USNC–URSI National Radio Science Meeting

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

Board on International Scientific Organizations
U.S. National Committee for the
International Union of Radio Science
National Academy of Sciences

9–12 January 2019
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
### 2019 USNC-URSI National Radio Science Meeting

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

<table>
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<tr>
<th>Room</th>
<th>105</th>
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<tr>
<td><strong>Wednesday 9 January 08:20-12:00</strong></td>
<td>A1 - Channel Sounder Measurements and Verification</td>
<td>C1 - Imaging and Distributed Sensing</td>
<td>G1 - Crowdsourcing for Terrestrial and Planetary Applications</td>
<td>F1 - Random and Complex Media Models</td>
<td>B1 - Antenna Arrays</td>
<td>H1 - Physics of the Radiation Belts I</td>
<td>J1 - Next Generation Very Large Array Design and Development</td>
<td>B2 - Nano-electromagnetics and Waveguiding Structures</td>
<td>B3 - Antennas for Specialized Platforms, Smartlans, UAVs, and UUVs</td>
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**Lunch**

**Special Event:** Historical Talk on Lise Meitner (Math 100)

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**17:00**

- Commission A 17:00
- Commission C 18:00

**18:00**

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

**Reception**

Reception for all Attendees in Engineering Center Lobby from 18:30 to 21:00

**Thursday 10 January 08:20-12:00**

Plenary Session (Math 100):
- Ernest K. Smith USNC-URSI Student Paper Competition

Meeting Highlight Plenary Talks: (1) IEEE SmartAg Initiative: Technology Applied to the Food Supply Chain; (2) Atacama Large Millimeter Array (ALMA) in 2030

**Lunch**

Lunch is Provided for all Students (Atrium at Koelbel - Business School)

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<tr>
<td><strong>Thursday 10 January 13:20-17:00</strong></td>
<td>K2 - RF, Microwave and THz Diagnostics, Therapeutics</td>
<td>G4 - Radar and Radio Techniques for Ionospheric Diagnostics</td>
<td>F3 - RF Propagation Utilizing Numerical Weather Prediction</td>
<td>B6 - Numerical Methods</td>
<td>H3 - Waves and Turbulence in Laboratory and Space Plasmas</td>
<td>J3 - Radio Emission from Extrasolar Planets</td>
<td>BK - Wearable, Implants, and Body-Area Networks</td>
<td>D2 - Components and Circuits for Wireless Applications</td>
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**17:00**

- Commission B 17:00
- Commission E 17:00

**18:00**

- Commission K 18:00
- Commission M 18:00
- Commission N 18:00
- Commission D 18:00

**Friday 11 January 08:20-12:00**

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<tr>
<td><strong>Friday 11 January 13:20-17:00</strong></td>
<td>FGH - GNSS and Radio Beacon Remote Sensing</td>
<td>F5 - Point-to-Point Propagation Effects: Measurements and Models</td>
<td>GH2 - Meteors, Orbral Debris, and Dusty Plasmas</td>
<td>J5 - Cosmology and Astrophysics at Low Frequencies II</td>
<td>B1O - Low-Profile Antennas from Gigahertz to Terahertz</td>
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**Special Event:** Sixth Hans Liebe Lecture (Math 100)
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. For further information on URSI, please visit www.ursi.org.

Both URSI and the U.S. National Committee (USNC) for 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 (NRS M) each January in Boulder, Colorado. This meeting is technically co–sponsored by the Antennas and Propagation Society of the Institute of Electrical and Electronics Engineers (IEEE/AP–S). The IEEE International Symposium on Antennas and Propagation and USNC–URSI Radio Science Meeting (RSM), co–sponsored by the IEEE/AP–S and USNC–URSI, is held each summer. Every five to eight years, a North American Radio Science Meeting (NARS M) is organized, co–sponsored by the U.S. and Canadian National Committees for URSI. The last NARS M was held in Vancouver, British Columbia, Canada on July 19–25, 2015. The next NARS M will be held in Montreal, Quebec, Canada on July 4–11, 2020.

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

In addition to the GASS, URSI holds two other flagship meetings every three years, the Atlantic Radio Science Conference (AT–RASC) and the Asia–Pacific Radio Science Conference (AP–RASC). The last AT–RASC meeting was held on May 28 – June 1, 2018 at the ExpoMeloneras Convention Center, Gran Canaria, Spain (www.at–rasc.org). The next AP–RASC meeting will be held on March 5–9, 2019 at the India Habitat Centre, New Delhi, India (www.aprasc2019.com).

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

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

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In addition to the individuals listed above, the USNC–URSI Committee includes Members–at–Large, Society Representatives, Government Liaisons, Honorary Members, and U.S. scientists involved in international URSI roles. Other U.S. Scientists and staff members help USNC–URSI by having important supporting roles. These additional members of the USNC–URSI Committee and the supporting scientists and staff members are listed below.

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USNC–URSI would like to thank the following Special Session Organizers:

