USNC–URSI National Radio Science Meeting

The National Academies of
SCIENCES · ENGINEERING · MEDICINE

4-7 January 2017
Boulder, Colorado, USA

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

www.nrsmboulder.org
### 2017 USNC-URSI National Radio Science Meeting

#### Meeting Overview: Technical Program and Commission Business Meetings

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<tr>
<th>Room</th>
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<th>121</th>
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<td>CDE1 - Spectrum Issues, Developments, and Solutions</td>
<td>G1 - Meteors and Millimeter Waves Propagation and Measurement</td>
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<td>B16 - Advanced Modeling of EM Propagation</td>
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<td>B17 - Special Event: Fourth Hans Lieble Lecture (Matt 100)</td>
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<td><strong>Friday 6 January 13:20-17:00</strong></td>
<td>B15 - Advanced Analysis, Design and Applications of Waveguides, Structures and Antenna Modifications</td>
<td>F6 - Atmospheric Effects and EM Propagation during the CASPER Field Campaign</td>
<td>G2 - Electromagnetics and Thermal Design Advances</td>
<td>GH2 - Meteors, Orbital Debris and Dusty Plasmas II</td>
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<td>B16 - Microwave Antennas and Printed Devices</td>
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### Plenary Session (Matt 100):
Ernest K. Smith USNC-URSI Student Paper Competition

**Highlight Plenary Talks:**
1. The Future of the Electromagnetic Spectrum;
2. Fast Radio Bursts: The Story so Far

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<tr>
<th><strong>Lunch</strong></th>
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<td><strong>Reception</strong></td>
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<td>Commission D 17:00</td>
<td>Commission E 17:00</td>
<td>Commission F 18:00</td>
<td>Commission G 17:00</td>
<td>Commission H 16:00</td>
<td>Commission I 18:00</td>
<td>Commission J 18:00</td>
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<tr>
<td><strong>Reception for all Attendees in Engineering Center Lobby from 18:30 to 21:00</strong></td>
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International Union of Radio Science / Union Radio Scientifique Internationale

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

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

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

About the USNC-URSI

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

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

The international URSI General Assembly and Scientific Symposium is held every three years in locations around the world. The 31st URSI General Assembly and Scientific Symposium was held in Beijing, China, on August 17-23, 2014. Over 1300 papers were presented by authors from over 50 countries in technical sessions covering the areas of all ten URSI Commissions. The 32nd URSI General Assembly and Scientific Symposium will be held in Montreal, Quebec, Canada, on August 19-26, 2017. The symposium website is www.gass2017.org.

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


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

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

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

Steven C. Reising  
USNC Immediate Past Chair  
Professor, Department of Electrical and Computer Engineering,  
Colorado State University  
E-mail: steven.reising@colostate.edu

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

### TUESDAY, 3 January 2017

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

### WEDNESDAY, 4 January 2017

**MORNING SESSIONS**  

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**AFTERNOON SESSIONS**  

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**BUSINESS MEETINGS**  

- Commission A 17:00, Room 105  
- Commission C 18:00, Room 200  
- Commission E 17:00, Room 245  
- Commission F 18:00, Room 265  
- Commission J 18:00, Math 100  

### THURSDAY, 5 January 2017

**MORNING PLENARY SESSION**  

- **Student Paper Competition** 08:20, Mathematics Auditorium (Math 100)  
- **Meeting Highlight Plenary Talks** 10:00, Mathematics Auditorium (Math 100)  

### FRIDAY, 6 January 2017

**MORNING SESSIONS**  

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### SATURDAY, 7 January 2017

**USNC-URSI Executive Council Meeting**  
08:00–11:00, Marriott Hotel
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 NANOPIERCED SHAPE
Chinmay Garud¹, Ahmed M. Hassan¹, Edward Garboczi²
¹Computer Science and Electrical Engineering, University of Missouri Kansas City, Kansas City, MO
²Applied 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. Mechem
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, Electrosience 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 UNIPOLAR 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
Xuehe 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 Chen¹, Weng C. Chew²
¹Physics, University of Illinois Urbana-Champaign, Champaign, IL
²Electrical 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 Peng1, Shen Lin1, Thomas Antonsen2
1Electrical and Computer Engineering, University of New Mexico, Albuquerque, NM
2University of Maryland College Park, MD

10:40 B2-7
FIGURE OF MERIT FOR COMPUTATIONAL ELECTROMAGNETICS SOLVERS
Tayfun Ozdemir1, Robert J. Burkholder2
1Virtual EM Inc., Ann Arbor, MI
2Electrical and Computer Engineering, The Ohio State University, Columbus, OH

11:00 B2-8
PARALLEL COMPUTATION IN HIERARCHICALLY SEMISEPARABLE 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 Na1, Fernando L. Teixeira1, Yuri A. Omelchenko2
1Electrical and Computer Engineering, The Ohio State University, Columbus, OH
2Trinum 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 POYTINGTON 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*, Seirans 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. Koslover1, Sammuel M. Jalali2, Greg R. Raith3
1Scientific Applications & Research Associates (SARA), Inc., Tyler, TX
2Scientific Applications & Research Associates (SARA), Inc., Cypress, CA
3Scientific Applications & Research Associates (SARA), Inc., Irvine, CA
WEDNESDAY MORNING, continued

11:20 B3-9
MODIFICATION, MODELING, AND MEASUREMENT OF A BALANCED ANTIPODAL VIVALDI FOR A MULTI-CHANNEL RECEIVER
Seth A. McCormick*1, William O. Coburn2
1United States Army Research Laboratory, Adelphi, MD
2General 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. Girij1, F M. Tesche2, W D. Prather3
1PRO-TECH, ALAMO
2EM Consultant (Retired), Lakeville, CT
3Air 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*1, Alan J. Michaels1, William Davis2
1Hume Center, Virginia Tech, Blacksburg, VA
2Electrical 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*1, Ying Liu2, Michael D. Dickey2, Jacob J. Adams3
1Electrical and Computer Engineering, North Carolina State University, Raleigh NC
2Chemical 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. Gasiowski, 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*1, Sarvin Regayat1, Alicia Magee1, Charles Baylis1, Lawrence Cohen2, Robert J. Marks II1
1Baylor University, Waco, TX
2Naval 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 Othman1,2, Emilio A. Nanni2, Valery Dolgashev2, Sami Tantawi2, Jeff Neilson2
1University of California Irvine, Irvine, CA
2SLAC 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 Hays1, Lucilia Lamers1, Charles Baylis1, Robert Marks1, Ed Viveiros2, Ali Darwish1, John Penn2, Abigail Hedden2
1WMCS, Baylor University, Waco, TX
2Army 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 Haack1, Rachel Norris1,2, Hedley Hansen3, Andrew Kulesa3,4
1Marine Meteorology Division, Naval Research Laboratory, Monterey, CA
2Electrical and Computer Engineering, University of Michigan, Ann Arbor, MI
3Cyber and Electronic Warfare Division, Defence Science and Technology Organisation, Adelaide, Queensland, AUSTRALIA
4Airborne 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 Strang1, Tracy Haack2, Zach Liebowitz1
1Naval Research Laboratory, Washington, DC
2Naval 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
WEDNESDAY MORNING, continued

10:00 Break

10:20 F1-6
HULL-MOUNTED SEA SURFACE MEASUREMENTS IN THE NORTH ATLANTIC FOR RF PERFORMANCE PREDICTIONS
Rick L. Navarro¹, Amalia Barrios¹, Katherine Horgan², Vincent van Leijen³, Erik van de Pol³, Tjarda Wilbrink³, Folkert Bolderhuis⁴, Earl M. Williams⁵
¹Space and Naval Warfare Systems Center Pacific, San Diego, CA
²Naval Surface Warfare Center Dahlgren Division, Dahlgren, VA
³Knowledge, Innovation, Experimentation and Simulation (KIXS), Defense Material Organisation, Den Helder, NL, NETHERLANDS
⁴Netherlands 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. Penton⁶, 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. Pozderac¹, Joel T. Johnson¹, Caglar Yardim¹, Craig F. Merrill², Tom Cook³, Tony de Paolo³, Eric Terrill³, Frank J. Ryan⁴, Paul Frederickson⁵
¹Electrical and Computer Engineering, ElectroScience Laboratory, The Ohio State University, Columbus, OH
²Naval Surface Warfare Center Dahlgren Division, Dahlgren, VA
³Naval Postgraduate School, Monterey, CA
⁴Naval Air Warfare Center Weapons Division, Point Mugu, CA
⁵Aerospace and Ocean Engineering, Virginia Tech, Blacksburg, VA

11:20 F1-9
A TECHNIQUE TO EVALUATE NUMERICAL WEATHER PREDICTION PERFORMANCE: AN ENGINEERING PERSPECTIVE
Matt Wilbanks¹, Stephanie Billingsley¹, Katherine Horgan¹, William Thornton¹, Qing Wang⁵, Tracey Haack⁶
¹Naval Surface Warfare Center Dahlgren Division, Dahlgren, VA
²Naval Postgraduate School, Monterey, CA
³Marine Meteorology Division, Naval Research Laboratory, Monterey, CA
⁴Naval Postgraduate School, Monterey, CA
⁵Environmental Research Institute of Michigan, Traverse City, MI
⁶Coastal and Marine Systems Science, Coastal Carolina University, Conway, SC

