<sup>2</sup>, David M. Smith<sup>3</sup>

<sup>1</sup>*Duke University, Durham, NC*

<sup>2</sup>*University of Alabama Huntsville, Huntsville, AL*

<sup>3</sup>*University of California Santa Cruz, Santa Cruz, CA*

**13:40 HEG1-2**



**ESTIMATION OF RADIATION DOSES RECEIVED BY AIRCRAFT PASSENGERS IN A TGF PHOTON BEAM**

Sebastien Celestin\*<sup>1</sup>, Francois Trompier<sup>2</sup>, Jean-Louis Pincon<sup>1</sup>

<sup>1</sup>LPC2E, University of Orleans, CNRS, Orleans, FRANCE

<sup>2</sup>Institut de Radioprotection et de Surete Nucleaire, Fontenay-aux-Roses, FRANCE

**14:00 HEG1-3**

**A NEW TYPE OF TRANSIENT LUMINOUS EVENTS PRODUCED BY TERRESTRIAL GAMMA-RAY FLASHES**

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

<sup>1</sup>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, CNRS, Orleans, FRANCE

<sup>3</sup>Communications and Space Sciences Laboratory, Pennsylvania State University, University Park, PA

**14:20 HEG1-4**

**TRYAD: A PAIR OF CUBESATS TO OBSERVE TERRESTRIAL GAMMA-RAY FLASH BEAMS**

Michael S. Briggs\*<sup>1</sup>, Pete Jenke<sup>1</sup>, Jean-Marie Wersinger<sup>2</sup>, Mike Folge<sup>2</sup>

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

<sup>2</sup>Physics, Auburn University, Auburn, AL

**14:40 HEG1-5**

**USING WWLLN TO FIND WEAKER TGFS IN THE FERMI GBM DATA**

Michael S. Briggs\*, Kareem Omar

CSPAR, University of Alabama Huntsville, Huntsville, AL

**15:00 Break**

**15:20 HEG1-6**

**CALCULATING HF AND VHF EMISSIONS FROM COMPACT INTRACLOUD DISCHARGES**

Joseph R. Dwyer\*, Ningyu Liu

Physics Department and Space Science Center (EOS), University of New Hampshire, Durham NH

**15:40 HEG1-7**

**FRACTAL DIMENSION OF CLOUD-TO-GROUND LIGHTNING**

Ningyu Liu\*<sup>1</sup>, Julia Tilles<sup>1</sup>, Levi Boggs<sup>2</sup>, Alan Bozarth<sup>2</sup>, Hamid Rassoul<sup>2</sup>, Jeremy Rioussset<sup>3</sup>

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

<sup>2</sup>Physics and Space Sciences, Florida Institute of Technology, Melbourne, FL

<sup>3</sup>Center for Space and Atmospheric Research, Physical Sciences Department, Embry Riddle Aeronautical University, Daytona Beach, FL

**16:00 HEG1-8**

### 3-D MODELING OF TWO INTERACTING STREAMERS

Feng Shi\*<sup>1</sup>, Ningyu Liu<sup>1</sup>, Hamid K. Rassoul<sup>2</sup>

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

<sup>2</sup>*Physics and Space Sciences, Florida Institute of Technology, Melbourne, FL*

### 16:20 HEG1-9

#### RADIO INTERFEROMETER STUDY OF HIGH-POWER LIGHTNING NARROW BIPOLAR EVENTS IN FLORIDA

Julia N. Tilles\*<sup>1</sup>, Ningyu Liu<sup>1</sup>, Paul R. Krehbiel<sup>2</sup>, William Rison<sup>2</sup>, Mark A. Stanley<sup>2</sup>,

Robert G. Brown<sup>3</sup>, Jennifer G. Wilson<sup>3</sup>, Levi Boggs<sup>4</sup>, Michael Stock<sup>5</sup>

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

<sup>2</sup>*Langmuir Laboratory, New Mexico Tech, Socorro, NM*

<sup>3</sup>*NASA Kennedy Space Center, Kennedy Space Center, FL*

<sup>4</sup>*Physics and Space Sciences, Florida Institute of Technology, Melbourne, FL*

<sup>5</sup>*Osaka University, Osaka, JAPAN*

### Session J3: New Telescopes, Techniques and Technology II (Special Session)

#### Math 100

Co-Chairs: David DeBoer, *University of California Berkeley*;

Jeffery Mangum, *National Radio Astronomy Observatory*

### 13:20 J3-1

#### ALMA DIGITAL DOWNCONVERTER

Sylas Ashton\*

*National Radio Astronomy Observatory, Socorro, NM*

### 13:40 J3-2

#### SURVEYING THE MOLECULAR GAS FUELING EARLY STAR FORMATION: PRESENT RESULTS AND FUTURE DIRECTIONS

Garrett K. Keating\*<sup>1</sup>, Daniel P. Marrone<sup>2</sup>, Geoffrey C. Bower<sup>3</sup>

<sup>1</sup>*Smithsonian Astrophysical Observatory, Cambridge, MA*

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

<sup>3</sup>*ASIAA, Hilo, HI*

### 14:00 J3-3

#### SUSTAINING SUBMILLIMETER SCIENCE IN THE NEXT DECADE AND BEYOND

Henry A. Wootten, Jeffrey G. Mangum\*

*National Radio Astronomy Observatory and University of Virginia, Charlottesville, VA*

### Session J4: Cosmic Microwave Background Polarization (Special Session)

#### Math 100

Co-Chairs: Dan Marrone, *University of Arizona*;

Miguel Morales, *University of Washington*

**15:20 J4-1**

**OVERVIEW OF DETECTOR ARRAYS FOR THE MEASUREMENT OF COSMIC  
MICROWAVE BACKGROUND POLARIZATION**

Johannes Hubmayr\*

*National Institute of Standards and Technology, Boulder, CO*

**15:40 J4-2**

**NEXT-GENERATION COSMOLOGY WITH ADVANCED ACTPOL**

Sara M. Simon\*

*University of Michigan, Ann Arbor, MI*

**16:00 J4-3**

**THE BICEP/KECK CMB POLARIZATION APPROACH: MEASURING DEGREE  
ANGULAR SCALES WITH SMALL APERTURES**

Kirit S. Karkare\*

*Harvard-Smithsonian Center for Astrophysics, Cambridge, MA*

**16:20 J4-4**

**SPT-3G: THE THIRD GENERATION CAMERA AND SURVEY FOR THE SOUTH POLE  
TELESCOPE**

Joaquin Vieira\*

*Astronomy, The University of Illinois at Urbana-Champaign, Urbana, IL*

**16:40 J4-5**

**THE COSMOLOGY LARGE ANGULAR SCALE SURVEYOR**

Lucas P. Parker\*

*Johns Hopkins University, Baltimore, MD*

**17:00 J4-6**

**MEASURING GALACTIC SYNCHROTRON WITH THE C-BAND ALL SKY SURVEY**

Heiko M. Heilgendorff\*

*University of KwaZulu-Natal, Durban, SOUTH AFRICA*

**Commission Business Meetings**

<b>17:00</b> Commission B	Room 1B40
<b>17:00</b> Commission D	Room 105
<b>17:00</b> Commission G	Room 245
<b>18:00</b> Commission H	Room 265
<b>18:00</b> Commission K	Room 200

**FRIDAY MORNING, 6 January 2017**

**Session B13: Antenna Measurements and Simulations  
(Special Session)  
Room 1B40**

Co-Chairs: Steven Weiss, *US Army Research Lab*;  
Jeanne Quimby, *National Institute of Standards and Technology*

**08:20 B13-1**

**MEASURED PERFORMANCE OF LOW PROFILE ANTENNAS FED IN A BALANCED CONFIGURATION**

Steven Weiss\*, Gregory Mitchell

*United States Army Research Laboratory, Adelphi, MD*

**08:40 B13-2**

**MODIFICATION, MODELING, AND MEASUREMENT OF A BALANCED ANTIPODAL VIVALDI FOR A MULTI-CHANNEL RECEIVER**

Seth A. McCormick\*<sup>1</sup>, William O. Coburn<sup>2</sup>

<sup>1</sup>*General Technical Services LLC, Wall, NJ*

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

**09:00 B13-3**

**UNIQUE GEOMETRY FOR A CONCENTRIC DUAL BAND ARRAY ANTENNA AT S- AND X-BAND**

Gregory Mitchell\*

*United States Army Research Laboratory, Adelphi, MD*

**09:20 B13-4**

**STUDY OF PHASE VARIATION ON PROPAGATING THROUGH METAMATERIAL**

Quang M. Nguyen\*, Amir I. Zaghoul, Steven J. Weiss

*United States Army Research Laboratory, Adelphi, MD*

**09:40 B13-5**

**MODELING AND MEASUREMENT OF 3D PRINTED  $\lambda/30$  SPHERICAL SPIRAL DIPOLES**

Theodore K. Anthony\*, Keefe Coburn, Amir I. Zaghoul

*United States Army Research Laboratory, Adelphi, MD*

**10:00 Break**

**10:20 B13-6**

**NOVEL CHOKE RINGS FOR ULTRA-WIDEBAND ANTENNA ARRAY**

Zahra Manzoor\*<sup>1</sup>, Gholamreza Moradi<sup>2</sup>

<sup>1</sup>*Electrical and Computer Engineering, Missouri Science and Technology University, Rolla, MO*