<table>
<thead>
<tr>
<th>Name</th>
<th>Color-coded Title</th>
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<tr>
<td>Chris Anderson</td>
<td>Philip Erickson</td>
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<td>Reyhan Baktur</td>
<td>Alex Fletcher</td>
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<td>Stuart Bale</td>
<td>Alyson Ford</td>
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<td>Charles Baylis</td>
<td>Al Gasiewski</td>
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<td>Tom Gaussiran</td>
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<td>Paul Bernhardt</td>
<td>Mark Golkowski</td>
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<td>Shubhendu Bhardwaj</td>
<td>Ryan Green</td>
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<td>Rebecca Bishop</td>
<td>Tracy Haack</td>
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<td>Judd Bowman</td>
<td>Vijay Harid</td>
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<td>Stan Briczinski</td>
<td>Kate Horgan</td>
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<td>Gary Brown</td>
<td>Poorya Hosseini</td>
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<td>Berhanu Bulcha</td>
<td>Gregory Huff</td>
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<td>Terry Bullett</td>
<td>Ashwin Iyer</td>
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<td>Roy Cafas</td>
<td>David Jackson</td>
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<td>Filippo Capolino</td>
<td>Asimina Kiourti</td>
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<td>Jean-Francois Chamberland-Tremblay</td>
<td>Dave Kunkee</td>
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<td>Goutam Chattopadhyyay</td>
<td>Joe Lazio</td>
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<td>Jonathan Chisum</td>
<td>Robert Lysak</td>
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<td>Sigrid Close</td>
<td>David Malaspina</td>
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<td>Lawrence Cohen</td>
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<td>Chris Crabtree</td>
<td>Majid Manteghi</td>
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<td>Juming Dia</td>
<td>Robert Marshall</td>
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<td>Charles Dietlein</td>
<td>Bob McCoy</td>
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<td>Steve Durand</td>
<td>Ghanshyam Mishra</td>
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<td>Negar Ehsan</td>
<td>Sidharth Misra</td>
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Eric Mokole
Bashir Morshed
Y. Jade Morton
Saba Mudaliar
Eliana Nossa
Scott Palo
Victor Pasko
Zoya Popovic
Jeanne Quimby
Steve Reising
Fabiano Rodrigues
Jim Schroeder
Rob Selina
Satish K. Sharma
Carl Siefring
John Stang
John Swoboda
Greg Taylor
Nithyanandan Thyagarajan
Julio Urbina
Karl Warnick
Alex Wolstecan
Nikolay Zabotin

New in 2019: Look for Color–Coded Name Badges

The colored ribbons attached to certain individuals’ name tags will help you identify the Officers, Commission Chairs and Committee Members of the USNC–URSI, as well as recognize those who have volunteered to serve as session chairs. If you have any questions about USNC–URSI, please ask one of these leaders.

Blue: USNC–URSI Officer
Green: USNC–URSI Committee Member
Orange: USNC–URSI Commission Chair
Red: Session Chair

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, 8 January 2019
USNC–URSI Business Meeting
17:00 – 21:00, Marriott Hotel

WEDNESDAY, 9 January 2019
MORNING SESSIONS
Session A1 08:20, Room 105
Session B1 08:20, Room 200
Session B2 08:20, Room 1B40
Session B3 10:20, Room 1B40
Session C1 08:20, Room 135
Session C2 10:20, Room 135
Session F1 08:20, Room 155
Session G1 08:20, Room 151
Session G2 10:20, Room 151
Session H1 08:20, Room 245
Session J1 08:20, Room 265

Special Historical Lecture 12:15, Room Math 100,

AFTERNOON SESSIONS
Session AD 13:20, Room 105
Session B4 13:20, Room 1B40
Session B5 13:20, Room 200
Session C3 13:20, Room 135
Session CDEJ 15:20, Room 135
Session D1 13:20, Room 1B51
Session F2 13:20, Room 155
Session G3 13:20, Room 151
Session GH1 15:20, Room 151
Session H2 13:20, Room 245
Session J2 13:20, Room 265
Session K1 13:20, Room 150

BUSINESS MEETINGS
Commission E 17:00, Room 135
Commission F 17:00, Room 155
Commission A 18:00, Room 105
Commission C 18:00, Room 135
Commission J 18:00, Room 265

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

THURSDAY, 10 January 2019
MORNING PLENARY SESSIONS
Student Paper Competition
08:20, Mathematics Auditorium (Math 100)

Meeting Highlight Plenary Talks
10:00, Mathematics Auditorium (Math 100)

THURSDAY, 10 January 2019
MORNING PLENARY SESSIONS
Student Paper Competition
08:20, Mathematics Auditorium (Math 100)
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Meeting Highlight Plenary Talks
10:00, Mathematics Auditorium (Math 100)
National Radio Science Meeting
9–12 January 2019
University of Colorado Boulder
Sponsored by USNC–URSI

TUESDAY EVENING, 8 January 2019

17:00 – 21:00 USNC–URSI Business Meeting, Marriott Hotel

WEDNESDAY MORNING, 9 January 2019

Session A1: Channel Sounder Measurements and Verification
Room 105
Co–Chairs: Jeanne Quimby, NIST Boulder; Christopher Anderson, US Naval Academy

08:20 A1–1
AN NTIA/ITS HIGH–PERFORMANCE CW CHANNEL SOUNDER
Robert T. Johnk*, Chris A. Hammerschmidt
Institute for Telecommunication Sciences, Boulder, CO

08:40 A1–2
A SOFTWARE DEFINED RADIO PN CHANNEL SOUNDER FOR UNMANNED AERIAL VEHICLES
Kenneth R. Baker1,2, Christopher R. Anderson2
1Theory Division, Institute for Telecommunication Sciences, Boulder, CO
2Wireless Measurement Group, US Naval Academy, Annapolis, MD

09:00 A1–3
PRECISION GEOLOCATION FOR PROPAGATION MEASUREMENTS IN THE FIELD: CONSIDERATIONS AND BEST PRACTICES
Anna Paulson*
Institute for Telecommunication Sciences/Spectrum and Propagation Measurements Division, National Telecommunications and Information Administration, Boulder, CO

09:20 A1–4
MODELING THE SPATIO–TEMPORAL RESOLUTION OF DIRECTIONAL CHANNEL SOUNDERS
David G. Michelson*, Anmol Bhardwaj
Electrical and Computer Engineering, University of British Columbia, Vancouver, BC, CANADA

09:40 A1–5
CHANNEL SOUNDER MEASUREMENT VERIFICATION: CONDUCTED MEASUREMENT CAMPAIGN
Jeanne Quimby1,2, Chris Hammerschmidt2, Amanda Koepke1, Robert Johnk2, Jacob Rezac1, Jeffrey Jargon1, Rod Leonhardt1, Kate A. Remley1, Paul Mckenna2, Irena Stange2, Mike Chang2, Paul Hale1, Nicholas DeMinco2, Savio Tran1
1NIST Boulder, Boulder, CO
2ITS Boulder, Boulder, CO