11:40 F1-10
NUMERICAL COMPUTATION OF FADING DEPTH FOR TROPOSPHERIC SCINTILLATION
Swagato Mukherjee¹, Caglar Yardim¹, Qing Wang²
¹Electrical and Computer Engineering, The Ohio State University, Columbus, OH
²Naval 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 Siefring, Naval Research Laboratory; Attila 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 Breitsch⁶, Jade Morton
Electrical and Computer Engineering, Colorado State University, Fort Collins, CO

08:40 FGH1-2
MULTI-CONSTELLATION GNSS TEC MEASUREMENTS
YuXiang Peng¹,², Xavier E. Gomez¹, Wayne A. Scales¹,²
¹Electrical and Computer Engineering, Virginia Tech, Blacksburg, VA
²Center 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. Loucks¹, Scott Paol³, Marcin Pilinski², Geoff Crowley⁴, Irfan Azeem⁵, Don Hampton⁶
¹Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO
²Atmospheric and Space Technology Research Associates (ASTRA), Boulder, CO
³Virginia Tech, Blacksburg, VA
⁴Geophysical Institute, University of Alaska Fairbanks, Fairbanks, AK

09:20 FGH1-4
USING GPS TEC MEASUREMENTS TO PROBE IONOSPHERIC STRUCTURE ASSOCIATED WITH SCINTILLATION
Erin H. Lay¹, Peter A. Parker¹, Max E. Light²
¹ISR-2, Los Alamos National Laboratory, Los Alamos, NM
²AOT-SE, Los Alamos National Laboratory, Los Alamos, NM

09:40 FGH1-5
ESTIMATION OF IONOSPHERIC IRREGULARITIES WITH A SCINTILLATION AURORAL GPS ARRAY
Yang Su¹, Seehany Datta-Banu¹, Gary Bust², Kshitija Deshpande³
¹Illinois Institute of Technology, Chicago, IL
²Johns Hopkins University Applied Physics Laboratory, Laurel, MD
³Virginia Tech, Blacksburg, VA

10:00 Break

10:20 FGH1-6
THE RAMIFICATIONS OF CONFIGURATION-SPACE MODELS FOR GNSS SCINTILLATION
Charles L. Rino⁶, 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 Hsu¹, Tomoko Matsuo²,³, Xinan Yue¹, Jann-Yenq Liu¹
¹National Central University, Institute of Space Science, Taoyuan, TAIWAN
²University of Colorado at Boulder, Cooperative Institute for Research in Environmental Sciences, University of Colorado Boulder, Boulder, CO
³National Oceanic and Atmospheric Administration, Space Weather Prediction Center, Boulder, CO

4Chinese Academy of Sciences, Institute of Geology and Geophysics, Beijing, CHINA
11:00 G1-8
AIRBORNE MEASUREMENT OF SEA SURFACE MEAN SQUARE SLOPE IN 2008 HURRICANE IKE USING GNSS REFLECTIONS AND WIDE-SWATH RADAR ALTIMETER
Scott Gleason*, Valery Zavorotny*, Dennis Akos3, Edward Walsh2
1Southwest Research Institute, Boulder, CO
2NAEA Earth System Research Laboratory, Boulder, CO
3University of Colorado Boulder, Boulder, CO

11:20 G1-9
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 DATARecord TO-DATE BY THE EPOP RADIO RECEIVER INSTRUMENT (RRI)
Gordon James*,1, Gareth Perry2, Andrew Yau2
1Retired, Ottawa, ON, CANADA
2Physics 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*,1, Stanley J. Briczinski1, Carl L. Siefing1, Donald E. Barrick2, Jehu Bryant3, Andrew Howarth4, H G James4, Andrew Yau4
1Code 6754, Naval Research Laboratory, Washington, DC
2Code Oceans Systems, Menlo Park, CA
3Raytheon IIS, Chesapeake, VA
4Physics 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)
1University of Illinois at Urbana-Champaign, Champaign, IL
2Naval Research Laboratory, Washington, DC
3University of Colorado Berkeley, Boulder, CO

11:00 G1-8
ADVANCING IONOSPHERIC OBSERVATIONS WITH THE GLOBAL-SCALE OBSERVATIONS OF THE LIMB AND DISK (GOLD) MISSION
Richard W. Estes*, Alan G. Burns2, Stanley C. Solomon2, William E. McCintock3
1Florida Space Institute, University of Central Florida, Orlando, FL
2High Altitude Observatory, National Center for Atmospheric Research, Boulder, CO
3Laboratory 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. East1, Romina Nikoukar*, Rick Doss2, David M. Khumpr3
1Johns Hopkins University Applied Physics Laboratory, Laurel, MD
2SRI International, Menlo Park, CA
3University of California Los Angeles, Los Angeles, CA

11:40 G1-10
DETAILED CHARACTERISTICS OF RADIATION BELT ELECTRONS REVEALED BY CSSWE/REPTILE MEASUREMENTS
Kun Zhang*1,2, Xinlin Li1,2, Quintin Schiller3, David Gerhardt4, Hong Zhao1, Robyn Millan4
1Laboratory for Atmospheric and Space Physics, University of Colorado Boulder, Boulder, CO
2Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO
3Heliophysics Laboratory, NASA Goddard Space Flight Center, Greenbelt, MD
4Physics 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
WEDNESDAY MORNING, continued

08:40 H1-2
ELECTROMAGNETIC TURBULENCE AND TRANSPORT IN HIGH $\beta$ LABORATORY PLASMAS
Troy Carter*1, Giovanni Rossi1, Mj Pueschel2, Paul Terry2, Frank Jenko1
1Physics and Astronomy, University of California Los Angeles, Los Angeles, CA
2Physics, 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

10:00 Break

09:40 H1-5
ELECTRON SLOSHING ASSOCIATED WITH INERTIAL ALFVEN WAVES
J. W. R. Schroeder*1, F. Skiff1, G. G. Howes1, C. A. Kletzing1, T. A. Carter2, S. Vincena2, S. Dorfman2
1Physics and Astronomy, University of Iowa, Iowa City, IA
2Physics and Astronomy, University of California Los Angeles, Los Angeles, CA

10:20 H1-6
TWO DIMENSIONAL LIF MEASUREMENTS AND POTENTIAL STRUCTURE OF ION BEAM FORMATION IN AN ARGON HELICON PLASMA
Evan M. Aguirre*1, Timothy Good2, Earl E. Scime1
1Physics and Astronomy, West Virginia University, Morgantown, WV
2Physics, Gettysburg College, Gettysburg, PA

11:00 H1-8
MAGNETOHYDRODYNAMIC INSTABILITIES IN JETS AND BUBBLES USING A COMPACT COAXIAL PLASMA GUN IN A BACKGROUND MAGNETIZED PLASMA
Mark Gilmore*1, Yue Zhang1, Dustin M. Fisher1, Ben Wallace1, Scott C. Hsu2
1University of New Mexico, Albuquerque, NM
2Los Alamos National Laboratory, Los Alamos, NM

11:00 H1-8
PRECISION COSMOLOGICAL MEASUREMENTS WITH DARE AND EDGES
Raul A. Monsalve*1, Jack O. Burns1, Richard F. Bradley2, Keith Tauscher1, Bang Nhan1, Judd D. Bowman1, David Newell3, David Draper4, David Drapetti1, Alan E. E. Rogers5, Thomas J. Moxzen1
1University of Colorado Boulder, Boulder, CO
2National Radio Astronomy Observatory, Charlottesville, VA
3Arizona State University, Tempe, AZ
4Ball Aerospace & Technologies, Boulder, CO
5MIT Haystack Observatory, Westford, MA

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 Thyagarajan1, Aaron R. Parsons2, David R. DeBoer1, Judd D. Bowman1
1School of Earth and Space Exploration, Arizona State University, Tempe, AZ
2Astronomy, 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*, Jack O. Burns1, Richard F. Bradley2, Keith Tauscher1, Judd D. Bowman1, David Newell3, David Draper4, David Drapetti1, Alan E. E. Rogers5, Thomas J. Moxzen1
1University of Colorado Boulder, Boulder, CO
2National Radio Astronomy Observatory, Charlottesville, VA
3Arizona State University, Tempe, AZ
4Ball Aerospace & Technologies, Boulder, CO
5MIT 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 Barry¹ 1, Bryna Hazelton¹ 2, Ian Sullivan³, Miguel F. Morales⁴, Jonathan C. Pober⁴
¹Physics, University of Washington, Seattle, WA
²eScience Institute, University of Washington, Seattle, WA
³Astronomy, University of Washington, Seattle, WA
⁴Physics, 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. Pingel¹ 1, Richard Black², D. J. Pisano¹, Brian Jeffs²
¹Astronomy, West Virginia University, Morgantown, WV
²Electrical 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*, Ali Foudazi¹, Kristen M. Donnell², David J. Pommerenke¹
¹Electrical and Computer Engineering, Missouri University of Science and Technology, EMC Lab, Rolla, MO
²Electrical 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 BROAD-BAND 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
Boyu 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
SUPER RADIANCE, 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. Kidde¹ 1, Ethan J. Wilcox¹, Ahmed M. Hassan¹, Edward J. Garboczi²
¹Computer Science and Electrical Engineering, University of Missouri-Kansas City, Kansas City, MO
²Applied Chemicals and Materials Division, National Institute of Standards and Technology, Boulder, CO
**Electromagnetic Scattering from Crumpled Graphene Flakes**

Kalyan C. Durbha, Ahmed M. Hassan, Deb Chatterjee, Fernando Vargas-Lara, Jack F. Douglas, Edward J. Garboczi