<sup>2</sup>*Electrical and Computer Engineering, Amir Kabir University, Tehran, IRAN*

**10:40 B13-7**

**DESIGN AND CALIBRATION OF A CLOSED LOOP LABORATORY RF PROPAGATION SECTION**

William O. Coburn\*<sup>1</sup>, Andre K. Witcher<sup>1</sup>, Seth A. McCormick<sup>2</sup>

<sup>1</sup>*United States Army Research Laboratory, Adelphi MD*

<sup>2</sup>*General Technical Services LLC, Adelphi MD*

**11:00 B13-8**

**THE TRISKELION-ARCHIMEDEAN SPIRAL ANTENNA**

Seunghwan Yoon\*<sup>1</sup>, Alfred G. Besoli<sup>1</sup>, Franco De Flaviis<sup>2</sup>, Nicolaos G. Alexopoulos<sup>3</sup>

<sup>1</sup>*Movandi Corporation, Newport Beach, CA*

<sup>2</sup>*University of California Irvine, Irvine, CA*

<sup>3</sup>*Broadcom Foundation, Newport Beach, CA*

**Session B14: Antenna Arrays II**

**Room 245**

Co-Chairs: Dejan Filipovic, *University of Colorado Boulder;*

Gokhan Mumcu, *University of South Florida*

**08:20 B14-1**

**INVESTIGATION OF MULTI-OCTAVE WIDEBAND CAVITY-BACKED VIVALDI  
ARRAY ANTENNAS**

Elie G. Tianang\*, Mohamed A. Elmansouri, Dejan S. Filipovic

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

**08:40 B14-2**

**DUAL POLARIZED 7.2:1 BANDWIDTH PHASED ARRAY WITH 60 DEGREE SCANNING**

Jingni Zhong\*, Elias A. Alwan, John L. Volakis

*Electrical and Computer Engineering, The Ohio State University, Columbus, OH*

**09:00 B14-3**

**WIDEBAND PHASED ARRAY OF SPIRAL ANTENNAS FOR SIMULTANEOUS  
TRANSMIT AND RECEIVE (STAR)**

Alexander Hovsepian\*, Elias A. Alwan, John L. Volakis

*Electrical and Computer Engineering, The Ohio State University, Columbus, OH*

**09:20 B14-4**

**INVESTIGATION OF LATERAL SPACE WAVE AND SURFACE WAVE ON THE LINK  
BUDGET OF CHIP-TO-CHIP SWITCHED-BEAM 60-GHZ ARRAY**

Prabhat Baniya\*, Kathleen L. Melde

*Electrical and Computer Engineering, University of Arizona, Tucson, AZ*

**09:40 B14-5**

**DIRECTIONAL ARRAY FOR MILLIMETER-WAVE CELLULAR NETWORK**

Toan K. Vo Dai\*, Ozlem Kilic

*The Catholic University of America, Washington, DC*

**10:00 Break**

**10:20 B14-6**

**PHASE SHIFTER CONTROL SCHEME IMPLEMENTATION FOR STEERABLE/ADAPTIVE L-BAND PHASED ARRAYS**

Farhan Quaiyum<sup>\*1</sup>, Robab Kazemy<sup>2</sup>, Aly E. Fathy<sup>1</sup>

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

<sup>2</sup>*Electrical and Computer Engineering, University of Tabriz, Tabriz, IRAN*

**10:40 B14-7**

**ADAPTIVE WIRELESS ENERGY HARVESTING SYSTEMS USING FOCUSED ANTENNA ARRAYS**

Daniel E. Schemmel\*, Payam Nayeri

*Electrical Engineering and Computer Science, Colorado School of Mines, Golden, CO*

**11:00 B14-8**

**EXAMINATION OF THE NEAR FIELD RESPONSE OF CIRCULAR ANTENNA ARRAYS**

Kristopher R. Buchanan\*, Oren Sternberg, Sara Wheeland, John Rockway

*SSC Pacific, San Diego, CA*

**Session B15: Advanced Analysis, Design, and Applications of Waveguiding Structures (Special Session)**

**Room 105**

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

**08:20 B15-1**

**OPTIMIZATION OF STEPPED-WAVEGUIDE APPLICATORS FOR THE CHARACTERIZATION OF CONDUCTOR-BACKED ABSORBING MATERIALS**

Edward J. Rothwell\*, Jonathan L. Frasch

*Electrical and Computer Engineering, Michigan State University, East Lansing, MI*

**08:40 B15-2**

**OPTICALLY TRANSPARENT PLANAR COMPOSITE STRUCTURE CONTAINING METALS AND DNG METAMATERIALS**

Piergiorgio L. E. Uslenghi\*

*University of Illinois Chicago, Chicago, IL*

**09:00 B15-3**

**MULTIMODAL WAVEGUIDES WITH EXCEPTIONAL POINTS OF DEGENERACY OF VARIOUS ORDERS**

Mohamed Othman<sup>1</sup>, Mehdi Veysi<sup>1</sup>, Farshad Yazdi<sup>1</sup>, Mohamed Nada<sup>1</sup>, Dmitry Oshmarin<sup>1</sup>, Alexander Figotin<sup>2</sup>, Filippo Capolino\*<sup>1</sup>

<sup>1</sup>*Electrical Engineering and Computer Science, University of California Irvine, Irvine, CA*

<sup>2</sup>*Mathematics, University of California Irvine, Irvine, CA*

**09:20 B15-4**

**RECTANGULAR WAVEGUIDE MODE AND BANDWIDTH ENHANCEMENT USING COMMON AND DIFFERENTIAL EXCITATION**

Michael J. Havrilla\*

*Air Force Institute of Technology, Wright-Patterson AFB, OH*

**09:40 B15-5**

**PHOTONIC TOPOLOGICAL INSULATOR WAVEGUIDING FROM A CLASSICAL ELECTROMAGNETICS PERSPECTIVE**

Ali Hassani\*, George W. Hanson

*Electrical Engineering, University of Wisconsin Milwaukee, Milwaukee, WI*

**Session C2: Interfacing Hardware and Signal Processing in Distributed Radar and Sensing Systems**

**Room 135**

Co-Chairs: Jean-Francois Chamberland, *Texas A&M University*;

Laura Pulido Mancera, *Duke University*

**08:20 C2-1**

**ON THE IMPACT OF ANTENNA DESIGN IN THE CONTEXT OF GRAPH INFERENCE BASED ON WI-FI METADATA**

Mandel Oats\*, Travis Taghavi, Jean-Francois Chamberland, Gregory H. Huff

*Electrical and Computer Engineering, Texas A&M University, College Station, TX*

**08:40 C2-2**

**ADAPTING RANGE MIGRATION TECHNIQUES FOR FAST IMAGE RECONSTRUCTION WITH METASURFACE ANTENNAS**

Laura M. Pulido Mancera\*<sup>1</sup>, Thomas Fromenteze<sup>1</sup>, Timothy Sleasman<sup>1</sup>, Michael Boyarsky<sup>1</sup>, Mohammadreza F. Imani<sup>1</sup>, Matthew Reynolds<sup>2</sup>, David R. Smith<sup>1</sup>

<sup>1</sup>*Duke University, Durham, NC*

<sup>2</sup>*University of Washington, Seattle, WA*

**09:00 C2-3**

**A NOVEL MODEL FOR DIRECTION OF ARRIVAL ESTIMATION USING THE PHASE CENTER CONCEPT**

Evangelos Kornaros\*, Saman Kabiri, Alister Hosseini, Franco De Flaviis

*University of California Irvine, Irvine, CA*

**09:20 C2-4**

**DEVELOPMENT OF A LOW COST COMPACT INTEGRATED STEP FREQUENCY CONTINUOUS WAVE RADAR FOR NON-CONTACT VITAL SIGN DETECTION**

Lingyun Ren\*, Sabikun Nahar, Aly E. Fathy

*Electrical Engineering and Computer Science, University of Tennessee, Knoxville, TN*