10:00 Break

10:20 A1–6
CHANNEL SOUNDER MEASUREMENT VERIFICATION: OPEN AREA TEST SITE MEASUREMENT CAMPAIGNS
Robert Johnk*, Jeanne Quimby1, Chris Hammerschmidt2, Amanda Koepke1, Irena Strang1, Mike Chang1, Savio Tran1, Jacob Rezac2, Jeffrey Jargon1, Rod Leonhardt2, Paul Mckenna1, Nicholas DeMinco1, Paul Hale1, Kate A. Remley2
1ITS Boulder, Boulder, CO
2NIST Boulder, Boulder, CO

10:40 A1–7
CHANNEL SOUNDER MEASUREMENT VERIFICATION: RANDOM MEASUREMENT ERROR
Amanda Koepke*, Jeanne Quimby1, Chris Hammerschmidt2, Jacob Rezac1, Rod Leonhardt1, Paul Hale1, Robert Johnk2, Paul Mckenna2, Jeffrey Jargon1, Irena Stange2, Mike Chang2, Kate A. Remley1, Savio Tran1, Nicholas DeMinco2
1NIST Boulder, Boulder, CO
2ITS Boulder, Boulder, CO

11:00 A1–8
CHANNEL SOUNDER MEASUREMENT VERIFICATION: BEST PRACTICES
Chris Hammerschmidt*, Jeanne Quimby2, Amanda Koepke2, Jacob Rezac2, Robert Johnk1, Jeffrey Jargon2, Rod Leonhardt2, Paul Hale2, Paul Mckenna1, Irena Stange1, Mike Chang1, Savio Tran1, Nicholas DeMinco2
1ITS Boulder, Boulder, CO
2NIST Boulder, Boulder, CO

11:20 A1–9
CHANNEL MODEL COMPARISON FOR 28 GHZ MILLIMETER WAVE IN SUBURBAN AND RURAL ENVIRONMENTS
Yaguang Zhang1, Christopher R. Anderson2
1School of Electrical and Computer Engineering, Purdue University, West Lafayette, IN
2Electrical and Computer Engineering, United States Naval Academy, Annapolis, MD

11:40 A1–10
SPATIAL VARIABILITY OF RADIO–FREQUENCY NOISE IN URBAN ENVIRONMENTS IN THE VHF AND UHF BANDS
Caitlin E. Haedrich*, Daniel J. Breton, Keith D. Wilson
Signature Physics, Cold Regions Research and Engineering Laboratory, Hanover, NH

Session B1: Antenna Arrays
Room 200
Co–Chairs: Filippo Capolino, University of California, Irvine; Nader Behdad, University of Wisconsin-Madison

08:20 B1–1
SIMPLIFYING AND GENERALIZING ANTENNA ARRAY EXPRESSIONS WITH THE ANTENNA EQUATION
Everett G. Farr*
Farr Fields, LC, Albuquerque, NM
08:40 B1–2
EXPERIMENTAL COMPARISON OF DIGITAL BEAMFORMING INTERFERENCE CANCELLATION ALGORITHMS USING A SOFTWARE DEFINED RADIO ARRAY
Daniel C. Gaydos*, Payam Nayeri, Randy Haupt
Electrical Engineering, Colorado School of Mines, Golden, CO

09:00 B1–3
A COMPACT BEAM STEERING DRA ANTENNA FOR WIRELESS POWER TRANSFER
Reza Karimian Bahnemiri, Behzad Koosha*, Shahrokh Ahmadi, Mona Zaghoul
Electrical and Computer Engineering, The George Washington University, Washington, DC

09:20 B1–4
DESIGN OF WIDEBAND ELLIPTIC MONOPOLE ANTENNA ARRAYS WITH CONSTANT HALF-POWER BEAMWIDTH
Dakotah J. Simpson*, Christopher G. Gay, Dimitra Psychogiou
Electrical, Computer, and Energy Engineering, University of Colorado Boulder, Boulder, CO

09:40 B1–5
A WIDEBAND DIFFERENTIALLY FED TIGHTLY COUPLED DIPOLE ARRAY
Alexander D. Johnson*, Elias A. Alwan, John L. Volakis
Florida International University, Miami, FL

10:00 Break

10:20 B1–6
5G MASSIVE MIMO BASE STATION PANELS WITH DUAL LINEAR POLARIZED VIVALDI ARRAY ANTENNA APERTURE
Hao–Lung Chu, Ghanshyam Mishra*, Satish Kumar Sharma
Electrical and Computer Engineering, San Diego State University, San Diego, CA

10:40 B1–7
DEPLOYABLE ULTRA-WIDEBAND TIGHTLY COUPLED DIPOLE TEXTILE ARRAY
Matthew W. Nichols*, Alexander D. Johnson, Elias A. Alwan, John L. Volakis
Florida International University, Miami, FL

11:00 B1–8
EXTENDED BUTLER MATRIX DESIGN BY USING PHASE RECONFIGURABLE CRLH TRANSMISSION LINE
Reza Karimian Bahnemiri, Behzad Koosha*, Shahrokh Ahmadi, Mona Zaghoul
Electrical and Computer Engineering, The George Washington University, Washington, DC

11:20 B1–9
WIDEBAND DUAL-POLARIZED CAVITY-BACKED VIVALDI ARRAY ANTENNAS FOR BI-STATIC SIMULTANEOUS TRANSMIT RECEIVE
Elie G. Tianang*, Mohamed A. Elmansouri, Dejan S. Filipovic
Electrical, Computer, and Energy Engineering, University of Colorado Boulder, Boulder, CO

11:40 B1–10
BROADBAND SMALL-APERTURE DIRECTION FINDING ARRAY WITH AZIMUTH AND ELEVATION ESTIMATION CAPABILITY
Ruyu Ma*, Nader Behdad
Electrical and Computer Engineering, University of Wisconsin–Madison, Madison, WI