1 Computer Science and Electrical Engineering, University of Missouri-Kansas City, Kansas City, MO
2 Materials Science and Engineering Division, National Institute of Standards and Technology, Gaithersburg, MD
3 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. Massey1, Yaniv Brick2, Ali E. Yilmaz1,2

1 Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX
2 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 Semouchkina1, Navid Gandhi1, Bahram Seifi1, Gangchea Lee*, Seokwon Jung*, Michael Lanagan2, Thomas Neuberger2

1 Michigan Technological University, Houghton, MI
2 Pennsylvania State University, University Park, PA

14:40 B7-5

Excitation Probes for Ultra-High Field Magnetic Resonance Imaging

Patrick Bluem1, Andrew Kiruluta1, Pierre-Francois Van de Moortele2, Gregor Adriany3, Zoya Popovic1

1 University of Colorado Boulder, Boulder, CO
2 Harvard University, Cambridge, MA
3 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*, Patrick Bluem2, Zoya Popovic2, Pierre-Francois Van de Moortele3, Branislav M. Notaros4

1 Physics, Harvard University, Cambridge, MA
2 Electrical, Computer and Energy Engineering, University of Colorado, Boulder, CO
3 Radiology, University of Minnesota, Minneapolis, MN
4 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. Pollock1, Navid Hosseini2, Nicola De Zanche1, AshwinK. Iyer*

1 Electrical and Computer Engineering, University of Alberta, Edmonton, Alberta, CANADA
2 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*, Milan M. Ilic1,2, Andrew J. M. Kiruluta3, Pierre-Francois Van de Moortele4, Branislav M. Notaros1

1 Electrical and Computer Engineering, Colorado State University, Fort Collins, CO
2 Electrical Engineering, University of Belgrade, Belgrade, Serbia, YUGOSLAVIA
3 Radiology, Massachusetts General Hospital, Harvard Medical School, Boston, MA
4 Radiology, University of Minnesota, Minneapolis, MN

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

Room 245

Co-Chairs: Piergiorgio Uselenghi, 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, Electrosence Laboratory, The Ohio State University, Columbus, OH
14:00 B8-3
IMAGING PERFORMANCE COMPARISON IN REINFORCED CONCRETE PILLARS USING GROUND PENETRATING RADAR AND RADIO FREQUENCY TOMOGRAPHY
Tadahiro Negishi1, Gianluca Gennarelli2, Yangqing Liu1, Davide Errecolo1, Francesco Soldovieri2
1Electrical and Computer Engineering, University of Illinois Chicago, Chicago, IL
2Institute 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

13:20 B9-1
ARRAY OF SLOT PAIRS IN A RECTANGULAR WAVEGUIDE FOR OMNIDIRECTIONAL RADIATION
Sembiam R. Renganarajan1, Jeffrey Pawlan2
1California State University, Northridge, CA
2Pawlan 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 ELECTRICAL-LY 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*, Olem 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 Manoochehri1, Amin Darvazehban2, Farhad Farzami1, Davide Errecolo1
1Electrical and Computer Engineering, University of Illinois Chicago, Chicago, IL
2Electrical 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 Manoochehri1, Amin Darvazehban2, Farhad Farzami1, Davide Errecolo1
1Electrical and Computer Engineering, University of Illinois Chicago, Chicago, IL
2Electrical and Computer Engineering, Amirkabir University of Technology, Tehran, IRAN

Session B10: Antennas for Small Satellites
(Special Session), Room 245

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
Muhammadziz 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, Fernanda L. Teixeira
1ElectroScience Laboratory, The Ohio State University, Columbus, OH
2Electronics 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, Mohammadreza F. Imani, Michael Boyarsky, Laura Pulido, Thomas Fromenteze, Jonah N. Gollub, Matthew S. Reynolds, David R. Smith
1Electrical and Computer Engineering, Duke University, Durham, NC
2Electrical 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, Titas 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, Timothy Sleasman, Laura Pulido-Mancera, Mohammadreza F. Imani, Matthew S. Reynolds, David R. Smith
1Electrical and Computer Engineering, Duke University, Durham, NC
2Electrical 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

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, Daniel J. Breton, Johnathan M. Corgan
1Signature Physics Branch, Cold Regions Research and Engineering Laboratory, Hanover, NH
2Corgan 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
HIGH ANGLE, X-BAND SHIP RCS OVER ROUGH SEA SURFACES IN DUCTING ENVIRONMENTS USING POLDER AND PWE METHODS
Frank Ryan1, Dale Zolnicky2
1Applied Technology, Inc., San Diego, CA
2Radar Analysis Branch, Radar Division, Naval Research Laboratory, Washington, DC

THE CURRENT STATE OF RADAR AND COMMUNICATION ELECTROMAGNETIC PROPAGATION MODELS
Abby Anderson*
NSWC Dahlgren, Dahlgren, VA

ESTIMATING REFRACTIVITY FROM PROPAGATION LOSS IN TURBULENT MEDIA
Mark A. Wagner1, Peter Gerstoft1, Ted Rogers2
1Electrical and Computer Engineering, University of California San Diego, La Jolla, CA
2SPAWAR, Point Loma, CA

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

TECHDEMSAT-1 LAND ALTIMETRY AND SEA ICE BOUNDARY DETECTION
Jake R. Mashburn1, Penina Axelrad1, Kristine Larson1, Stephen Lowe2
1Aerospace Engineering Sciences, University of Colorado Boulder, Boulder Colorado
2NASA Jet Propulsion Laboratory, Pasadena, CA

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

THE FROST DYNAMICS OBSERVATORY (FRODO) CONCEPT
Clara C. Chew1, Kyle C. McDonald1,2, Cinzia Zuffada1, Erika Podest1, Nick Steiner2
1NASA Jet Propulsion Laboratory, Pasadena, CA
2Earth and Atmospheric Sciences, The City College of New York, New York, NY

SNOWCUBE MISSION CONCEPT: P-BAND SIGNAL OF OPPORTUNITY FOR REMOTE SENSING OF SNOW
Simon Yueh1,2, Steve Margulis2, Chris Derksen3, Michael Durand4, Kelly Elder5, Andrea Stakotos6, Glen Liston6, Rashmi Shah1, Xiaolan Xu1, Chun-Sik Chae1
1NASA Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA
2University of California Los Angeles, Los Angeles, CA
3Environment and Climate Change Canada, Toronto, CANADA
4The Ohio State University, Columbus, OH
5United States Forest Service, Fort Collins, CO
6Colorado State University, Fort Collins, CO

Session FG H2: GNSS and Radio Beacon Remote Sensing II (Special Session), Room 135
Co-Chairs: Clara Chew, NASA Jet Propulsion Laboratory; Carl Siefring, Naval Research Laboratory; Atilla Komjathy, NASA Jet Propulsion Laboratory

THIRD GENERATION MF-HF RADAR FOR IONOSPHERE RADIO SCIENCE
Robert C. Livingston1, Richard N. Grubb2, Terence W. Bullett*
1Scion Associates, Port Townsend, WA
2University of Colorado Boulder, Boulder, CO
SESSION H2: Physics of the Radiation Belts (Special Session), Room 265

13:20 H2-1
OBSERVATIONS OF ENERGETIC ELECTRON PRECIPITATION BY THE BARREL BALLOON CAMPAIGNS
John Sample*1, Robyn Millan2
1Montana State University, Bozeman, MT
2Dartmouth College, Hanover, NH

13:40 H2-2
VAN ALLEN PROBE MULTIPONT MEASUREMENTS OF THE SPATIAL AND COHERENCE SCALES OF EMIC WAVES
Lauren W. Blum*1, John W. Bonnell2, Oleksiy Agapitov2
1NASA/GSFC, Greenbelt, MD
2Space 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*1, David M. Malaspina1, Allison N. Jaynes1, Robert Bruder1, Ian R. Mann3, John R. Wygant1, Robert E. Ergun4
1LASP, Boulder, CO
2University of Colorado Boulder, Boulder, CO
3University of Alberta, Edmonton, AB, CANADA
4University of Minnesota, Minneapolis, MN

14:20 H2-4
THE VIRTUES OF PARAMETERIZING PLASMASPERHIC HISS (AND OTHER INNER MAGNETOSPHERE WAVE MODES) BY PLASMAPAUSE LOCATION
David M. Malaspina*1, Allison N. Jaynes1, Jacob Bortnik2, Robert E. Ergun1, Craig Kletzing3, John R. Wygant4
1Laboratory for Atmospheric and Space Physics, University of Colorado Boulder, Boulder, CO
2Atmospheric and Oceanic Sciences, University of California Los Angeles, Los Angeles, CA
3Physics and Astronomy, University of Iowa, Iowa City, IA
4Physics 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. Hartley1, Craig A. Kletzing1, William S. Kurth1, George B. Hospodarsky1, Scott R. Bounds1, Terrance F. Averkamp1, John W. Bonnell2, Ondrej Santolik3,4, John R. Wygant5
1Physics and Astronomy, University of Iowa, Iowa City, IA
2Space Sciences Laboratory, University of California Berkeley, Berkeley, CA
3Space Physics, Institute of Atmospheric Physics, Prague, CZECH REPUBLIC
4Mathematics and Physics, Charles University, Prague, CZECH REPUBLIC
5Physics 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*1, Alan G. Ling2, Steven M. O’Malley2
1Space Vehicles Directorate, Air Force Research Laboratory, Kirtland AFB, NM
2Atmospheric 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*, Joe Fennell1, J. Bernard Blake1, Allison Jaynes2, Dan Baker2, Rick Wilder2, Geoff Reeves3, Wen Li4, Craig Kletzing5, Ian Cohen6, Barry Mauk6
1The Aerospace Corporation, El Segundo, CA
2Laboratory for Atmospheric and Space Physics, University of Colorado Boulder, Boulder, CO
3Los Alamos National Laboratory, Los Alamos, NM
4University of California Los Angeles, Los Angeles, CA
5University of Iowa, Iowa City, IA
6Applied 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 EMPIRIC ON IRREGULAR MESHES  
Dong-Yeop Na*1, Fernando L. Teixeira1, Yuri A. Omelchenko2  
1ElectroScience Laboratory, The Ohio State University, Columbus, OH  
2Trinum 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