**09:40 C2-5**

**INTEGRATING REAL TIME WEATHER RADAR DATA INTO THE CLOUD-HOSTED  
REAL-TIME DATA SERVICES FOR THE GEOSCIENCES (CHORDS) PROJECT**

Ryan Gooch\*<sup>1</sup>, V. Chandrasekar<sup>1</sup>, Mike Daniels<sup>2</sup>

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

<sup>2</sup>*National Center for Atmospheric Research, Boulder, CO*

**10:00 Break**

**10:20 C2-6**

**A FLEXIBLE FPGA DEVELOPMENT ENVIRONMENT FOR THE SWOT ON-BOARD  
RADAR PROCESSOR**

Cody Vaudrin\*, David Hawkins

*Radar Science and Engineering, NASA Jet Propulsion Laboratory, Pasadena, CA*

**10:40 C2-7**

**HUMAN RESPIRATION RATE ESTIMATION USING SFCW RADAR SYSTEM**

Sabikun Nahar\*<sup>1</sup>, Lingyun Ren<sup>1</sup>, Tuan Phan<sup>2</sup>, Ozlem Kilic<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>*Electrical Engineering and Computer Science, The Catholic University of America, Washington, DC*

**11:00 C2-8**

**SYNDICATED TEST BENCH SET-UP FOR TESTING OF REAL-TIME  
RECONFIGURABLE POWER AMPLIFIERS FOR THE NEXT GENERATION RADAR**

Lucilia R. Lamers\*<sup>1</sup>, Zachary Hays<sup>1</sup>, Charles Baylis<sup>1</sup>, Robert Marks<sup>1</sup>, Edward Viveiros<sup>2</sup>,  
John Penn<sup>2</sup>, Abigail Hedden<sup>2</sup>, Ali Darwish<sup>2</sup>

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

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

**11:20 C2-9**

**NASA D3R RADAR UPGRADE: ENHANCING SENSITIVITY AND SPATIAL  
RESOLUTION**

Mohit Kumar\*<sup>1</sup>, Robert M. Beauchamp<sup>1</sup>, Shashank S. Joshil<sup>1</sup>, Manuel Vega<sup>1,2</sup>, V. Chandrasekar<sup>1</sup>

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

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

**Session F5: Microwave Remote Sensing of the Earth and Atmosphere  
Room 150**

Co-Chairs: Chandrasekar V. Chandra, *Colorado State University*;

Kamal Sarabandi, *University of Michigan Ann Arbor*

**08:20 F5-1**

**CLOUD OBSERVATION USING KA-BAND CLOUD RADAR IN CHENGDU PLAIN**

Xuehua Li\*<sup>1</sup>, V. Chandrasekar<sup>2</sup>, Jianxin He<sup>1</sup>, Lin Yang<sup>1</sup>



<sup>1</sup>Electronic Engineering, Chengdu University of Information Technology, Chengdu, Sichuan, CHINA

<sup>2</sup>Electrical and Computer Engineering, Colorado State University, Fort Collins, CO

**08:40 F5-2**

**USING DOPPLER VELOCITY DIFFERENCE FROM 3- AND 35-GHZ VERTICALLY POINTING RADARS TO RETRIEVE VERTICAL AIR MOTION AND RAINDROP SIZE DISTRIBUTIONS**

Christopher R. Williams\*<sup>1,2</sup>, Robert M. Beauchamp<sup>3</sup>, Chandra V. Chandrasekar<sup>3</sup>

<sup>1</sup>Cooperative Institute for Research in Environmental Science (CIRES), University of Colorado Boulder, Boulder, CO

<sup>2</sup>Physical Science Division, NOAA Earth System Research Laboratory, Boulder, CO

<sup>3</sup>Electrical and Computer Engineering, Colorado State University, Fort Collins, CO

**09:00 F5-3**

**A MACHINE LEARNING MODEL FOR RADAR RAINFALL ESTIMATION BASED ON GAUGE OBSERVATIONS**

Haiming Tan\*, V. Chandrasekar, Haonan Chen

Colorado State University, Fort Collins, CO

**09:20 F5-4**

**TESTING RAINFALL RATE ALGORITHMS FOR CSU-CHILL X-BAND RADAR**

Pranav S. Athalye\*<sup>1</sup>, Merhala Thurai<sup>1</sup>, V. N. Bringi<sup>1</sup>, Patrick C. Kennedy<sup>2</sup>, Branislav M. Notaros<sup>1</sup>

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

<sup>2</sup>Atmospheric Science, Colorado State University, Fort Collins, CO

**09:40 F5-5**

**SCATTERING CALCULATIONS FOR ASYMMETRIC RAIN DROPS UNDERGOING MIXED MODE OSCILLATIONS**

Sanja Manic\*, Merhala Thurai, V. N. Bringi, Branislav Notaros

Electrical and Computer Engineering, Colorado State University, Fort Collins, CO

**10:00 Break**

**10:20 F5-6**

**RANGE AMBIGUITY CHARACTERIZATION AND MITIGATION FOR THE NASA D3R**

Shashank S. Joshil\*, Robert M. Beauchamp, V. Chandrasekar

Electrical and Computer Engineering, Colorado State University, Fort Collins, CO

**10:40 F5-7**

**IDENTIFICATION OF SNOW FROM GPM-DPR OBSERVATIONS AND CROSS VALIDATION WITH S-BAND GROUND RADAR DUAL POLARIZATION MEASUREMENTS**

Sounak K. Biswas\*, Minda Le, V. Chandrasekar

Electrical and Computer Engineering, Colorado State University, Fort Collins, CO

**11:00 F5-8**

**SPACE BORNE DUAL FREQUENCY RADAR SIGNATURES OF HAIL AND GRAUPEL**

Karthik Ganesan\*, V. Chandrasekar, Minda Le

*Electrical and Computer Engineering, Colorado State University, Fort Collins, CO*

**11:20 F5-9**

**ANALYSIS OF DDSCAT-BASED PHASE MATRIX SYMMETRY FOR 3-D RADIATIVE TRANSFER MODEL DEVELOPMENT**

Kun Zhang\*, Albin J. Gasiewski

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

**11:40 F5-10**

**L-BAND HIGH RESOLUTION SOIL MOISTURE MAPPING USING A SMALL UNMANNED AERIAL SYSTEM**

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

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

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

**Session G3: New Horizons in Active and Passive Radio Techniques for Geospace Remote Sensing**

**(Special Session)**

**Room 200**

Co-Chairs: Philip Erickson, *MIT Haystack Observatory;*

Julio Urbina, *Pennsylvania State University*

**08:20 G3-1**

**THZ LIMB SOUNDER (TLS) FOR LOWER THERMOSPHERIC WIND, OXYGEN DENSITY, AND TEMPERATURE**

Dong L. Wu<sup>\*1</sup>, Jeng-Hwa Yee<sup>2</sup>, Erich T. Schlecht<sup>3</sup>, Imran Mehdi<sup>3</sup>, Jose V. Siles<sup>3</sup>, Brian J. Drouin<sup>3</sup>

<sup>1</sup>*NASA Goddard Space Flight Center, Greenbelt, MD*

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

<sup>3</sup>*NASA Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA*

**08:40 G3-2**

**STUDIES OF THERMOSPHERIC WAVE ACTIVITY USING DYNASONDE TECHNIQUES: CURRENT STATE AND THE FUTURE**

Nikolay Zabolotin<sup>\*1</sup>, Catalin Negrea<sup>1</sup>, Oleg Godin<sup>2</sup>, Terence Bullett<sup>1</sup>

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

<sup>2</sup>*Naval Postgraduate School, Monterey, CA*

**09:00 G3-3**

**NEW CAPABILITY AT SONDESTROM RADAR: SUB-SECOND AURORAL ELECTRON DENSITY MEASUREMENTS**

Asti Bhatt\*<sup>1</sup>, Juha Vierinen<sup>2</sup>, Joshua Semeter<sup>3</sup>, Michael Hirsch<sup>3</sup>, Mary McCready<sup>1</sup>

<sup>1</sup>*SRI International, Menlo Park, CA*

<sup>2</sup>*University of Tromsø, Tromsø, NORWAY*

<sup>3</sup>*Boston University, Boston, MA*

**09:20 G3-4**

**OPPORTUNITIES FOR POLAR CAP SCIENCE USING COORDINATED RISR-C AND RISR-N EXPERIMENTS**

Roger H. Varney\*<sup>1</sup>, Robert G. Gillies<sup>2</sup>

<sup>1</sup>*Center for Geospace Studies, SRI International, Menlo Park, CA*

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

**09:40 G3-5**

**HIGH-ORDER PARTICLE-IN-CELL SIMULATIONS OF INCOHERENT SCATTER RADAR SPECTRA**

Alex Fletcher\*<sup>1,2</sup>, William Longley<sup>1</sup>, Meers M. Oppenheim<sup>1</sup>