Session B2: Nano-electromagnetics and Waveguiding Structures
Room 1B40
Co-Chairs: Zoya Popovic, University of Colorado Boulder; Dimitrios Peroulis, Purdue University

08:20 B2–1
H-PLANE CAVITY FILTERS AND DIPLEXERS FOR MICROWAVE RADIOMETERS
Zheng Wang*
Boulder Environmental Sciences and Technology, Boulder, CO

08:40 B2–2
CAD OF SELF-BIASED FERRITE CIRCULATORS
Laila F. Marzall*, Mauricio Pinto, Andrea Ashley, Dimitra Psychogiou, Zoya Popovic
Electrical, Computer, and Energy Engineering, University of Colorado Boulder, Boulder, CO

09:00 B2–3
GAAS MMIC ACTIVE CIRCULATOR
Laila Marzall*, Zoya Popovic
Electrical, Computer, and Energy Engineering, University of Colorado Boulder, Boulder, CO

09:20 B2–4
HYBRID WEDGE-INTEGRATED PLASMONIC-PHOTONIC WAVEGUIDE
Zahra Manzoor*
Missouri University of Science and Technology, Rolla, MO

09:40 B2–5
EMBEDDED MTM-EBGS FOR ANTENNA APPLICATIONS
Stuart Barth, Braden P. Smyth, Jacob A. Brown, Ashwin K. Iyer*
Electrical and Computer Engineering, University of Alberta, Edmonton, Alberta, CANADA

Session B3: Antennas for Specialized Platforms: SmallSats, UAVs, and UUVs
Room 1B40
Co-Chairs: Reyhan Baktur, Utah State University; David Jackson, University of Houston

10:20 B3–1
REPRESENTATIVE LOW-PROFILE GREGORIAN REFLECTOR ANTENNA DESIGN WITH A COMPACT DEPLOYMENT STRATEGY FOR EMERGING CUBESATS
Vignesh Manohar*, Jordan Budhu, Yahya Rahmat-Samii
Electrical and Computer Engineering, University of California, Los Angeles, Los Angeles, CA
WEDNESDAY MORNING, continued

10:40 B3–2
COMPACT HIGH ISOLATION PLANAR RX–TX KU BAND PHASED ARRAYS FOR UNMANNED AERIAL SYSTEMS (UAS)
Jakob W. Kunzler*, Jacob M. Bartschi, Karl F. Warnick
Electrical and Computer Engineering, Brigham Young University, Provo, UT

11:00 B3–3 (Invited)
DESIGN OF A RECONFIGURABLE, PLATFORM–BASED HF DIRECTION FINDING SYSTEM USING THE CHARACTERISTIC MODE THEORY
Kai Ren*, Ruyu Ma, Nader Behdad
Electrical and Computer Engineering, University of Wisconsin–Madison, Madison, WI

11:20 B3–4
INFLATABLE ANTENNAS AND ANTENNAS PRINTED ON WEATHER BALLOONS
Robert M. McKay*, Reyhan Baktur
Electrical and Computer Engineering, Utah State University, Logan, UT

11:40 B3–5
A STUDY ON EFFECTS OF SMALL BREAKAGES ON AN ANTENNA
Dave W. Barker*, Reyhan Baktur
Electrical Engineering, Utah State University, Logan, UT

Session C1: Imaging and Distributed Sensing
Room 135
Co–Chairs: Jean–Francois Chamberland, Texas A&M University; Gregory Huff, The Pennsylvania State University; Eric Mokole, The MITRE Corporation

08:20 C1–1
AUTOMATIC SENSOR RECONFIGURATION BASED ON ADAPTIVE RELEVANCE VECTOR MACHINE FOR UNCERTAINTY REDUCTION IN TOMOGRAPHY IMAGING
Daniel Ospina Acero*, Shah M. Chowdhury1, Fernando L. Teixeira1, Qussai M. Marashdeh2
1ElectroScience Laboratory, Electrical and Computer Engineering, The Ohio State University, Columbus, OH
2Tech4Imaging, Columbus, OH

08:40 C1–2
EVALUATING CROSS–PLANE ACQUISITIONS FOR VOLUME PROCESS TOMOGRAPHY IN THE LAPLACIAN REGIME
Rafiuje K. Rasel1, Daniel Ospina Acero1, Fernando L. Teixeira1, Qussai M. Marashdeh2
1Electrical and Computer Engineering, The Ohio State University, Columbus, OH
2Tech4Imaging LLC, Columbus, OH

09:00 C1–3
VELOCITY PROFILING OF TWO–PHASE FLOWS BASED ON SOFT–FIELD VOLUME TOMOGRAPHY
Shah M. Chowdhury1, Rafiuje K. Rasel1, Fernando L. Teixeira1, Qussai M. Marashdeh2
1Electrical and Computer Engineering, The Ohio State University, Columbus, OH
2Tech4Imaging LLC, Columbus, OH

09:20 C1–4
A SELF–SUSTAINING MARITIME MESH NETWORK
Ali Hosseini–Fahraj1, Kexiong Zeng, Yaling Yang, Majid Manteghi
Electrical and Computer Engineering, Virginia Polytechnic Institute & State University, Blacksburg, VA

09:40 C1–5
AN ANTENNA SYSTEM FOR AUTONOMOUS UNDERWATER VEHICLE
Pedram Loghmennia*, Majid Manteghi
Electrical and Computer Engineering, Virginia Polytechnic Institute & State University, Blacksburg, VA

Session C2: Array Performance for Transmit and Receive Systems
Room 135
Co–Chairs: Lawrence Cohen, Naval Research Laboratory; Eric Mokole, The MITRE Corporation

10:20 C2–1
USING THE ANTENNA EQUATION TO DESCRIBE COUPLING INTO AND LEAKAGE FROM IMPERFEKTLY SHIELDED ENCLOSURES
Everett G. Farr*
Farr Fields, LC, Albuquerque, NM