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*1, Sivasankaran Srikanth2, Marian Pospieszalski2, Silver Sturgis1  
1Electronics, National Radio Astronomy Observatory, Socorro, NM  
2Central 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 ASTROMONOMICAL 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
WEDNESDAY AFTERNOON, continued

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*1, Alec Walter1, Olga Shenderova2, Nicholas Nunn2, Gary McGuire2, Magda El-Shenawee1
1Electrical Engineering, University of Arkansas, Fayetteville, AR
2Adamas Nanotechnologies, Inc., Raleigh, NC

13:40 K1-2
TERAHERTZ IMAGING OF FRESHLY EXCISED MURINE BREAST CANCER TUMORS
Tyler Bowman*1, Sruhgi Ravindranathan2, David Zaharoff2, Narasimhan Rajaram2, Keith Bailey3, Magda El-Shenawee1
1Electrical Engineering, University of Arkansas, Fayetteville, AR
2Biomedical Engineering, University of Arkansas, Fayetteville, AR
3Oklahoma 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*1, Tyler Bowman1, Olga Shenderova2, Nicholas Nunn2, Gary McGuire2, Magda El-Shenawee1
1Electrical Engineering, University of Arkansas, Fayetteville, AR
2Adamas Nanotechnologies, Inc., Raleigh, NC

14:20 K1-4
TERAHERTZ IMAGING FOR DEFECT IDENTIFICATION IN LIQUID-STERILIZING MEMBRANE DEVICES
Nathan Burford1, Tyler Bowman*2, Robert Beitle3, Magda El-Shenawee2
1Microelectronics-Photonics Program, University of Arkansas, Fayetteville, AR
2Electrical Engineering, University of Arkansas, Fayetteville, AR
3Chemical 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*1, Pratik Shah2, Guanbo Chen2, John Stang2
1Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, BRAZIL
2Electrical Engineering, University of Southern California, Los Angeles, CA

Commission Business Meetings

17:00 Commission A
17:00 Commission E
18:00 Commission C
18:00 Commission F
18:00 Commission J

Room 105
Room 245
Room 200
Room 265
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*
William Chappell*
Director, Microsystems Technology Office, Defense Advanced Research Projects Agency, Arlington, VA

(2) *Fast Radio Bursts: The Story So Far*
Duncan Lorimer*
Physics and Astronomy, West Virginia University, Morgantown, WV

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
Atrium at Koelbel – Business School

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 Hong1, Steven Lane1, David Murrell1, Nicholas Tarasenko1, Christos Christodoulou2
1Space Vehicles Directorate, Air Force Research Laboratory, Albuquerque, NM
2Electrical 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. Diener4, Jeanne T. Quimby2, Kate A. Remley2, Atef Z. Elsherbeni1
1Electrical Engineering and Computer Science, Colorado School of Mines, Golden, CO
2National Institute of Standards and Technology, Boulder, CO

14:00 A1-3
A NOVEL V-BAND PRINTED QUASI-PARABOLIC REFLECTOR ANTENNA
Alistar Hosseini, Evangelos Kornaros, Saman Kabiri*, 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*, 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*
Dakota Ridge R&I, Boulder, CO

15:00 Break

15:20 A1-6
FIBER GLASS-WEAVE SKEW ANALYSIS USING THE FINITE-DIFFERENCE TIME-DOMAIN METHOD
Ravi C. Bollimuntha1, Venkata D. Paladugu1, Rounak Saha1, Melinda J. Piket-May1, Atef Z. Elsherbeni2, Mohammed F. Hadji1,2,3
1Electrical, Computer and Energy Engineering, University of Colorado, Boulder, CO
2Electrical Engineering and Computer Science, Colorado School of Mines, Golden, CO
3Electrical Engineering, Kuwait University, Kuwait, KUWAIT

15:40 A1-7
EXPERIMENTAL DEMONSTRATION OF HIGHER ORDER DISPERSION IN INHOMOGENEOUS SLOW WAVE STRUCTURES FOR BACKWARD WAVE OSCILLATORS
Ushemadzoro 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 Gilmore
Electrical and Computer Engineering, University of New Mexico, Albuquerque, NM
THURSDAY AFTERNOON, continued

16:20 B11-9
ELECTRICAL BREAKDOWN STRENGTHS OF VARIOUS GASES AND GAS MIXTURES
D V. Giri*1, V Carbonu2, J M. Lehr3
1PRO-TEC, ALAMO
2L3 Communications (Retired), San Leandro, CA
3University 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
IMPEDEANCE 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*1, Syed K. Islam1, Salvatore A. Pullano2, Antonino S. Fiorillo2, Samira Shamsir1, Mark S. Gaylord3, Yochien Lorch3
1Electrical Engineering and Computer Science, University of Tennessee Knoxville, Knoxville, TN
2Health Sciences, University Magna Graecia of Catanzaro, Catanzaro, ITALY
3Obstetrics 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, Changhi 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*1, Islam K. Syed1, Mohamed Mahfouz2, Gary To2
1Electrical Engineering and Computer Science, University of Tennessee Knoxville, Knoxville, TN
2Mechanical, 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 Noghanian
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, Irrat 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 COMPRESSION 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*1, Philip Maukopf1, Georgios Trichopoulos2, Steven Hailey-Dunsheath3, Charles M. Bradford3,4, Jason Glenn5, Corwin Shiu6, Erik Shirokoff7, Jordan Wheeler5
1Earth & Space Exploration, Arizona State University, Tempe, AZ
2Electrical, Computer and Energy Engineering, Arizona State University, Tempe, AZ
3Astronomy, California Institute of Technology, Pasadena, CA
4Astronomy & Space Sciences, NASA Jet Propulsion Laboratory, Pasadena, CA
5Astrophysical & Planetary Sciences, University of Colorado Boulder, Boulder, CO
6Physics, Princeton University, Princeton, NJ
7Astronomy & 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*1, Lawrence Cohen2
1Consultant, Burke, VA
2Radar Division, Naval Research Laboratory, Washington, DC

13:40 CDE1-2
SUMMARY OF RECENT RADAR SPECTRUM ACTIVITIES
Eric L. Mokole1, Lawrence Cohen2
1Consultant, Burke, VA
2Radar 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*, Robert J. Marks II1, Liang Dong1, Andrew Clegg2, Lawrence Cohen3
1Wireless and Microwave Circuits and Systems Program, Baylor University, Waco, TX
2Google, Reston, VA
3Radar Division, 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*, Zach Hays1, Christopher Kappelman1, Matthew Fellows1, Charles Baylis1, Robert Marks1, Ed Viverios2, Abigail Hedden2, John Penn2, Ali Darwish2
1Electrical and Computer Engineering, Baylor University, Waco, TX
2Army Research Laboratory, Adelphi, MD
THURSDAY AFTERNOON, continued

16:00 CDE1-8
IMPROVING CUBESAT TRANSMITTER EIRP TO ENABLE IMPROVING SPACE NETWORK COMMUNICATION CAPABILITIES
Sushia Rahimpazadeh*1, Peter Fetterer1, Zoya Popovic1, Harry Shaw4
1University of Colorado Boulder, Boulder, CO
2Goddard Space Flight Center, Greenbelt, MD

16:20 CDE1-9
MILLIMETER-WAVE TRANSMIT/RECEIVE SYSTEM FOR MILLIMETER-WAVE TRANSMIT/RECEIVE SYSTEM FOR SECURE HIGH DATA RATE COMMUNICATIONS
Dimitrios Siafarikas*, 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 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 DESIGNING A CLIMATE-MONITORING MICROWAVE RADIOMETER
Philip W. Rosenkranz*1, William J. Blackwell1, Albin J. Gasiewski2, R. V. Leslie1, Carl A. Mears3, Jeffrey R. Pfeipmeier4, Paul E. Racette4, Benjamin D. Santer5
1Massachusetts Institute of Technology, Cambridge, MA
2University of Colorado Boulder, Boulder, CO
3Remote Sensing Systems, Santa Rosa, CA
4NASA Goddard Space Flight Center, Greenbelt, MD
5Lawrence 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*1, Jie Gong1,2
1NASA Goddard Space Flight Center, Greenbelt, MD
2 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 Oglu*4, Xavier Bosch-Lluis1, Steven C. Reising1, Yurii V. Goncharenko1, Pekka Kangaslahti1, Erich Schlecht2, Richard Cofield2, Nacer Chahat2, Sharmila Padmanabhan2, Jonathan Jiang3, Shannon T. Brown2, William R. Deal3, Alex Zamora3, Kevin Leong3, Sean Shih3, Gerry Mei3
1Electrical and Computer Engineering, Colorado State University, Fort Collins, CO
2NASA Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA
3Northrop Grumman Aerospace Systems, Redondo Beach, CA