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

<sup>2</sup>*Physics, Massachusetts Institute of Technology, Cambridge, MA*

**10:00 Break**

**10:20 G3-6**

**THE MIT INCOHERENT SCATTER PERFORMANCE SIMULATOR (MIPS)**

Philip J. Erickson\*<sup>1</sup>, Juha Vierinen<sup>2</sup>, Frank D. Lind<sup>1</sup>, Ryan Volz<sup>1</sup>

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

<sup>2</sup>*Physics and Technology, University of Tromsø, Tromsø, NORWAY*

**10:40 G3-7**

**A SYNTHESIS ARRAY FOR RADIO AND RADAR IMAGING OF THE IONOSPHERE**

Brett Isham\*<sup>1</sup>, Terence Bullett<sup>2</sup>, Bjorn Gustavsson<sup>3</sup>, Vasyl Belyey<sup>4</sup>

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

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

<sup>3</sup>*University of Tromsø, Tromsø, NORWAY*

<sup>4</sup>*Pinhole AS, Tromsø, NORWAY*

**11:00 G3-8**

**COVARIANCE ESTIMATION OF POLARIZED SIGNALS WITH APPLICATION TO VECTOR SENSOR IMAGING**

Ryan Volz<sup>1</sup>, Frank C. Robey<sup>2</sup>, Mary Knapp<sup>3</sup>, Frank D. Lind<sup>1</sup>, Philip J. Erickson\*<sup>1</sup>

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

<sup>2</sup>*Lincoln Laboratory, Massachusetts Institute of Technology, Lexington, MA*

<sup>3</sup>*Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, MA*

**11:20 G3-9**

**CALCULATING THE ABSORPTION OF HF RADIO WAVES IN THE IONOSPHERE**

Katherine A. Zawdie\*, Douglas P. Drob, David E. Siskind, Clayton Coker  
*Space Science Division, Naval Research Laboratory, Washington, DC*

**Session HEG2: Lightning and its Interaction with the Ionosphere II  
(Special Session)**

**Room 265**

Co-Chairs: Robert Marshall, *University of Colorado Boulder*;  
Morris Cohen, *Georgia Institute of Technology*;  
Ningyu Liu, *University of New Hampshire*

**10:20 HEG2-1**

**THUNDERSTORM TO IONOSPHERE COUPLING: RECENT RESULTS AND FUTURE DIRECTION**

Erin H. Lay\*

*ISR-2, Los Alamos National Laboratory, Los Alamos, NM*

**10:40 HEG2-2**

**ION DYNAMICS IN LIGHTNING-INDUCED HEATING OF THE LOWER IONOSPHERE**

Daniel A. Kotovsky\*, Robert C. Moore

*University of Florida, Gainesville, FL*

**11:00 HEG2-3**

**LWPC MODELING OF VLF PERTURBATIONS ON OVERLAPPING PROPAGATION PATHS FROM LIGHTNING INDUCED ENERGETIC ELECTRON PRECIPITATION**

C. Renick<sup>1</sup>, M. Golkowski<sup>1</sup>, S. Sarker<sup>1</sup>, M. B. Cohen<sup>2</sup>

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

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

**11:20 HEG2-4**

**LWPC ANALYSIS OF LIGHTNING SFERIC ELF PROPAGATION VELOCITY**

Sandeep R. Sarker\*<sup>1</sup>, Mark Golkowski<sup>1</sup>, Chad Renick<sup>1</sup>, Robert Moore<sup>2</sup>, Neal Dupree<sup>2</sup>

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

<sup>2</sup>*University of Florida, Gainesville, FL*

**Session HG1: Ionospheric Modification  
(Special Session)**

**Room 105**

Co-Chairs: Michael Sulzer, *Arecibo Observatory*;  
Robert Moore, *University of Florida*

**10:20 HG1-1**

**IONOSPHERIC REMOTE SENSING USING BROADBAND SFERICS IN SPACE AND TIME**

Jackson C. McCormick\*, Morris B. Cohen

*Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA*

**10:40 HG1-2**

**IONOSPHERIC FEEDBACK INSTABILITY IN THE IONOSPHERIC ALFVEN  
RESONATOR AT HIGH LATITUDES: MODELING AND OBSERVATIONS**

Beket Tulegenov\*, Anatoly V. Streltsov

*Physical Sciences, Embry-Riddle Aeronautical University, Daytona Beach, FL*

**11:00 HG1-3**

**ARTIFICIAL IONOSPHERIC SCINTILLATION EXCITED DURING ACTIVE  
MODULATION OF THE IONOSPHERE**

Alireza Mahmoudian\*<sup>1</sup>, Wayne A. Scales<sup>2</sup>, Paul A. Bernhardt<sup>3</sup>, K. Papadopoulos<sup>4</sup>, G. Milikh<sup>4</sup>,  
S. Ghader<sup>1</sup>, A. Najmi<sup>4</sup>

<sup>1</sup>*Institute of Geophysics, University of Tehran, Tehran, IRAN*

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

<sup>3</sup>*Plasma Physics, Naval Research Laboratory, Washington, DC*

<sup>4</sup>*Physics and Astronomy, University of Maryland, College Park, MD*

**11:20 HG1-4**

**HF MEASUREMENTS OF THE IONOSPHERE USING THE E-POP RADIO RECEIVER  
INSTRUMENT**

Stanley J. Briczinski\*<sup>1</sup>, Paul A. Bernhardt<sup>1</sup>, Carl A. Siefring<sup>1</sup>, Michael P. Sulzer<sup>2</sup>, Phil Perillat<sup>2</sup>,  
Eframir Franco<sup>2</sup>, Andrew Yau<sup>3</sup>, Andrew Howarth<sup>3</sup>, H. Gordon James<sup>3</sup>

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

<sup>2</sup>*Arecibo Observatory, Arecibo, PR*

<sup>3</sup>*University of Calgary, Calgary, CANADA*

**Session J5: New Telescopes, Techniques and Technology III  
(Special Session)**

**Math 100**

Co-Chairs: David DeBoer, *University of California Berkeley*;  
Jeffery Mangum, *National Radio Astronomy Observatory*

**08:20 J5-1**

**SPHERICAL HARMONIC POWER SPECTRA AND THE LIGHT CONE PROBLEM IN  
INTENSITY MAPPING SURVEYS**

Adrian Liu\*

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

**08:40 J5-2**

**PRECISION SIMULATIONS OF COSMIC DAWN EXPERIMENTS**

Adam E. Lanman\*

*Physics, Brown University, Providence, RI*

**09:00 J5-3**

## INVESTIGATION ON IMPROVEMENT OF RADIO INTERFEROMETRY CALIBRATION USING REDUNDANT CALIBRATION ALONG WITH SKY MODEL CALIBRATION

Wenyang Li\*, Jonathan C. Pober

*Physics, Brown University, Providence, RI*

### 09:20 J5-4

#### THE BREAKTHROUGH LISTEN SETI PROGRAM

Dan Werthimer\*<sup>1</sup>, David Anderson<sup>1</sup>, Jeff Cobb<sup>1</sup>, Steve Croft<sup>1</sup>, David DeBoer<sup>1</sup>, Jamie Drew<sup>2</sup>, J. Emilio Enriquez<sup>1</sup>, Daniel Farias<sup>1</sup>, Vishal Gajjar<sup>1</sup>, Greg Hellbourg<sup>1</sup>, Jack Hickish<sup>1</sup>, Barb Hoversten<sup>1</sup>, Howard Isaacson<sup>1</sup>, Pete Klupar<sup>2</sup>, Eric Korpela<sup>1</sup>, Matt Lebofsky<sup>1</sup>, David MacMahon<sup>1</sup>, Danny Price<sup>1</sup>, Chris Schodt<sup>1</sup>, Isaac Shivvers<sup>1</sup>, Pete Worden<sup>2</sup>

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

<sup>2</sup>*Breakthrough Prize Foundation, Moffett Field, CA*

### 09:40 J5-5

#### A SYMBIOTIC BEAMFORMING APPROACH FOR IMPROVED ASTRONOMICAL SURVEYS

Greg Hellbourg\*

*University of California Berkeley, Berkeley, CA*

### 10:00 Break

### 10:20 J5-6

#### AN L-BAND CRYOGENIC PHASED ARRAY FOR THE GREEN BANK TELESCOPE: INSTRUMENTATION UPGRADES AND EXPANDED FIELD-OF-VIEW

William Shillue\*<sup>1</sup>, Damodaran A. Roshi<sup>1</sup>, J R. Fisher<sup>1</sup>, Matthew A. Morgan<sup>1</sup>, Jason Castro<sup>1</sup>, Wavley Groves<sup>1</sup>, Tod Boyd<sup>1</sup>, Richard Prestage<sup>2</sup>, Steven White<sup>2</sup>, Robert Simon<sup>2</sup>, Vereese Van Tonder<sup>2</sup>, J D. Nelson<sup>2</sup>, Jason Ray<sup>2</sup>, Thomas Chamberlain<sup>2</sup>, Karl F. Warnick<sup>3</sup>, Brian Jeffs<sup>3</sup>