10:40 C2–2
WIDEBAND TRANSMIT NOISE SUPPRESSION IN STAR SYSTEM WITH UWB ARRAYS
Satheesh Bojja Venkatakrishnan*, Alexander Hovsepian, Elias Alwan, John Volakis
Electrical and Computer Engineering, Florida International University, Miami, FL

11:00 C2–3
IMPROVING THE PERFORMANCE OF ARRAY RECEIVERS BY EXPLOITING THE BASIC PHYSICS OF SPACETIME
Arjuna Madanayake1, Soumyajit Mandal2, Yingying Wang2, Jifu Liang2, Leonid Belostotski3
1Florida International University (FIU), Miami, FL
2Case Western Reserve University (CWRU), Cleveland, OH
3University of Calgary, Calgary, AB, CANADA

11:20 C2–4
MECHANICAL ROTATING ARRAYS FOR SIDELOBE SUPPRESSION
Junming Diao*, Maziar Hedayati, Rustu U. Tok, Yuanxun E. Wang
University of California, Los Angeles, Los Angeles, CA
11:40 C2–5
EXPERIMENTAL DEMONSTRATION OF DISTRIBUTED BEAMFORMING ON TWO FLYING MINI–DRONES
Junming Diao*, Maziar Hedayati, Yunxuan E. Wang
University of California, Los Angeles, Los Angeles, CA

Session F1: Random and Complex Media Models
Room 155
Co–Chairs: Saba Mudaliar, Air Force Research Laboratory; Gary Brown, Virginia Polytechnic Institute & State University

08:20 F1–1
ANALYTIC APPROACHES TO MULTIPLE SCATTERING ON ROUGH SURFACES
Gary S. Brown*, Kevin Diomedi
EMIL, Electrical and Computer Engineering, Virginia Polytechnic Institute & State University, Blacksburg, VA

08:40 F1–2 (Invited)
A METHOD OF A TANGENT CYLINDER IN THE THEORY OF WAVE SCATTERING BY CONVEX SURFACES
Alexander G. Voronovich*
Physical Sciences Division, NOAA/ESRL, Boulder, CO

09:00 F1–3 (Invited)
BISTATIC RADAR SCATTERING FROM THE OCEAN SURFACE: ASSESSMENT OF VALIDITY OF THE KIRCHHOFF–GEOMETRIC OPTICS APPROACH USING THE SMALL SLOPE APPROXIMATION
Valery U. Zavorotny*, Alexander G. Voronovich¹
¹NOAA/Earth System Research Laboratory, Boulder, CO
²CIRES, University of Colorado Boulder, Boulder, CO

09:20 F1–4 (Invited)
A STUDY OF FORWARD MODELS FOR PREDICTING CROSS–POLARIZED BACKSCATTER FROM SOIL SURFACES
Shanka N. Wijesundara*, Joel T. Johnson
ElectroScience Laboratory, The Ohio State University, Columbus, Ohio

09:40 F1–5 (Invited)
TIME–DOMAIN ANALYSIS OF MULTIPLE SCATTERING EFFECTS ON THE RADAR CROSS SECTION (RCS) OF OBJECTS IN A RANDOM MEDIUM
Chenxin Su*, Akira Ishimaru¹, Yasuo Kuga¹,
Sermakul Jaruwatanadilok²
¹Electrical Engineering, University of Washington, Seattle, WA
²Jet Propulsion Laboratory, Pasadena, CA

10:00 Break

10:20 F1–6
A MODAL ANALYSIS OF SCATTERING OF OBJECTS IN AN INHOMOGENEOUS WAVEGUIDE
Saba Mudaliar¹, Prabavathi Chidambaram²
¹Sensors Directorate, Air Force Research Laboratory, Dayton, OH
²P.O. Box 24467, Independent Researcher, Huber Heights, OH

WEDNESDAY MORNING, continued

10:40 F1–7 (Invited)
PROPAGATION IN HIGHLY ANISOTROPIC RANDOM MEDIA
Charles L. Rino*, Charles S. Corran
Institute for Scientific Research, Boston College, Chestnut Hill, MA

11:00 F1–8 (Invited)
DECONVOLUTION–IMPROVED ANGULAR RESOLUTION IN THE EARLY–TIME DIFFUSION IMAGING THROUGH RANDOM MEDIA
Elizabeth Bleszynski*, Marek Bleszynski, Thomas Jaroszewicz
Monopole Research, Thousand Oaks, CA

11:20 F1–9 (Invited)
NUMERICAL COMPUTATION OF SIGNAL LOG–AMPLITUDE VARIANCE IN TROPOSPHERIC TURBULENCE
Swagato Mukherjee*, Caglar Yardim
The Ohio State University, Columbus, OH

11:40 F1–10 (Invited)
BISTATIC SCATTERING FROM FORESTS WITH UNDERLYING ROUGH SURFACES
Can Suer*, Roger Lang
Electrical and Computer Engineering, George Washington University, Washington, DC

Session G1: Crowd Sourcing for Terrestrial and Planetary Applications
Room 151
Co–Chairs: Fabiano Rodrigues, The University of Texas at Dallas; Roy Calfas, The University of Texas at Austin

08:20 G1–1
INVESTIGATING CELL PHONE GNSS FOR IONOSPHERE REMOTE SENSING
Susan Skone*, Sajan Mushini
University of Calgary, Calgary, Alberta, CANADA

08:40 G1–2
FLEXIBLE, DEPLOYABLE RADIO INSTRUMENTS USING RAPID HARDWARE AND DIGITAL RF SOFTWARE
Ryan Volz*, Frank D. Lind, John Swoboda, Philip J. Erickson
MIT Haystack Observatory, Westford, MA

09:00 G1–3
THE IARPA PASSIVE IONOSPHERIC NON–CHARACTERIZED SOUNDING (PINS) CHALLENGE
Torreon Creekmore¹, Eugene V. Dao², Patrick B. Dandenaürt³, Ethan S. Miller⁴, Charles Gill⁵
¹IARPA, Riverdale Park, MD
²Space Vehicles Directorate, Air Force Research Laboratory, Albuquerque, NM
³Johns Hopkins University Applied Physics Laboratory, Laurel, MD