14:20 F3-4
THE CUBESAT RADIOMETER RADIO FREQUENCY THE CUBESAT RADIOMETER RADIO FREQUENCY INTERFERENCE TECHNOLOGY VALIDATION (CUBERT) MISSION
Christa McKelvey*1, Joel T. Johnson1, Chi-Chih Chen1, Andrew O’Brien1, Graeme E. Smith1, Mark Andrews1, J. Landon Garry1, Sidharth Misra*2, Shannon Brown2, Jonathan Koetz*2, Robert Jarnot2, Damon C. Bradley3, Priscilla N. Mohamed3, Jared F. Luquez3, Jeffrey R. Pfeipmeier3, Kevin Horgan3, Michael Solly3, Joseph Knuble3
1Electrical and Computer Engineering, ElectroScience Laboratory, The Ohio State University, Columbus, OH
2NASA Jet Propulsion Laboratory, Pasadena, CA
3NASA Goddard Space Flight Center, Greenbelt, MD

14:40 F3-5
CYGNSS: EARLY LAUNCH ENGINEERING AND SCIENCE COMMISSIONING
Scott Gleason*1, Valery Zavorotny2, Christopher Ruf2, Randy Rose1
1Southwest Research Institute, Boulder, CO
2NOAA Earth System Research Laboratory, Boulder, CO
3Climate and Space, University of Michigan, Ann Arbor, MI

15:00 Break

15:20 F3-6
PRE-LAUNCH CALIBRATION AND PERFORMANCE 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 RADIOMETER CALIBRATION WITH GPS RADIO OCCULTATION FOR THE MIRATA CUBESAT MISSION
Kerri Cahoy*1, Anne Maripan1, Rebecca Bishop2, Susan Lui3, James Barthan3, Tamitha Skov3, William Blackwell3, R. Vincent Leslie3, Idahosa Osaretin3, Michael Shields3
1Aeronautics and Astronautics, Massachusetts Institute of Technology, Cambridge, MA
2The Aerospace Corporation, El Segundo, CA
3MIT Lincoln Laboratory, Lexington, CA
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*, Todd C. Gaier, Christian D. Kummerow, V. Chandrasekar, Sharmila Padmanabhan, Boon H. Lim, Cate Henehan, Wesley Berg, Jon P. Olson, Shannon T. Brown, John Carvo, Matthew Pallas
1 Electrical and Computer Engineering, Colorado State University, Fort Collins, CO
2 NASA Jet Propulsion Laboratory, Pasadena, CA
3 Atmospheric Sciences, Colorado State University, Fort Collins, CO
4 Blue Canyon Technologies, Boulder, CO

16:20 F3-9
THE TEMPEST-D DEMONSTRATION RADIOMETER INSTRUMENT FOR MEASUREMENT OF CLOUDS AND PRECIPITATION
Todd Gaier, Sharmila Padmanabhan, Boon Lim, Richard Cofield, Mary Easter, Mary Soria, Heather Owen, Steven C. Reising
1 NASA Jet Propulsion Laboratory, Pasadena, CA
2 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, Roger H. Lang
1 Johns Hopkins University Applied Physics Laboratory, Laurel, MD
2 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
Sha Madaliara, C. P. Vendhan, C. Prabavathi
1 Sensors Directorate, Air Force Research Laboratory, Dayton, OH
2 Indian Institute of Technology Madras, Chennai, INDIA
3 P.O. Box 24467, Dayton, OH

16:00 F4-7
PASSIVE INFRARED RETRIEVAL OF TROPOSPHERIC REFRACTIVITY, TEMPERATURE, AND WATER VAPOR PROFILES
Fredrick S. Solheim
Dakota Ridge R&D, Boulder, CO

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, Pennsylvania State University

13:20 GH1-1
ANALYSIS OF PLASMA TURBULENCE ON THE FORMATION OF SPECULAR METEOR ECHOES
Freddy R. Galindo, Julio V. Urbina, Lars P. Dyrud
1 Electrical Engineering and Computer Science, Pennsylvania State University, University Park, PA
2 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, Sigrid Close, Peter Brown
1 University of Colorado Boulder, Boulder, CO
2 Stanford University, Stanford, CA
3 University of Western Ontario, London, ON, CANADA
4 Institute of Atmospheric Physics, Kuhlungsborn, GERMANY
THURSDAY AFTERNOON, continued

14:00 GH1-3
SIMULTANEOUS UHF/VHF RADAR AND OPTICAL OBSERVATIONS OF METEORS AT ARECIBO
Michael DeLuca1,2, Diego Janches3, Robert Michell4,5, Rebecca Chen6, Zoltan Sternovsky1,2
1Laboratory for Atmospheric and Space Physics, University of Colorado Boulder, Boulder, CO
2Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO
3Space Weather Laboratory, NASA Goddard Space Flight Center, Greenbelt, MD
4Geospace Environment Laboratory, NASA Goddard Space Flight Center, Greenbelt, MD
5Astronomy, University of Maryland, College Park, College Park, MD
6River Hill High School, Clarksville, MD

14:20 GH1-4
METEOROID SPATTERING AS A SOURCE FOR LOWER-THERMOSPHERIC METALS AND THE RADIO SCIENCE OF HIGH-ALTITUDE RADAR METEORS
John D. Mathews1, Boyi Gao1, Saiveena Kesara1, Shikha Rai2
1Radar Space Sciences Lab, Pennsylvania State University, University Park, PA
2Space Science Division, Arecibo Observatory, Arecibo, PR

15:00 Break

15:20 GH1-5
LOW-ALTITUDE RADAR METEORS AND BOLOID LANGMUIR WAVES
John D. Mathews1, Qian Zhu1, Frank T. Dju2
1Radar Space Sciences Lab, Pennsylvania State University, University Park, PA
2Geospace 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 Janches1,2, Petk Porokny2, Nimala Swarnalingam2, David Nesvorny1, John M. C. Plane4, Wuhu Feng4, Juan Diego Cabrillo-Sanches4, Juan Carlos Gomez Martin4, David Vokrouhlicky5
1Space Weather Laboratory, NASA, Greenbelt, MD
2Physics, Catholic University of America, Washington, D.C
3SouthWest Research Institute, Boulder, CO
4Chemistry, University of Leeds, Leeds, United Kingdom
5Institute of Astronomy, Charles University, Prague, Czech Republic

16:00 GH1-7
MICROMETEOROID ABLATION SIMULATED IN THE LABORATORY USING A DUST ACCELERATOR
Z. Sternovsky1,2,3, E. Thomas2,3, M. DeLuca1,2, M. Horanyi1,3,4, D. Janches5, N. Swarnalingam5, R. Marshall2, T. Munsat3,4, J. M. C. Plane6
1LASP, University of Colorado Boulder, Boulder, CO
2Aerospace Eng. Sci., University of Colorado Boulder, Boulder, CO
3IMPACT, University of Colorado Boulder, Boulder, CO
4Physics, University of Colorado Boulder, Boulder, CO
5Space Weather Laboratory, NASA Goddard Space Flight Center, Greenbelt, MD
6School 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 Nuttall8, 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. Jaynes1, Maria Usanova1, Marc Lessard2, Kazue Takahashi3, Ashar Ali4, Davjd Malaspina4, Robert Michell5, Emma Spanswick5, Daniele N. Baker1, J B. Blake6, Chris Cully7, Eric Donovan7, Craig Kletzing7, Geoff Reeves8, Marilia Samara4, Harlan Spence2, John Wygant9
1LASP, University of Colorado Boulder, Boulder, CO
2University of New Hampshire, Durham, NH
3Johns Hopkins University Applied Physics Laboratory, Laurel, MD
4NASA Goddard Space Flight Center, Greenbelt, MD
5University of Calgary, Calgary, Canada
6Aerospace Corporation, El Segundo, CA
7University of Iowa, Iowa City, IA
8Los Alamos National Laboratory, Los Alamos, NM
9University 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 Crabtree1, Gurudas Ganguli1, Erik Tejero1, George Hospodarsky2, Craig Kletzing2
1Naval Research Laboratory, Washington, DC
2University 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 Breneman1, Alex Crew2
1University of Minnesota, Minneapolis, MN
2Johns 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. Cummer1, Fanchao Lyu1, Michael S. Briggs2, David M. Smith3
1Duke University, Durham, NC
2University of Alabama Huntsville, Huntsville, AL
3University 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 Celestin1, Francois Trompier2, Jean-Louis Pincon1
1LPCE2, University of Orleans, CNRS, Orleans, FRANCE
2Institut 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 Xu1, Sebastien Celestin*, Victor P. Pasko3
1Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO
2Laboratory of Physics and Chemistry of the Environment and Space (LPCE2), University of Orleans, CNRS, Orleans, FRANCE
3Communications and Space Science 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. Briggs1, Pete Jenke1, Jean-Marie Wersinger2, Mike Folge
1CSPAR, University of Alabama Huntsville, Huntsville, AL
2Physics, Auburn University, Auburn, AL