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

<sup>2</sup>*Green Bank Observatory, Green Bank, WV*

<sup>3</sup>*Brigham Young University, Provo, UT*

### 10:40 J5-7

#### ULTRA LOW NOISE S-BAND LNA FOR DEEP SPACE COMMUNICATION

Andrew Janzen\*

*NASA Jet Propulsion Laboratory, Pasadena, CA*

### 11:00 J5-8

#### AUTOMATED RADIO ASTRONOMY OBSERVATIONS WITH THE NASA DEEP SPACE NETWORK

Thomas B. H. Kuiper\*<sup>1</sup>, Charles J. Naudet<sup>1</sup>, Cristina Garcia Miro<sup>2</sup>, Shinji Horiuchi<sup>3</sup>, Steven R. Levee<sup>1</sup>, Danny Luong<sup>1</sup>, George Q. Wang<sup>1</sup>

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

<sup>2</sup>*Instituto Nacional de Tecnica Aeroespacial, Ingenier a de Sistemas para la Defensa de Espana, Madrid, SPAIN*

<sup>3</sup>Canberra Deep Space Communications Complex, Commonwealth Scientific and Industrial Research Organization, Canberra, AUSTRALIA

**11:20 J5-9**

**THE STATUS OF THE FIVE-HUNDRED-METER APERTURE SPHERICAL RADIO TELESCOPE**

Di Li\*, Youling Yue

*National Astronomical Observatory China, Beijing, CHINA*

**Session K2: Human Body Interactions with Antennas and Other Electromagnetic Devices**

**Room 155**

Co-Chairs: Majid Manteghi, *Virginia Tech*;

Erdem Topsakal, *Virginia Commonwealth University*

**08:20 K2-1**

**MINIATURIZED ANTENNA SYSTEM DESIGNS AND CHARACTERIZATIONS FOR WIRELESS AND FULLY-PASSIVE BRAIN-MACHINE INTERFACE**

Lingnan Song\*, Yahya Rahmat-Samii

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

**08:40 K2-2**

**INVESTIGATION OF CREEPING WAVE PROPAGATIONS AROUND THE HUMAN HEAD AND NECK AT ISM FREQUENCY BANDS**

Drew G. Bresnahan\*, Yang Li

*Electrical and Computer Engineering, Baylor University, Waco, TX*

**09:00 K2-3**

**CLASSIFICATION OF FINGER MOVEMENTS USING REFLECTION COEFFICIENT VARIATIONS OF A BODY-WORN ELECTRICALLY SMALL ANTENNA**

Bin Xu\*<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*

**09:20 K2-4**

**UNINTENTIONAL RF ENERGY TRANSFER DURING ENDOSCOPY**

Satheesh Bojja Venkatakrishnan\*<sup>1</sup>, Edward L. Jones<sup>2</sup>, Asimina Kiourti<sup>1</sup>

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

<sup>2</sup>*Surgery, University of Colorado, Denver, CO*

**09:40 K2-5**

**NEW INSIGHT INTO ELECTROMAGNETIC FIELD ENHANCED MAGNETIC ISOTOPE AND NUCLEAR SPIN EFFECTS ON BIOLOGICAL SYSTEMS**

Yanyu Xiong\*

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

**10:00 Break**

**10:20 K2-6**

**MAGNETIC INDUCTION COMMUNICATIONS FOR WIRELESS BODY AREA NETWORK**

Negar Golestani\*, Mahta Moghaddam

*Ming Hsieh Department of Electrical Engineering, University of Southern California, Los Angeles, CA*

**10:40 K2-7**

**NEAR-FIELD 1.4 GHZ PROBES FOR POWER DELIVERY TO DEEP TISSUE LAYERS**

Parisa Momenroodaki<sup>1</sup>, Mojtaba Fallahpour<sup>2</sup>, Zoya Popovic<sup>1</sup>

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

<sup>2</sup>*Stanford University, Palo Alto, CA*

**11:00 K2-8**

**SIMULATION OF DYNAMIC LOWER-BODY ELECTROMAGNETIC WAVE PROPAGATION WITH EXPERIMENTAL VERIFICATION**

George Lee\*, Brian Garner, Yang Li

*Electrical and Computer Engineering, Baylor University, Waco, TX*

**11:20 K2-9**

**MICROWAVE ABSORPTION IN THE BRAIN AT 5G USING REALISTIC COMPUTATIONAL AND IN VITRO HEAD MODELS**

Roxanne Jassawalla\*, Erdem Topsakal

*Electrical and Computer Engineering, Virginia Commonwealth University, Richmond, VA*

## **FRIDAY AFTERNOON, 6 January 2017**

**Session B16: Microstrip Antennas and Printed Devices**

**Room 1B40**

Co-Chairs: Erdem Topsakal, *Virginia Commonwealth University*;

Ozlem Kilic, *The Catholic University of America*

**13:20 B16-1**

**SIMULATION AND FABRICATION OF A RECTIFIER ANTENNA AT THE PROPOSED 5G BAND**

Panagiotis Efthymakis\*, Afroditi V. Filippas, Erdem Topsakal

*Electrical and Computer Engineering, Virginia Commonwealth University, Richmond, VA*

**13:40 B16-2**

**LOW COST MULTI-LAYERED ARRAY DESIGN FOR MM-WAVE COMMUNICATIONS**

Varittha Sanphuang, Brock J. DeLong\*, Markus Novak, Elias A. Alwan, John L. Volakis

*Electrical and Computer Engineering, The Ohio State University, Columbus, OH*



**14:00 B16-3**

**DESIGN OF A MICROSTRIP PATCH ANTENNA FOR MICROWAVE SENSING OF PETROLEUM PRODUCTION LINES**

Ali Foudazi\*, Kristen M. Donnell

*Electrical and Computer Engineering, Missouri University of Science and Technology, Applied Microwave Nondestructive Testing Laboratory (AMNTL), Rolla, MO*

**14:20 B16-4**

**CONCEPTUAL 3600 SCANNING BEAMFORMER DESIGN FOR MASSIVE MIMO SYSTEM**

Tuan M. Nguyen\*, Ozlem Kilic

*Electrical Engineering and Computer Science, The Catholic University of America, Washington, DC*

**14:40 B16-5**

**INVESTIGATIONS OF WIDEBAND CIRCULAR POLARIZED HIGH GAIN MICROSTRIP PATCH ARRAY ANTENNA AT KU-BAND ON CURVED SURFACES**

Roshin Rose George\*, Alejandro T. Castro, Satish K. Sharma

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

**15:00 Break**

**15:20 B16-6**

**A COMPACT MICROSTRIP ROTMAN LENS DESIGN**

Toan K. Vo Dai\*, Tuan Nguyen, Ozlem Kilic

*The Catholic University of America, Washington, DC*

**15:40 B16-7**

**3D PRINTED ANTENNAS USING CONDUCTIVE FILAMENTS**

Umar Hasni\*, Ryan B. Green, Afroditi V. Filippas, Erdem Topsakal

*Virginia Commonwealth University, Richmond, VA*

**16:00 B16-8**

**SIGNAL INTERFERENCE-BASED BANDPASS FILTERS WITH FREQUENCY RECONFIGURABLE IN-BAND REJECTION BANDS**

Dimitra Psychogiou<sup>1</sup>, Roberto Gómez-García<sup>2</sup>, Dimitrios Peroulis<sup>3</sup>

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

<sup>2</sup>*Dpt. Signal Theory & Commun., University of Alcalá, Alcalá de Henares, Madrid, SPAIN*

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

**16:20 B16-9**

**OPTICALLY TRANSPARENT ANTENNA FOR 5G COMMUNICATION**

Ryan B. Green\*, M.d. B. Ullah, Vitaliy Avrutin, Umit Ozgur, Hadis Morkoc, Erdem Topsakal

*Electrical and Computer Engineering, Virginia Commonwealth University, Richmond, VA*

**Session B17: Numerical Methods**

**Room 200**

Co-Chairs: Atef Elsherbeni, *Colorado School of Mines*;  
Melinda Piket-May, *University of Colorado Boulder*