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**Session G2: New Application of SmallSat Sensors in Space**

**Room 151**

Co-Chairs: Paul Bernhardt, Naval Research Laboratory; Rebecca Bishop, The Aerospace Corporation

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**10:20 G2–1**

**THE LOW–LATITUDE IONOSPHERE/ THERMOSPHERE ENHANCEMENTS IN DENSITY (LLITED) MISSION**

Rebecca L. Bishop*1, James H. Clemmons2, Aroh Barjatya3, Richard L. Walterscheid4

1The Aerospace Corporation, El Segundo, CA
2University of New Hampshire, Durham, NH
3Embry-Riddle Aeronautical University, Daytona Beach, FL

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**10:40 G2–2**

**UTILIZING GNSS RADIO OCCULTATION SENSORS ON SPACE WEATHER CUBESAT MISSIONS**

Rebecca L. Bishop*

The Aerospace Corporation, El Segundo, CA

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**11:00 G2–3**

**COMPOSITION OF THE TOPSIDE IONOSPHERE DETERMINED FROM PLASMA WAVE MEASUREMENTS USING THE RADIO RECEIVER INSTRUMENT ON E–POP**

Paul A. Bernhardt*1, Michael K. Griffin2, William C. Bougas2, A D. Howarth3, Gordon James4

1Plasma Physics, Naval Research Laboratory, Washington, DC
2Space Systems and Technology, MIT/Lincoln Laboratory, Lexington, MA
3Physics and Astronomy, University of Calgary, Calgary, Alberta, Canada

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**11:20 G2–4**

**SPACE– AND GROUND–BASED MEASUREMENTS OF RADIATION BELT PRECIPITATION: EXTENDING THE CAPABILITIES OF CUBESATS AND RADARS**

Diana Juarez Madera*1, Sigrid Close1, Alexander Crew2, Robert Marshall3

1Aeronautics and Astronautics, Stanford University, Stanford, CA
2Applied Physics Laboratory, Johns Hopkins University, Laurel, MD
3Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO

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**11:40 G2–5**

**CYGNSS: GLOBAL REMOTE SENSING WITH A CONSTELLATION OF SMALL SATELLITES**

Scott Gleason*1, Chris Ruf2, Dorina Twigg3, Charles Bussy-Virat3, Aaron Ridley3, Kyle Nave3

1UCAR, Boulder
2University of Michigan, Ann Arbor, MI
3Applied Defense Solutions, Denver, CO
WEDNESDAY MORNING, continued

11:20 J1–9 (Invited)
COMPOSITE 18M ANTENNA REFLECTOR FOR THE NGVLA
Dean R. Chalmers*, Gordon E. Lacy1, Mohammad Islam1, Richard Hellyer1, Joelle FitziSimmons1, Lynn Baker1, Matt C. Fleming1, Matt Wessel1
1National Research Council of Canada – Herzberg Astronomy and Astrophysics, Penticton, BC, CANADA
2Private Consultant, Issaquah, WA
3Minex Engineering, Antioch, CA
4SED Systems, Saskatoon, SK, CANADA

11:40 J1–10 (Invited)
THE LONG BASELINE MAJOR OPTION FOR THE NEXT GENERATION VERY LARGE ARRAY
Thomas J. Maccarone*
Physics and Astronomy, Texas Tech University, Lubbock, TX

WEDNESDAY NOON, 9 January 2019
Special Historical Lecture
Math 100

12:15 LM –1
LISE MEITNER: HER ESCAPE FROM GERMANY AND THE DISCOVERY OF FISSION
Anthea J. Coster*
MIT Haystack Observatory, Westford, MA

WEDNESDAY AFTERNOON, 9 January 2019
Session AD: Passive and Active Device and System Measurements
Room 105
Session Co–Chairs: Jeanne Quimby, NIST; Matt Simons, NIST

13:20 AD–1
TRANSIENT ANTENNA PATTERNS BASED ON THE ANTENNA EQUATION
Everett G. Farr*
Farr Fields, LC, Albuquerque, NM

13:40 AD–2
RADIO FREQUENCY POWER MEASUREMENTS BASED ON RYDBERG ATOM SPECTROSCOPY
Matt T. Simons*, Abdulaziz H. Haddab1, Marcus D. Kautz1, Joshua A. Gordon1, David A. Anderson1, Georg Raithel2,3, Christopher L. Holloway1
1CTL, NIST, Boulder, CO
2Rydberg Technologies, LLC, Ann Arbor, MI
3Physics, University of Michigan, Ann Arbor, MI

14:00 AD–3
DEVELOPMENT AND MEASUREMENT OF ULTRA–THIN ANTENNAS FOR MUOS
Steven Weiss*
US Army Research Laboratory, Adelphi, MD

14:20 AD–4
USING RADIATION PRESSURE TO DEVELOP A NEW SI TRACEABLE POWER MEASUREMENT
Christopher L. Holloway*, Matthew Simons, Alexandra Artusio–Glimpse, Ivan Ryger, Abdulaziz Haddab, David Novotny, Kyle Rogers, John Lehman, Paul Williams, Gordon Shaw
NIST, Boulder, CO

14:40 AD–5
ULTRA–WIDEBAND, COMPACT, AND HIGH–GAIN SLOT ANTENNA SYSTEM FOR FULL–DUPLEX APPLICATIONS
Seyed Mohammad Amjadi*, Kamal Sarabandi
The University of Michigan, Ann Arbor, MI

15:00 Break

15:20 AD–6
A SINGLE LAYER PLANAR K–BAND MONOPULSE RADAR RECEIVER
Michael C. Brown*, Changhi Li
Electrical and Computer Engineering, Texas Tech University, Lubbock, TX