14:40 HEG1-5
USING WVLNN 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 INTRA CLOUD 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 Liu1, Julia Tilles1, Levi Bogg2, Alan Boechar2, Hamid Rassoul2, Jeremy Riousset3
1Physics and Space Science Center, University of New Hampshire, Durham, NH
2Physics and Space Sciences, Florida Institute of Technology, Melbourne, FL
3Center 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 Shi1, Ningyu Liu1, Hamid K. Rassoul2
1Physics and Space Science Center, University of New Hampshire, Durham, NH
2Physics 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
1Physics and Space Science Center, University of New Hampshire, Durham, NH
2Langmuir Laboratory, New Mexico Tech, Socorro, NM
3NASA Kennedy Space Center, Kennedy Space Center, FL
4Physics and Space Sciences, Florida Institute of Technology, Melbourne, FL
5Osaka 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. Keating1, Daniel P. Marrone2, Geoffrey C. Bower3
1Smithsonian Astrophysical Observatory, Cambridge, MA
2Astronomy, University of Arizona, Tucson, AZ
3ASIAA, 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 SURVEY-OR
Lucas P. Parker*
Johns Hopkins University, Baltimore, MD

17:00  J4-6
MEASURING GALACTIC SYNCHRONTRON WITH THE C-BAND ALL SKY SURVEY
Heiko M. Heilgendorff*
University of KwaZulu-Natal, Durban, SOUTH AFRICA

Commission Business Meetings

17:00  Commission B  Room 1B40
17:00  Commission D  Room 105
17:00  Commission G  Room 245
18:00  Commission H  Room 265
18:00  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*1, William O. Coburn2
1General Technical Services LLC, Wall, NJ
2United 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. Zaghloul, Steven J. Weiss
United States Army Research Laboratory, Adelphi, MD

09:40 B13-5
MODELING AND MEASUREMENT OF 3D PRINTED λ/30 SPHERICAL SPIRAL DIPOLES
Theodore K. Anthony*, Keefe Coburn, Amir I. Zaghloul
United States Army Research Laboratory, Adelphi, MD

10:00 Break

10:20 B13-6
NOVEL CHOKE RINGS FOR ULTRA-WIDEBAND ANTENNA ARRAY
Zahra Manzoor*1, Gholamreza Moradi2
1Electrical and Computer Engineering, Missouri Science and Technology University, Rolla, MO
2Electrical 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*1, Andre K. Witcher1, Seth A. McCormick2
1United States Army Research Laboratory, Adelphi MD
2General Technical Services LLC, Adelphi MD

11:00 B13-8
THE TRISKELION-ARCHIMEDEAN SPIRAL ANTENNA
Seunghwan Yoon*1, Alfred G. Besoli1, Franco De Flaviis*, Nicolas G. Alexopoulos3
1Movandi Corporation, Newport Beach, CA
2University of California Irvine, Irvine, CA
3Broadcom 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 LATERN SPACED WAVE AND SURFACE WAVE ON THE 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*1, Robab Kazemyan2, Aly E. Fathy1
1Electrical Engineering and Computer Science, University of Tennessee, Knoxville, TN
2Electrical and Computer Engineering, University of Tabriz, Tabriz, IRAN
FRIDAY MORNING, continued

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 APPLICATIONS 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 Othman1, Mehdi Veyssi1, Fanshad Yazdi1, Mohamed Nada1, Dmitriy Oshmarin1, Alexander Figotin2, Filippo Capolino*1
1Electrical Engineering and Computer Science, University of California Irvine, Irvine, CA
2Mathematics, 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*, Thomas Fromenteze1, Timothy Sleasman1, Michael Boyarsky1, Mohammadreza F. Imani1, Matthew Reynolds2, David R. Smith1
1Duke University, Durham, NC
2University 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*, V. Chandrasekar1, Mike Daniels2
1Electrical and Computer Engineering, Colorado State University, Fort Collins, CO
2National 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 C5-6
HUMAN RESPIRATION RATE ESTIMATION USING SFCW RADAR SYSTEM
Sabikun Nahar*1, Lingyun Ren1, Tuan Phan2, Ozlem Kilic2, Aly E. Fathy1
1Electrical Engineering and Computer Science, The University of
Tennessee, Knoxville, TN
2Electrical Engineering and Computer Science, The Catholic
University of America, Washington, DC

11:00 C2-8
SYNCHRONIZED TEST BENCHMARK SET-UP FOR TESTING OF
REAL-TIME RECONFIGURABLE POWER AMPLIFIERS
FOR THE NEXT GENERATION RADAR
Lucilia R. Lamers*1, Zachary Hays1, Charles Baylis1, Robert Marks1, Edward Viveiros2, John Penn2, Abigail Heddlen2, Ali Darwish2
1Electrical and Computer Engineering, Baylor University, Waco, TX
2Army Research Laboratory, Adelphi, MD

11:20 C2-9
NASA D3R RADAR UPGRADE: ENHANCING SENSITIVITY AND SPATIAL RESOLUTION
Mohit Kumar1, Robert M. Beauchamp1, Shashank S. Joshi1, Manuel Vega1,2, V. Chandrasekar1
1Electrical and Computer Engineering, Colorado State University, Fort Collins, CO
2NASA 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 Li1, V. Chandrasekar2, Jianxin He1, Lin Yang1
1Electronic Engineering, Chengdu University of Information Technology, Chengdu, Sichuan, CHINA
2Electrical 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. Williams1,2, Robert M. Beauchamp3, Chandra V. Chandrasekar3
1Cooperative Institute for Research in Environmental Science (CIRES), University of Colorado Boulder, Boulder, CO
2Physical Science Division, NOAA Earth System Research Laboratory, Boulder, CO
3Electrical 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 CSUCHILL X-BAND RADAR
Pranav S. Athalye1, Merhala Thurai1, V. N. Bringi1, Patrick C. Kennedy2, Branislav M. Notaros1
1Electrical and Computer Engineering, Colorado State University, Fort Collins, CO
2Atmospheric 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. Joshi*, 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 DDSAT-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
FRIDAY MORNING, continued

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<td><strong>Session G3: New Horizons in Active and Passive Radio Techniques for Geospace Remote Sensing (Special Session), Room 200</strong></td>
<td>Co-Chairs: Philip Erickson, MIT Haystack Observatory; Julio Urbina, Pennsylvania State University.</td>
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<tr>
<td>08:20</td>
<td>G3-1</td>
<td>THZ LIMB SOUNDER (TLS) FOR LOWER THERMOSPHERIC WIND, OXYGEN DENSITY, AND TEMPERATURE</td>
<td>Dong L. Wu, Jeng-Hwa Yee, Erich T. Schlegel, Imran Mehdi, Jose V. Siles, Brian J. Drouin. NASA Goddard Space Flight Center, Greenbelt, MD. Johns Hopkins University Applied Physics Laboratory, Laurel, MD. NASA Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA.</td>
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<tr>
<td>09:00</td>
<td>G3-3</td>
<td>NEW CAPABILITY AT SONDRESTM STOM RADAR: SUBSECOND AUROLAR ELECTRON DENSITY MEASUREMENTS</td>
<td>Asti Bhatt, Juha Vierinen, Joshua Semeter, Michael Hirsch, Mary McCready. SRI International, Menlo Park, CA. University of Tromso, Tromso, NORWAY. Boston University, Boston, MA.</td>
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<tr>
<td>09:40</td>
<td>G3-5</td>
<td>HIGH-ORDER PARTICLE-IN-CELL SIMULATIONS OF INCOHERENT SCATTER RADAR SPECTRA</td>
<td>Alex Fletcher, William Longley, Meers M. Oppenheim. Center for Space Physics, Boston University, Boston, MA. Physics, Massachusetts Institute of Technology, Cambridge, MA.</td>
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10:00 Break

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<td>10:20</td>
<td>G3-6</td>
<td>THE MIT INCOHERENT SCATTER PERFORMANCE SIMULATOR (MIPS)</td>
<td>Philip J. Erickson, Juha Vierinen, Frank D. Lind, Ryan Volz. Haystack Observatory, Massachusetts Institute of Technology, Westford, MA. Physics and Technology, University of Tromso, Tromso, NORWAY.</td>
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<tr>
<td>10:40</td>
<td>G3-7</td>
<td>A SYNTHESIS ARRAY FOR RADIO AND RADAR IMAGING OF THE IONOSPHERE</td>
<td>Brett Isham, Terence Bullett, Bjorn Gustavsson, Yasyi Belyey. Interamerican University of Puerto Rico, Bayamon, PR. University of Colorado Boulder, Boulder, CO. University of Tromso, Tromso, NORWAY. Pinhole AS, Tromso, NORWAY.</td>
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11:00 G3-8
COVARIANCE ESTIMATION OF POLARIZED SIGNALS WITH APPLICATION TO VECTOR SENSOR IMAGING
Ryan Volz, Frank C. Robey, Mary Knapp, Frank D. Lind, Philip J. Erickson. Haystack Observatory, Massachusetts Institute of Technology, Westford, MA. Lincoln Laboratory, Massachusetts Institute of Technology, Lexington, MA. 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.