**15:20 B17-1**

**FAST SIMULATION OF MEASUREMENT-WHILE-DRILLING ELECTROMAGNETIC  
TELEMETRY USING THIN WIRE KERNEL AND LAYERED MEDIUM GREEN'S  
FUNCTION**

Shubin Zeng\*, Dawei Li, Donald R. Wilton, Jiefu Chen

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

**15:40 B17-2**

**NULL-FIELD GENERATION METHOD APPLIED TO DOUBLE-HIGHER-ORDER  
METHOD OF MOMENTS SOLVER**

Nabeel N. Moin\*, Branislav M. Notaros

*Electrical and Computer Engineering, Colorado State University, Fort Collins, CO*

**16:00 B17-3**

**ENHANCEMENT OF HIGHER ORDER FDTD METHOD USING OPENCL, CUDA, AND  
MPI ON SINGLE AND MULTIPLE CPUS/GPUS**

Alec Weiss\*<sup>1</sup>, Sanjay DMello<sup>1</sup>, Ashik Akbar Basha<sup>1</sup>, Atef Z. Elsherbeni<sup>2</sup>, Melinda J. Piket-May<sup>1</sup>,  
Mohammed F. Hadi<sup>1,2,3</sup>

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

<sup>2</sup>*Electrical Engineering and Computer Science, Colorado School of Mines, Golden, CO*

<sup>3</sup>*Electrical Engineering, Kuwait University, Kuwait, KUWAIT*

**16:20 B17-4**

**OGIVE MODELING WITH CONFORMAL STANDARD AND HIGHER-ORDER FDTD**

Ravi C. Bollimuntha<sup>1</sup>, Joseph Diener\*<sup>2</sup>, Mohammed F. Hadi<sup>1,2,3</sup>, Melinda J. Piket-May<sup>1</sup>,  
Atef Z. Elsherbeni<sup>2</sup>

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

<sup>2</sup>*Electrical Engineering and Computer Science, Colorado School of Mines, Golden, CO*

<sup>3</sup>*Kuwait University, Kuwait, KUWAIT*

**16:40 B17-5**

**TOWARDS A REAL-TIME SOLUTION OF EXTREME-SCALE ELECTROMAGNETIC  
PROBLEMS**

Brian MacKie-Mason\*, Zhen Peng

*Electrical and Computer Engineering, University of New Mexico, Albuquerque, NM*

**17:00 B17-6**

**A COMPARISON OF INTEGRATION SCHEMES FOR SOMMERFELD INTEGRAL  
EVALUATION IN THE HALF-SPACE PROBLEM**

Dawei Li\*, Donald R. Wilton, David R. Jackson, Ji Chen

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

**Session B18: Advanced Modeling of EM Propagation  
(Special Session)**

**Room 105**

Co-Chairs: Jamesina Simpson, *University of Utah*;  
Robert Marshall, *University of Colorado Boulder*

**15:20 B18-1**

**TECHNIQUES AND APPLICATIONS OF VLF PROPAGATION MODELING**

Steven A. Cummer\*, Bogdan Popa, Joel Weinert

*Duke University, Durham, NC*

**15:40 B18-2**

**MODELING VLF TRANSMITTER AMPLITUDE AND PHASE VARIATIONS IN THE  
EARTH-IONOSPHERE WAVEGUIDE**

Robert A. Marshall\*<sup>1</sup>, Thomas Wallace<sup>2</sup>, Michael Turbe<sup>3</sup>

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

<sup>2</sup>*Vesperix Corporation, Arlington, VA*

<sup>3</sup>*Leidos Incorporated, Huntsville, AL*

**16:00 B18-3**

**THREE-DIMENSIONAL FORWARD MODELING OF LIGHTNING-INDUCED ELECTRON  
PRECIPITATION FROM THE RADIATION BELTS**

Austin P. Sousa\*<sup>1</sup>, Robert A. Marshall<sup>2</sup>

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

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

**16:20 B18-4**

**MODELING ELECTROMAGNETIC WAVE PROPAGATION IN SPACE PLASMA**

Lunjin Chen\*

*Physics, Center for Space Sciences, The University of Texas at Dallas, Richardson, TX*

**16:40 B18-5**

**MODELING OF ULTRA-LOW-FREQUENCY WAVES IN EARTH'S MAGNETOSPHERE**

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

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

<sup>2</sup>*Mathematical and Physical Sciences, University of Newcastle, Callaghan, New South Wales,  
AUSTRALIA*

**17:00 B18-6**

**GLOBAL FDTD MODELING OF ULF SCATTERINGS FROM SUBMERGED OBJECTS**

Sean Burns\*<sup>1</sup>, Alireza Samimi<sup>2</sup>, Jamesina Simpson<sup>1</sup>

<sup>1</sup>*University of Utah, Salt Lake City, UT*

<sup>2</sup>*Nanometrics, Milpitas, CA*

**Session F6: Atmospheric Effects and EM Propagation during the  
CASPER Field Campaign  
(Special Session)**

**Room 150**

Co-Chairs: Qing Wang, *Naval Postgraduate School*;  
Katherine Horgan, *Naval Surface Warfare Center Dahlgren Division*

**13:20 F6-1**

**CASPER SCIENCE OBJECTIVES REVIEW AND MONIN-OBUKHOV SIMILARITY FOR  
EVAPORATIVE DUCT CHARACTERIZATIONS**

Qing Wang\*<sup>1</sup>, Robin C. Cherrett<sup>2</sup>, Denny P. Alappattu<sup>1,3</sup>, Kyle B. Franklin<sup>1</sup>,  
Ryan T. Yamaguchi<sup>1</sup>, Richard J. Lind<sup>1</sup>, John A. Kalogiros<sup>4</sup>

<sup>1</sup>*Naval Postgraduate School, Monterey, CA*

<sup>2</sup>*Meteorology and Oceanography, US Navy*

<sup>3</sup>*Moss Landing Marine Laboratory, Moss Landing, CA*

<sup>4</sup>*National Observatory of Athens, Athens, GREECE*

**13:40 F6-2**

**OBSERVATIONS OF INTERNAL MARINE ATMOSPHERIC BOUNDARY LAYER  
DEVELOPMENT DURING THE CASPER EAST CAMPAIGN**

Adam J. Christman\*<sup>1</sup>, H. J. S. Fernando<sup>1</sup>, Raghavendra Krishnamurthy<sup>1</sup>, David Grober<sup>2</sup>,  
Chris Hocut<sup>3</sup>, Ed Creegan<sup>3</sup>, Qing Wang<sup>4</sup>

<sup>1</sup>*University of Notre Dame, Notre Dame, IN*

<sup>2</sup>*Motion Picture Marine-Perfect Horizon Stabilization, Marina del Rey, CA*

<sup>3</sup>*U.S. Army Research Laboratory, White Sands, NM*

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

**14:00 F6-3**

**CHARACTERIZATION OF THE ENVIRONMENT ALONG AN X-BAND PROPAGATION  
PATH USING THE CONTROLLED TOWED VEHICLE (CTV) DURING CASPER-EAST**

Djamal Khelif\*<sup>1</sup>, Robert J. Burkholder<sup>2</sup>, Caglar Yardim<sup>2</sup>, Qing Wang<sup>3</sup>

<sup>1</sup>*Mechanical & Aerospace Engineering, University of California Irvine, Irvine, CA*

<sup>2</sup>*Electrical and Computer Engineering, The Ohio State University, Columbus, OH*

<sup>3</sup>*Meteorology, Naval Postgraduate School, Monterey, CA*

**14:20 F6-4**

**VARIABILITY OF EVAPORATION DUCT PROPERTIES OBSERVED IN A COASTAL  
ENVIRONMENT DURING CASPER**

Denny P. Alappattu\*<sup>1,2</sup>, Qing Wang<sup>1</sup>, John Kalogiros<sup>3</sup>

<sup>1</sup>*Meteorology, Naval Postgraduate School, Monterey, CA*

<sup>2</sup>*Moss Landing Marine Laboratories, Moss Landing, CA*

<sup>3</sup>*National Observatory of Athens, Athens, Greece, GREECE*

**14:40 F6-5**

## EVAPORATION DUCT HEIGHT ESTIMATION FROM UWB LOWER ATMOSPHERIC PROPAGATION (LATPROP) MEASUREMENT SYSTEM

Luyao Xu\*<sup>1</sup>, Caglar Yardim<sup>1</sup>, Swagato Mukherjee<sup>1</sup>, Robert J. Burkholder<sup>1</sup>, Jon Pozderac<sup>1</sup>, Adam Christman<sup>2</sup>, Harindra Fernando<sup>2</sup>, Qing Wang<sup>3</sup>, Edward Creegan<sup>4</sup>