15:40 AD–7
MILLIMETER WAVE INTEGRATED ANTENNA ARRAY ON LTCC
Maxence Carvalho*, Abe Akhiyat, John Volakis
Electrical and Computer Engineering, Florida International University, Miami, FL

16:00 AD–8
DIELECTRIC METAMATERIAL FOR ANTENNA SUBSTRATES
Quang Nguyen, Max Burnett*, Amir Zaghloul
U.S. Army Research Laboratory, Adelphi, MD

16:20 AD–9
MEASUREMENT OF A FOUR CHANNEL ANALOG BEAMFORMER FOR ANTI–JAM GPS APPLICATIONS
Jeffrey A. Maloney*, Steven D. Keller1, Theodore K. Anhony2, Steven J. Weiss1, Do–Hoon Kwon1, Ramakrishna Janaswamy1
1Electrical and Computer Engineering, University of Massachusetts Amherst, Amherst, MA
2Sensors and Electronic Devices Directorate, The US Army Research Laboratory, Adelphi, MD

16:40 AD–10
DIELECTRIC MEASUREMENTS OF HIGH PERMITTIVITY 3D PRINTED SUBSTRATES
Gregory Mitchell*, Thedore Anthony, Quang Nguyen
U.S. Army Research Laboratory, Adelphi, MD

Session B4: Metamaterials and Metasurfaces: Theory & Applications
Room 1B40
Session Co–Chairs: Ashwin Iyer, University of Alberta; Filippo Capolino, University of California, Irvine
MAGNET–FREE CIRCULATORS BASED ON LINEAR TIME–VARYING CIRCUITS
Ahmed Kord*, Andrea Alu
1Electrical and Computer Engineering, University of Texas at Austin, Austin, TX
2Advanced Science Research Center, City University of New York, New York, NY

EXCEPTIONAL POINTS OF DEGENERACY INDUCED IN LINEAR TIME–PERIODIC SYSTEMS
Hamidreza Kazemi*, Mohamad Y. Nada, Tarek Mealy, Ahmed F. Abdelshafy, Filippo Capolino
University of California, Irvine, Irvine, CA

N–PATH NETWORK ANALYSIS USING THE FLOQUET SCATTERING MATRIX METHOD
Cody R. Scarborough*, Anthony Grbic
Electrical Engineering and Computer Science, The University of Michigan, Ann Arbor, MI

RECTANGULAR WAVEGUIDE LOADED WITH A DIELECTRIC SLOT IN A THICK METALLIC SHIELD
Abdulaziz H. Haddab*, Edward F. Kuester1, Christopher L. Holloway2
1University of Colorado Boulder, Boulder, Colorado
2National Institute of Standards and Technology (NIST), Boulder, CO

DISPERSION AND FIELD CONTROL IN A METASURFACE–IMPLANTED WAVEGUIDE
Pai–yen Chen*, Danilo Erricolo1, Yue Li, Atif Shamim1, Hakan Bagci
1Electrical and Computer Engineering, University of Illinois at Chicago, Chicago, IL
2Electrical and Systems Engineering, University of Pennsylvania, Philadelphia, PA
3Division of Computer, Electrical, and Mathematical Science and Engineering, King Abdullah University of Science and Technology (KAUST), Thuwal, SAUDI ARABIA

SHAPE–INDEPENDENT ULTRA–SUBWAVELENGTH TOPOLOGICAL SUPERSCATTERERS
S. Ali Hassan Gangaraj1*, Constantininos Valagiannopoulos2, Francesco Monticone1
1School of Electrical and Computer Engineering, Cornell University, Ithaca, NY
2Physics, Nazarbayev University, Astana, KAZAKSTAN

ADVANCES IN METASURFACES BASED ON METAMATERIAL–LINED APERTURES AND DISCS
Mitchell Semple, Elham Baladi, Ashwin K. Iyer*
Electrical and Computer Engineering, University of Alberta, Edmonton, Alberta, CANADA

MANIPULATION OF FRESNEL COEFFICIENTS USING CROSS–ANISOTROPIC METASURFACE COATING
Guillaume Lavigne*, Christophe Caloz
Polytechnique Montreal, Montreal, Quebec, CANADA

DESIGN OF COMPACT BEAM–STEERING ACTIVE SLOT ANTENNAS WITH A METASURFACE REFLECTOR
Omid Manoochehri1, Danilo Erricolo1*, Amin Darvazehban1, Francesco Monticone1
1Electrical and Computer Engineering, University of Illinois at Chicago, Chicago, IL
2Electrical Engineering, University of Illinois at Chicago, Chicago, IL
3School of Electrical and Computer Engineering, Cornell University, Ithaca, NY, SAUDI ARABIA

A NOVEL X–BAND OPTICALLY TUNABLE TRANSMISSION SURFACE BASED ON LUMPED ELEMENT OPTOELECTRONIC COMPONENTS
Marco D. Poort*, Piergiorgio L. Usilenghi
University of Illinois at Chicago, Chicago, IL

EVANESCENT–MODE CAVITY–BACKED TUNABLE SLOT ANTENNA
Abbas Semnani*, Michael D. Sinanis, Dimitrios Peroulis
School of Electrical and Computer Engineering, Purdue University, West Lafayette, IN

A PLANAR POSITIONING SYSTEM FOR ANTENNAS
Damien M. Gilbert*, Yangqinq Liu, Danilo Erricolo
University of Illinois at Chicago, Chicago, IL

SMALL ANTENNA REMOTE IMPEDANCE MEASUREMENT
Ali Hosseini–Fahraj*, Majid Manteghi
Electrical and Computer Engineering, Virginia Polytechnic Institute & State University, Blacksburg, VA