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<td>10:20</td>
<td>HEG2-1</td>
<td>THUNDERSTORM TO IONOSPHERE COUPLING: RECENT RESULTS AND FUTURE DIRECTION</td>
<td>Erin H. Lay. ISR-2, Los Alamos National Laboratory, Los Alamos, NM.</td>
</tr>
</tbody>
</table>
11:00 HEG2-3
LWPC MODELING OF VLF PERTURBATIONS ON OVER-LAPPING PROPAGATION PATHS FROM LIGHTNING INDUCED ENERGETIC ELECTRON PRECIPITATION
C. Renick*, M. Golkowski1, S. Sarker1, M. B. Cohen2
1Electrical Engineering, University of Colorado Denver, Denver, CO
2Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA

11:20 HEG2-4
LWPC ANALYSIS OF LIGHTNING SFERIC ELF PROPAGATION VELOCITY
Sandeep R. Sarker*, Mark Golkowski1, Chad Renick1, Robert Moore2, Neal Dupree2
1University of Colorado Denver, Denver, CO
2University 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 BROAD-BAND 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. Streletsov
Physical Sciences, Embry-Riddle Aeronautical University, Daytona Beach, FL

11:00 HG1-3
ARTIFICIAL IONOSPHERIC SCINTILLATION EXCITED DURING ACTIVE MODULATION OF THE IONOSPHERE
Alinez Mahmoudian*, Wayne A. Scales2, Paul A. Bernhardt3, K. Papadopoulos5, G. Milikh4, S. Ghader1, A. Najmi4
1Institute of Geophysics, University of Tehran, Tehran, IRAN
2Electrical and Computer Engineering, Virginia Tech, Blacksburg, VA
3Physics, Naval Research Laboratory, Washington, DC
4Physics 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. Briceinski*, Paul A. Bernhardt1, Carl A. Siefring1, Michael P. Sulzer2, Phil Perillar2, Eframir Franco3, Andrew Yau3, Andrew Howarth3, H. Gordon James3
1Plasma Physics Division, Naval Research Laboratory, Washington, DC
2Arecibo Observatory, Arecibo, PR
3University 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. Lannman*
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*, David Anderson1, Jeff Cobb1, Steve Croft1, David DeBoer1, Jamie Drew2, J. Emilio Enriquez1, Daniel Farjas1, Vishal Gajjar1, Greg Hellbour1, Jack Hickish1, Barb Hoversten1, Howard Isaacs1, Pete Klupar2, Eric Korpela1, Matt Lebofsky1, David MacMahon1, Geoff Marcy1, Danny Price1, Chris Schodt1, Issac Shivvers1, Andrew Siemion1, Pete Worden2
1Astronomy, University of California Berkeley, Berkeley, CA
2Breakthrough 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

10:20 J5-6
AN L-BAND CRYOGENIC PHASED ARRAY FOR THE GREEN BANK TELESCOPE: INSTRUMENTATION UPGRADES AND EXPANDED FIELD-OF-VIEW
1Central Development Laboratory, National Radio Astronomy Observatory, Charlottesville, VA
2Green Bank Observatory, Green Bank, WV
3Brigham Young University, Provo, UT
FRIDAY MORNING, continued

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. Kuiper1, Charles J. Naušter1, Cristina Garcia Miro1, Shinji Horiuchi3, Steven R. Levoe1, Danny Luong1, George Q. Wang1
1 NASA Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA
2 Instituto Nacional de Técnica Aeroespacial, Ingeniería de Sistemas para la Defensa de España, Madrid, SPAIN
3 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 Xu1, Yang Li1, Youngwook Kim2
1 Electrical and Computer Engineering, Baylor University, Waco, TX
2 Electrical and Computer Engineering, California State University, Fresno, Fresno, CA

09:20 K2-4
UNINTENTIONAL RF ENERGY TRANSFER DURING ENDOSCOPY
Satheesh Bojja Venkatakrishnan1, Edward L. Jones2, Asimina Kiourti1
1 Electrical and Computer Engineering, The Ohio State University, Columbus, OH
2 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 Moghadam
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 Memenroodaki1, Mojtaba Fallahpour2, Zoya Popovic1
1 University of Colorado Boulder, Boulder, CO
2 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 SCAN NG 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
Roslin 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*1, Roberto Gómez-García2, Dimitrios Peroulis3
1 Electrical, Computer and Energy Engineering, University of Colorado Boulder, Boulder, CO
3 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: Aref 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*1, Sanjay DMello1, Ashik Akbar Basha1, Aref Z. Elsherbeni2, Melinda J. Piket-May1, Mohammed F. Hadji1,2,3
1 Electrical, Computer and Energy Engineering, University of Colorado Boulder, Boulder, CO
2 Electrical Engineering and Computer Science, Colorado School of Mines, Golden, CO
3 Electrical Engineering, Kansas University, Kansas, KUWAIT

16:20 B17-4
OGIVE MODELING WITH CONFORMAL STANDARD AND HIGHER-ORDER FDTD
Ravi C. Bollimuntha1, Joseph Diener*2, Mohammed F. Hadji1,2,3, Melinda J. Piket-May1, Aref Z. Elsherbeni2
1 Electrical, Computer and Energy Engineering, University of Colorado Boulder, Boulder, CO
2 Electrical Engineering and Computer Science, Colorado School of Mines, Golden, CO
3 Kansas University, Kansas, 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
FRIDAY AFTERNOON, continued

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*1, Thomas Wallace2, Michael Turbe3
1University of Colorado Boulder, Boulder, CO
2Vesperix Corporation, Arlington, VA
3Leidos Incorporated, Huntsville, AL

16:00 B18-3
THREE-DIMENSIONAL FORWARD MODELING OF LIGHTNING-INDUCED ELECTRON PRECIPITATION FROM THE RADIATION BELTS
Austin P. Sousa*1, Robert A. Marshall2
1Electrical Engineering, Stanford University, Stanford, CA
2Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO

16:20 B18-4
MODELING ELECTROMAGNETIC WAVE PROPAGATION IN SPACE PLASMA
Linjun 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. Lysak1, Colin L. Waters2, Murray D. Sciffer2
1Physics and Astronomy, University of Minnesota, Minneapolis, MN
2Mathematical 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 Burns1, Alireza Samimi2, Jamesina Simpson1
1University of Utah, Salt Lake City, UT
2Nanometrics, 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*1, Robin C. Cherrett2, Denny P. Alappattu1,3, Kyle B. Franklin1, Ryan T. Yamaguchi1, Richard J. Lind1
John A. Kalogiros4
1Naval Postgraduate School, Monterey, CA
2Meteorology and Oceanography, US Navy
3Moss Landing Marine Laboratory, Moss Landing, CA
4National Observatory of Athens, Athens, GREECE

13:40 F6-2
OBSERVATIONS OF INTERNAL MARINE ATMOSPHERIC BOUNDARY LAYER DEVELOPMENT DURING THE CASPER EAST CAMPAIGN
Adam J. Christman1, H. J. S. Fernando1, Raghavendra Krishnamurthy1, David Grober2, Chris Hocut3, Ed Creegan3, Qing Wang4
1University of Notre Dame, Notre Dame, IN
2Motion Picture Marine-Perfect Horizon Stabilization, Marina del Rey, CA
3U.S. Army Research Laboratory, White Sands, NM
4Naval 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 Khelf1, Robert J. Burkholder2, Caglar Yardim2, Qing Wang3
1Mechanical & Aerospace Engineering, University of California Irvine, Irvine, CA
2Electrical and Computer Engineering, The Ohio State University, Columbus, OH
3Meteorology, Naval Postgraduate School, Monterey, CA

14:20 F6-4
VARIABILITY OF EVAPORATION DUCT PROPERTIES OBSERVED IN A COASTAL ENVIRONMENT DURING CASPER
Denny P. Alappattu1,2, Qing Wang1, John Kalogiros3
1Meteorology, Naval Postgraduate School, Monterey, CA
2Moss Landing Marine Laboratories, Moss Landing, CA
3National Observatory of Athens, Athens, Greece, GREECE

14:40 F6-5
EVAPORATION DUCT HEIGHT ESTIMATION FROM UWB LOWER ATMOSPHERIC PROPAGATION (LATPROP) MEASUREMENT SYSTEM
Luyao Xu1, Caglar Yardim1, Swagato Mukherjee1, Robert J. Burkholder1, Jon Padserac2, Adam Christman2, Harindra Fernando2, Qing Wang3, Edward Creegan4
1Electrical and Computer Engineering, ElectroScience Laboratory, The Ohio State University, Columbus, OH
2University of Notre Dame, Notre Dame, IN
3Naval Postgraduate School, Monterey, CA
4Army 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\textsuperscript{1}, Robert J. Burkholder\textsuperscript{1}, Luyao Xu\textsuperscript{1}, Jon Pozderac\textsuperscript{1}, Swagato Mukherjee\textsuperscript{1}, Caglar Yardim\textsuperscript{1}, Adam Christman\textsuperscript{2}, Harindra J. Fernando\textsuperscript{2}, Qing Wang\textsuperscript{3}, Edward Creegan\textsuperscript{3}
\textsuperscript{1}The Ohio State University, Columbus, OH
\textsuperscript{2}University of Notre Dame, Notre Dame, IN
\textsuperscript{3}Naval Postgraduate School, Monterey, CA

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\textsuperscript{1}, 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\textsuperscript{1}, Marc B. Airola\textsuperscript{1}, Andrea M. Brown\textsuperscript{1}, David M. Brown\textsuperscript{1}, Benjamin J. Drewry\textsuperscript{1}, Jonathan Z. Gehman\textsuperscript{1}, Richard M. Giannola\textsuperscript{1}, Randall T. Hanna\textsuperscript{1}, Ian M. Hughes\textsuperscript{1}, Amit V. Itagi\textsuperscript{1}, Jessica K. Makowski\textsuperscript{1}, Michael E. Thomas\textsuperscript{1}, Qing Wang\textsuperscript{2}, Adam H. Willitsford\textsuperscript{1}, Nathaniel S. Winstead\textsuperscript{1}
\textsuperscript{1}Johns Hopkins University Applied Physics Lab, Laurel, MD
\textsuperscript{2}Naval Postgraduate School, Monterey, CA