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

<sup>2</sup>*University of Notre Dame, Notre Dame, IN*

<sup>3</sup>*Naval Postgraduate School, Monterey, CA*

<sup>4</sup>*Army Research Laboratory, White Sands Missile Range, NM*

### 15:00 Break

### 15:20 F6-6

## EVAPORATION DUCT HEIGHT COMPARISONS FROM X-BAND EM PROPAGATION MEASUREMENTS OF THE CASPER CAMPAIGN AND NAVSLAM PREDICTIONS

Qi Wang\*<sup>1</sup>, Robert J. Burkholder<sup>1</sup>, Luyao Xu<sup>1</sup>, Jon Pozderac<sup>1</sup>, Swagato Mukherjee<sup>1</sup>, Caglar Yardim<sup>1</sup>, Adam Christman<sup>2</sup>, Harindra J. Fernando<sup>2</sup>, Qing Wang<sup>3</sup>, Edward Creegan<sup>4</sup>

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

<sup>2</sup>*University of Notre Dame, Notre Dame, IN*

<sup>3</sup>*Naval Postgraduate School, Monterey, CA*

<sup>4</sup>*Army Research Laboratory, White Sands Missile Range, NM*

### 15:40 F6-7

## NUMERICAL MODELING OF SHIP MOTION AND SEA SURFACE ROUGHNESS EFFECTS ON X-BAND EM PROPAGATION MEASUREMENTS OF THE CASPER CAMPAIGNS

Qi Wang\*, Robert Burkholder, Caglar Yardim, Jon Pozderac

*Electrical and Computer Engineering, The Ohio State University, Columbus, OH*

### 16:00 F6-8

## EO/IR, RF AND MM-WAVE PROPAGATION MEASUREMENTS IN THE MARINE ATMOSPHERIC SURFACE LAYER DURING THE CASPER ENVIRONMENT

Thomas R. Hanley\*<sup>1</sup>, Marc B. Airola<sup>1</sup>, Andrea M. Brown<sup>1</sup>, David M. Brown<sup>1</sup>, Benjamin J. Drewry<sup>1</sup>, Jonathan Z. Gehman<sup>1</sup>, Richard M. Giannola<sup>1</sup>, Randall T. Hanna<sup>1</sup>, Ian M. Hughes<sup>1</sup>, Amit V. Itagi<sup>1</sup>, Jessica K. Makowski<sup>1</sup>, Michael E. Thomas<sup>1</sup>, Qing Wang<sup>2</sup>, Adam H. Willitsford<sup>1</sup>, Nathaniel S. Winstead<sup>1</sup>

<sup>1</sup>*Johns Hopkins University Applied Physics Lab, Laurel, MD*

<sup>2</sup>*Naval Postgraduate School, Monterey, CA*

### 16:20 F6-9

## MEASUREMENTS OF ATMOSPHERIC TURBULENT REFRACTIVITY IN COASTAL ZONE AND MICROWAVE PROPAGATION

Frank Ryan\*<sup>1</sup>, Steven Russell<sup>2</sup>

<sup>1</sup>*Applied Technology, Inc., San Diego, CA*

<sup>2</sup>*CODE 331, Office of Naval Research, Arlington, VA*

**16:40 F6-10**

**APPLYING REFRACTIVITY FROM RADIO (RFR) INVERSIONS TO ENHANCE LOCAL NWP SIMULATIONS DURING THE CASPER EAST MEASUREMENT CAMPAIGN**

Edward Bertot\*<sup>1</sup>, Hank Owen<sup>2</sup>, Ted Rogers<sup>1</sup>

<sup>1</sup>*Atmospheric Propagation, SSC Pacific, San Diego, CA*

<sup>2</sup>*HS Owen LLC, Medford, NJ*

**17:00 F6-11**

**DUCTING CONDITIONS ASSOCIATED WITH OFFSHORE FLOW AND MARITIME AIR INTERACTIONS DURING CASPER EAST FIELD CAMPAIGN**

Marcela Ulate\*<sup>1</sup>, Qing Wang<sup>1</sup>, Tracy Haack<sup>2</sup>, Teddy Holt<sup>2</sup>

<sup>1</sup>*Naval Postgraduate School, Monterey, CA*

<sup>2</sup>*Naval Research Laboratory, Monterey, CA*

**Session GH2: Meteors, Orbital Debris and Dusty Plasmas II  
(Special Session)**

**Room 200**

Co-Chairs: Eric Gillman, *Naval Research Laboratory*;

Julio Urbina, *Pennsylvania State University*;

Edward Thomas, *Auburn University*

**13:20 GH2-1**

**RECENT ADVANCES IN EXPLORING IONOSPHERIC DUSTY PLASMAS USING GROUND BASED HIGH POWER HIGH FREQUENCY (HF) RADIO WAVE HEATING**

Wayne Scales\*

*Electrical and Computer Engineering, Virginia Tech, Blacksburg, VA*

**13:40 GH2-2**

**ON DUST CHARGING PROCESS ASSOCIATED WITH METEORIC SMOKE PARTICLES (MSP) IN THE MESOSPHERE**

Alireza Mahmoudian\*<sup>1</sup>, W.a. Scales<sup>2</sup>, M. Kosch<sup>3,4</sup>, A. Senior<sup>4</sup>, A. Mohebalhojeh<sup>1</sup>, M. Farahani<sup>1</sup>, S. Ghader<sup>1</sup>

<sup>1</sup>*Institute of Geophysics, University of Tehran, Tehran, IRAN*

<sup>2</sup>*Virginia Tech, Blacksburg, VA*

<sup>3</sup>*South African National Space Agency, Hermanus, SOUTH AFRICA*

<sup>4</sup>*Physics, Lancaster University, Lancaster, UNITED KINGDOM*

**14:00 GH2-3**

**DUSTY PLASMA MICROPARTICLE CONTROL AND RAPID EXPANSION IN A MAGNETIZED GLOW DISCHARGE**

Eric D. Gillman\*, W E. Amatucci

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

**14:20 GH2-4**

**PROBE-INDUCED DUST VOIDS IN THE MAGNETIZED DUSTY PLASMA EXPERIMENT (MDPX)**

Spencer LeBlanc\*, Edward Thomas  
*Auburn University, Auburn, AL*

**14:40 GH2-5**

**GROUND AND ISS APPLICATIONS OF PARTICLE IMAGE VELOCIMETRY DIAGNOSTICS FOR THE PK-4 AND PLASMALAB/EKOPLASMA MICROGRAVITY COMPLEX PLASMA EXPERIMENTS**

Edward Thomas\*<sup>1</sup>, Taylor Hall<sup>1</sup>, Jeremiah Williams<sup>2</sup>, Uwe Konopka<sup>1</sup>, Tetyana Antonova<sup>3</sup>, Christina Knapek<sup>3</sup>, Mikhail Pustyl'nik<sup>3</sup>, Hubertus Thomas<sup>3</sup>

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

<sup>2</sup>*Physics, Wittenberg University, Springfield, OH*

<sup>3</sup>*Complex Plasma Division, Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Oberpfaffenhofen, GERMANY*

**Session H5: Waves in Outer Solar System Plasmas  
(Special Session)**

**Room 265**

Co-Chairs: William Kurth, *University of Iowa*;  
George Hospodarsky, *University of Iowa*

**13:20 H5-1**

**PLASMA WAVES AT MARS: MAVEN OBSERVATIONS**

Suranga Ruhunusiri\*<sup>1</sup>, Jasper S. Halekas<sup>1</sup>, Yuki Harada<sup>2</sup>, Gina A. DiBraccio<sup>3</sup>, Norberto Romanelli<sup>4,5</sup>, Jared R. Espley<sup>3</sup>, Laila Andersson<sup>6</sup>, Christian Mazelle<sup>4,5</sup>, David A. Brain<sup>6</sup>, David L. Mitchell<sup>2</sup>, Bruce M. Jakosky<sup>6</sup>

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

<sup>2</sup>*Space Sciences Laboratory, University of California Berkeley, Berkeley, CA*

<sup>3</sup>*Solar System Exploration Division, NASA Goddard Space Flight Center, Greenbelt, MD*

<sup>4</sup>*CNRS, IRAP, Toulouse, FRANCE*

<sup>5</sup>*University Paul Sabatier, Toulouse, FRANCE*

<sup>6</sup>*Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, CO*

**13:40 H5-2**

**FIRST OBSERVATIONS NEAR JUPITER BY THE JUNO WAVES INVESTIGATION**

William S. Kurth\*<sup>1</sup>, Masafumi Imai<sup>1</sup>, George B. Hospodarsky<sup>1</sup>, Donald A. Gurnett<sup>1</sup>, Sadie S. Tetrick<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>*NASA Jet Propulsion Laboratory, Pasadena, CA*