16:20 F6-9
MEASUREMENTS OF ATMOSPHERIC TURBULENT REFRACTIVITY IN COASTAL ZONE AND MICROWAVE PROPAGATION
Frank Ryan\textsuperscript{1}, Steven Russell\textsuperscript{2}
\textsuperscript{1}Applied Technology, Inc., San Diego, CA
\textsuperscript{2}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 Bertor\textsuperscript{1}, Hank Owen\textsuperscript{2}, Ted Rogers\textsuperscript{1}
\textsuperscript{1}Atmospheric Propagation, SSC Pacific, San Diego, CA
\textsuperscript{2}HS Owen LLC, Medford, NJ

17:00 F6-11
DUCTING CONDITIONS ASSOCIATED WITH OFF-SHORE FLOW AND MARITIME AIR INTERACTIONS DURING CASPER EAST FIELD CAMPAIGN
Marcela Ulate\textsuperscript{1}, Qing Wang\textsuperscript{1}, Tracy Haack\textsuperscript{2}, Teddy Holt\textsuperscript{2}
\textsuperscript{1}Naval Postgraduate School, Monterey, CA
\textsuperscript{2}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 GROUNDBASED HIGH POWER HIGH FREQUENCY (HF) RADIOWAVE HEATING
Wayne Scales\textsuperscript{1}
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\textsuperscript{1}, W. A. Scales\textsuperscript{2}, M. Kosch\textsuperscript{3,4}, A. Senior\textsuperscript{4}, A. Mohebalhojeh\textsuperscript{1}, M. Farahani\textsuperscript{1}, S. Ghader\textsuperscript{1}
\textsuperscript{1}Institute of Geophysics, University of Tehran, Tehran, IRAN
\textsuperscript{2}Virginia Tech, Blacksburg, VA
\textsuperscript{3}South African National Space Agency, Hermanus, SOUTH AFRICA
\textsuperscript{4}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\textsuperscript{1}, 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\textsuperscript{1}, 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\textsuperscript{1}, Taylor Hall\textsuperscript{1}, Jeremiah Williams\textsuperscript{2}, Uwe Konopka\textsuperscript{2}, Tetyana Antonova\textsuperscript{3}, Christina Knaepk\textsuperscript{3}, Mikhail Pustynnik\textsuperscript{3}, Hubertus Thomas\textsuperscript{3}
\textsuperscript{1}Physics, Auburn University, Auburn, AL
\textsuperscript{2}Physics, Wittenberg University, Springfield, OH
\textsuperscript{3}Complex Plasma Division, Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Oberpaffenhofen, GERMANY
FRIDAY AFTERNOON, continued

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 Rubanuusuri1, Jasper S. Halekas1, Yuki Harada2, Gina A. DiBraggio3, Norberto Romangelli4,5, Jared R. Espley3, Laila Andersson6, Christian Mazelle4,5, David A. Brain6, David L. Mitchell2, Bruce M. Jakosky6
1The University of Iowa, Iowa City, IA
2Space Sciences Laboratory, University of California Berkeley, Berkeley, CA
3Solar System Exploration Division, NASA Goddard Space Flight Center, Greenbelt, MD
4CNRS, IRAP, Toulouse, FRANCE
5University Paul Sabatier, Toulouse, FRANCE
6Laboratory 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. Kurth1, Masafumi Imai1, George B. Hospodarsky1, Donald A. Gurnett1, Sadie S. Tetrick1, Scott J. Bolton2, John E. P. Connerney3, Steven M. Levin4
1University of Iowa, Iowa City, IA
2Southwest Research Institute, San Antonio, TX
3NASA Goddard Space Flight Center, Greenbelt, MD
4NASA 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. Hospodarsky1, William S. Kurth1, Donald A. Gurnett1, Scott J. Bolton2, Steven M. Levin3, John E. P. Connerney4
1University of Iowa, Iowa City, IA
2Southwest Research Institute, San Antonio, TX
3NASA Goddard Space Flight Center, Greenbelt, MD
4NASA Jet Propulsion Laboratory, Pasadena, CA

14:20 H5-4
JUPITER’S DECAMETRIC RADIATION OBSERVED BY JUNO AND EARTH-BASED RADIO OBSERVATORIES
Masafumi Imai1, William S. Kurth1, George B. Hospodarsky1, Scott J. Bolton2, John E. P. Connerney3, Steven M. Levin4, Tracy E. Clarke5, Charles A. Higgins6
1University of Iowa, Iowa City, IA
2Southwest Research Institute, San Antonio, TX
3NASA Goddard Space Flight Center, Greenbelt, MD
4NASA Jet Propulsion Laboratory, Pasadena, CA
5Observatoire de Paris, Meudon, FRANCE
6Naval Research Laboratory, Washington, DC
7Middle Tennessee State University, Murfreesboro, TN

14:30 H5-5
AN INVESTIGATION OF WHISTLER-MODE AURORAL HISS AT JUPITER USING THE JUNO SPACECRAFT
Sadie S. Tetrick1, William S. Kurth1, Masafumi Imai1, George B. Hospodarsky1, Donald A. Gurnett1, Scott J. Bolton2, John E. P. Connerney3, Steven M. Levin4, Barry H. Mauk5
1University of Iowa, Iowa City, IA
2Southwest Research Institute, San Antonio, TX
3NASA Goddard Space Flight Center, Greenbelt, MD
4NASA Jet Propulsion Laboratory, Pasadena, CA
5Johns 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. Gurnett1, W. S. Kurth1, G. B. Hospodarsky1, S. J. Bolton2, J. E. P. Connerney3, S. M. Levin4
1University of Iowa, Iowa City, IA
2Southwest Research Institute, San Antonio, TX
3NASA Goddard Space Flight Center, Greenbelt, MD
4NASA Jet Propulsion Laboratory, Pasadena, CA

15:40 H5-7
AN OVERVIEW OF SATURN RADIO EMISSIONS
Shengyi Ye1, William S. Kurth1, Georg Fischer2, John D. Menietti1, Donald A. Gurnett1
1Physics and Astronomy, University of Iowa, Iowa City, IA
2Space 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

14:00 J6-4

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Session J7: Planetary Remote Sensing (Special Session), Math 100
Co-Chairs: Bryan Butler, National Radio Astronomy Observatory;
Peter Williams, Harvard University

15:00 J7-1
EARLY OBSERVATIONS OF JUPITER WITH JUNO'S MICROWAVE RADIOMETER
Michael A. Janssen1, Scott J. Bolton2, Steven M. Levin1, Virgil Adumitroaie1, Michael D. Allison3, John K. Arballo1, Sushil K. Atreya4, Amadeo Bellotti5, Shannon T. Brown1, Andrew P. Ingersoll6, Laura A. Jewell1, Cheng Li1, Liming Li7, Jonathan I. Lunine8, Sidharth Misra1, Glenn S. Orton1, Maarten Roos4, Daniel Santos-Costa2, Edwin Sarkissian1, Paul G. Steffes5, Ross Williamson1
1NASA Jet Propulsion Laboratory, Pasadena, CA
2Southwest Research Institute, San Antonio, TX
3Goddard Institute of Space Studies, New York, NY
4University of Michigan, Ann Arbor, MI
5Georgia Institute of Technology, Atlanta, GA
6California Institute of Technology, Pasadena, CA
7University of Texas, Houston, TX
8Cornell University, Ithaca, NY

15:40 J7-2
USE OF THE JUNO MICROWAVE RADIOMETER (MWR) IN THE STUDY OF JOVIAN ATMOSPHERIC COMPOSITION, STRUCTURE, AND DYNAMICS
Amadeo Bellotti*, Paul G. Steffes1, Michael A. Janssen2, Steven M. Levin2, Samuel Gulkis2
1Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA
2NASA Jet Propulsion Laboratory, Pasadena, CA

16:00 J7-3
INVESTIGATING AMMONIA GAS IN THE JOVIAN ATMOSPHERE USING CENTIMETER WAVELENGTH TOTAL FLUX
Ramsey L. Karim1, David DeBoer1, Imke de Pater1, Garrett Keating1
1Astronomy, University of California Berkeley, Berkeley, CA
2Harvard-Smithsonian Center for Astrophysics, Cambridge, MA

16:20 J7-4
IMPROVING THE PLANETARY EPHEMERIS WITH VLBA ASTROMETRY: TRANSITIONING FROM CASSEINI TO JUNO
Dayton Jones1, William Folkner2, Robert Jacobson2, Christopher Jacobs2, Jonathan Romney3, Vivek Dhawan3, Edward Fomalont4
1Space Science Institute, Boulder, CO
2NASA Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA
3National Radio Astronomy Observatory, Socorro, NM
4National Radio Astronomy Observatory, Charlottesville, VA

16:40 J7-5
OBSERVATIONS OF SOLAR SYSTEM BODIES WITH THE VLA AND ALMA
Bryan Butler1
1National Radio Astronomy Observatory, Socorro, NM

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

14:00 K3-3
RFI MITIGATION IN MICROWAVE RADIOMETERS FOR INTERNAL BODY THERMOMETRY VIA ADAPTIVE FILTERING
Michael Fromandi*, Parisa Momenroodaki, Zoya Popovic
Electrical and Computer 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
CU-Boulder Engineering Center (EC)