**14:00 H5-3**



## LANGMUIR WAVES DETECTED BY THE JUNO WAVES INSTRUMENT UPSTREAM OF THE JOVIAN BOW SHOCK

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

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

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

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

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

### 14:20 H5-4

## JUPITER'S DECAMETRIC RADIATION OBSERVED BY JUNO 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>, Laurent Lamy<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>*NASA 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*

### 14:40 H5-5

## AN INVESTIGATION OF WHISTLER-MODE AURORAL HISS AT JUPITER USING THE JUNO SPACECRAFT

Sadie S. Tetrick\*<sup>1</sup>, William S. Kurth<sup>1</sup>, Masafumi Imai<sup>1</sup>, George B. Hospodarsky<sup>1</sup>, Donald A. Gurnett<sup>1</sup>, Scott J. Bolton<sup>2</sup>, John E. P. Connerney<sup>3</sup>, Steven M. Levin<sup>4</sup>, Barry H. Mauk<sup>5</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>*NASA Jet Propulsion Laboratory, Pasadena, CA*

<sup>5</sup>*Johns Hopkins University Applied Physics Laboratory, Laurel, MD*

### 15:00 Break

### 15:20 H5-6

## ELECTRON AND PROTON WHISTLERS DETECTED AT JUPITER BY THE JUNO SPACECRAFT

D. A. Gurnett\*<sup>1</sup>, W. S. Kurth<sup>1</sup>, G. B. Hospodarsky<sup>1</sup>, S. J. Bolton<sup>2</sup>, J. E. P. Connerney<sup>3</sup>, S. 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>*NASA Jet Propulsion Laboratory, Pasadena, CA*

### 15:40 H5-7



## AN OVERVIEW OF SATURN RADIO EMISSIONS

Shengyi Ye\*<sup>1</sup>, William S. Kurth<sup>1</sup>, Georg Fischer<sup>2</sup>, John D. Menietti<sup>1</sup>, Donald A. Gurnett<sup>1</sup>

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

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

### **Session J6: Observatory Reports and Lessons Learned (Special Session)**

#### **Math 100**

Co-Chairs: David DeBoer, *University of California Berkeley*;

Jeffery Mangum, *National Radio Astronomy Observatory*

#### **13:20 J6-1**

### **OWENS VALLEY RADIO OBSERVATORY SITE REPORT**

James W. Lamb\*

*California Institute of Technology, Big Pine, CA*

#### **13:40 J6-2**

### **THE GREEN BANK TELESCOPE: A STATUS UPDATE**

Richard M. Prestage\*, Robert Anderson, Joseph Brandt, Dennis Egan, Felix J. Lockman,  
Randy McCullough, Mark Whitehead

*Green Bank Observatory, Green Bank, WV*

#### **14:00 J6-3**

### **EXTREMELY LOW-NOISE CRYOGENIC AMPLIFIERS FOR RADIO ASTRONOMY: PAST, PRESENT AND FUTURE**

Marian W. Pospieszalski\*

*Central Development Laboratory, National Radio Astronomy Observatory, Charlottesville, VA*

### **Session J7: Planetary Remote Sensing (Special Session)**

#### **Math 100**

Co-Chairs: Bryan Butler, *National Radio Astronomy Observatory*;

Peter Williams, *Harvard University*

#### **15:20 J7-1**

### **EARLY OBSERVATIONS OF JUPITER WITH JUNO'S MICROWAVE RADIOMETER**

Michael A. Janssen\*<sup>1</sup>, Scott J. Bolton<sup>2</sup>, Steven M. Levin<sup>1</sup>, Virgil Adumitroaie<sup>1</sup>,  
Michael D. Allison<sup>3</sup>, John K. Arballo<sup>1</sup>, Sushil K. Atreya<sup>4</sup>, Amadeo Bellotti<sup>5</sup>, Shannon T. Brown<sup>1</sup>,  
Andrew P. Ingersoll<sup>6</sup>, Laura A. Jewell<sup>1</sup>, Cheng Li<sup>1</sup>, Liming Li<sup>7</sup>, Jonathan I. Lunine<sup>8</sup>,  
Sidharth Misra<sup>1</sup>, Glenn S. Orton<sup>1</sup>, Maarten Roos<sup>4</sup>, Daniel Santos-Costa<sup>2</sup>, Edwin Sarkissian<sup>1</sup>,  
Paul G. Steffes<sup>5</sup>, Ross Williamson<sup>1</sup>

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

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

<sup>3</sup>*Goddard Institute of Space Studies, New York, NY*

<sup>4</sup>*University of Michigan, Ann Arbor, MI*

<sup>5</sup>*Georgia Institute of Technology, Atlanta, GA*

<sup>6</sup>*California Institute of Technology, Pasadena, CA*

<sup>7</sup>*University of Texas, Houston, TX*

<sup>8</sup>*Cornell University, Ithaca, NY*

**16:00 J7-2**

**USE OF THE JUNO MICROWAVE RADIOMETER (MWR) IN THE STUDY OF JOVIAN ATMOSPHERIC COMPOSITION, STRUCTURE, AND DYNAMICS**

Amadeo Bellotti\*<sup>1</sup>, Paul G. Steffes<sup>1</sup>, Michael A. Janssen<sup>2</sup>, Steven M. Levin<sup>2</sup>, Samuel Gulkis<sup>2</sup>

<sup>1</sup>*Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA*

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

**16:20 J7-3**

**INVESTIGATING AMMONIA GAS IN THE JOVIAN ATMOSPHERE USING CENTIMETER WAVELENGTH TOTAL FLUX**

Ramsey L. Karim\*<sup>1</sup>, David DeBoer<sup>1</sup>, Imke de Pater<sup>1</sup>, Garrett Keating<sup>2</sup>

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

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

**16:40 J7-4**

**IMPROVING THE PLANETARY EPHEMERIS WITH VLBA ASTROMETRY: TRANSITIONING FROM CASSINI TO JUNO**

Dayton Jones\*<sup>1</sup>, William Folkner<sup>2</sup>, Robert Jacobson<sup>2</sup>, Christopher Jacobs<sup>2</sup>, Jonathan Romney<sup>3</sup>, Vivek Dhawan<sup>3</sup>, Edward Fomalont<sup>4</sup>

<sup>1</sup>*Space Science Institute, Boulder, CO*

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

<sup>3</sup>*National Radio Astronomy Observatory, Socorro, NM*

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

**17:00 J7-5**

**OBSERVATIONS OF SOLAR SYSTEM BODIES WITH THE VLA AND ALMA**

Bryan Butler\*

*National Radio Astronomy Observatory, Socorro, NM*

**17:20 J7-6**

**INVESTIGATING THE ICE SHELL AND BURIED OCEAN ON EUROPA WITH THE SCHUMANN RESONANCE**

Thomas Marshall Eubanks\*

*Asteroid Initiatives LLC, Clifton, VA*

**Session K3: Electromagnetics and Thermal Therapy: Advances in Treatment Planning (Special Session)**

**Room 155**

Co-Chairs: John Stang, *University of Southern California;*

Michael Fromandi, *University of Colorado Boulder*

**13:20 K3-1**

**MULTI-FUNCTIONAL PHOTOACOUSTIC IMAGING OF TUMOR ENVIRONMENT IN THERMOTHERAPY**

Junjie Yao\*

*Biomedical Engineering, Duke University, Durham, NC*

**13:40 K3-2**

**ESTIMATION OF TEMPERATURE INCREASE FOR PASSIVE IMPLANTS UNDERGOING MRI PROCEDURE**

Anirudh S. Annavajhala, Ran Guo\*

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

**14:00 K3-3**

**RFI MITIGATION IN MICROWAVE RADIOMETERS FOR INTERNAL BODY THERMOMETRY VIA ADAPTIVE FILTERING**

Michael Fromandi\*, Parisa Momenroodaki, Zoya Popovic

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

**14:20 K3-4**

**RECENT ADVANCES IN REAL-TIME MICROWAVE IMAGING FOR THERMAL THERAPY MONITORING**

John Stang\*, Guanbo Chen, Mahta Moghaddam

*University of Southern California, Los Angeles, CA*

**14:40 K3-5**

**THE HEALTH RISK FOR PHYSICIANS PERFORMING MICROWAVE ABLATION FOR LIVER CANCER TREATMENT**

Angelica M. Sunga\*, Umar Hasni, Erdem Topsakal

*Electrical and Computer Engineering, Virginia Commonwealth University, Richmond, VA*

**SATURDAY MORNING, 7 January 2017**

**08:00 – 11:00 USNC-URSI Executive Council Breakfast Meeting, Marriott Hotel**