PORT TO PORT ISOLATION OF AN OMNIDIRECTIONAL ANTENNA THROUGH PERFECT SYMMETRY FOR SIMULTANEOUS TRANSMIT AND RECEIVE (STAR)
Alexander Hovsepian*, Satheesh Boija Venkatakrishnan, Elias A. Alwan, John L. Volakis
Florida International University, Miami, FL
14:40 B5–5
HIGH DIRECTIVITY PARABOLIC REFLECTOR ANTENNA FOR SIMULTANEOUS TRANSMIT AND RECEIVE (STAR)
Merarys A. Caqius Olivera*, Prathap Valale Prasannakumar, Mohamed Elmansouri, Dejan S. Filipovic
Electrical, Computer and Energy Engineering, University of Colorado Boulder, Boulder, CO

15:00 Break

15:20 B5–6
A NEW 3D–PRINTED ELECTRONICALLY SCANNED SPINNING SPOT BEAM INHOMOGENEOUS DIELECTRIC LENS ANTENNA FOR SPACEBORNE WIND SCATTEROMETER WEATHER RADAR SATELLITES
Jordan F. Budhu*, Yahya Rahmat–Samii
Electrical and Computer Engineering, University of California Los Angeles, Los Angeles, CA

15:40 B5–7
DEPLOYABLE ULTRA WIDEBAND ANTENNA FOR CUBESATS
Alexander D. Johnson*, Satheesh Bojja Venkatakrishnan, Maifuz Ali, John L. Volakis
Florida International University, Miami, FL

16:00 B5–8
A SYSTEMATIC APPROACH FOR THE DESIGN OF METALLIC DELAY LENSES
Anastasios Papanastasopoulos*, Yahya Rahmat–Samii
Electrical and Computer Engineering, University of California Los Angeles, Los Angeles, CA

16:20 B5–9
DESIGN OF UWB SMALL LOOP ANTENNA WITH CONTINUOUS TUNING FREQUENCY 1–10 MHZ
Yubin Cai*, Daisong Zhang, Yahya Rahmat–Samii
Electrical and Computer Engineering, University of California Los Angeles, Los Angeles, CA

16:40 B5–10
EXPERIMENTAL RESULTS FROM A HIGHLY DIRECTIONAL AIR–TO–GROUND COMMUNICATIONS LINK
Sunil Ramlall*, Sally McGehee1, Jorge Romero1, Terrence Gibbons2, Nick Marcoux1, Adam Jones1, Kevin Quinn1
1SPAWAR Systems Center Pacific, San Diego, CA
2MIT Lincoln Laboratory, Lexington, MA
3Naval Undersea Warfare Center, Newport, RI

Session C3: Radar and Sensor Systems
Room 135
Session Co–Chairs: Gregory Huff, The Pennsylvania State University;
Jean–Francois Chamberland, Texas A&M University;
Eric Mokole, The MITRE Corporation

13:20 C3–1
INVESTIGATING 77 GHZ AUTOMOTIVE RADAR CORNER CASES USING HIGH FIDELITY FULL–PHYSICS SIMULATIONS
Ushemadzoro Chipengo*
ANSYS Inc., Ann Arbor, MI

13:40 C3–2
EFFECTS OF TIME–VARYING TRANSMIT AMPLIFIER MATCHING NETWORKS IN COGNITIVE RADAR APPLICATIONS
Austin S. Egbert*, Kyle Gallagher1, Charles Baylis1, Anthony Martone2, Ed Viveiros2, Robert Marks1
1Baylor University, Waco, TX
2Army Research Laboratory, Adelphi, MD

14:00 C3–3
VIRTUAL ANTENNA ARRAYS IN MIMO FMCW RADAR
Eloi Guerrero–Menéndez1, Jordi Verdú1, Pedro de Paco Sánchez*1,2
1Telecommunication and Systems Engineering, Universitat Autònoma de Barcelona, Bellaterra, SPAIN
2University of Colorado Boulder, Boulder, CO

14:20 C3–4
TOWARDS MULTIPLIERLESS DIGITAL ARCHITECTURES FOR APERTURE ARRAYS WITH 1024 RF BEAMS: A 32–BEAM BUILDING BLOCK AT 5.8 GHZ
Arjuna Madanayake1, Renato Cintra2, Soumyajit Mandal1, Viduneth Ariyarathna1, Sravan Pulipati1, Suresh Madishetty4, Diego Coelho3, Ted Rappaport2, Leonid Belostotski2
1Electrical and Computer Engineering, Florida International University (FIU), Miami, FL
2Electrical and Computer Engineering, University of Pernambuco, Recife, Pernambuco, BRAZIL
3Electrical and Computer Engineering, Case Western Reserve University, Cleveland, OH
4Electrical and Computer Engineering, University of Akron, Akron, OH

13:20 C3–1
INVESTIGATING 77 GHZ AUTOMOTIVE RADAR CORNER CASES USING HIGH FIDELITY FULL–PHYSICS SIMULATIONS
Ushemadzoro Chipengo*
ANSYS Inc., Ann Arbor, MI

13:40 C3–2
EFFECTS OF TIME–VARYING TRANSMIT AMPLIFIER MATCHING NETWORKS IN COGNITIVE RADAR APPLICATIONS
Austin S. Egbert*, Kyle Gallagher1, Charles Baylis1, Anthony Martone2, Ed Viveiros2, Robert Marks1
1Baylor University, Waco, TX
2Army Research Laboratory, Adelphi, MD

14:00 C3–3
VIRTUAL ANTENNA ARRAYS IN MIMO FMCW RADAR
Eloi Guerrero–Menéndez1, Jordi Verdú1, Pedro de Paco Sánchez*1,2
1Telecommunication and Systems Engineering, Universitat Autònoma de Barcelona, Bellaterra, SPAIN
2University of Colorado Boulder, Boulder, CO

14:20 C3–4
TOWARDS MULTIPLIERLESS DIGITAL ARCHITECTURES FOR APERTURE ARRAYS WITH 1024 RF BEAMS: A 32–BEAM BUILDING BLOCK AT 5.8 GHZ
Arjuna Madanayake1, Renato Cintra2, Soumyajit Mandal1, Viduneth Ariyarathna1, Sravan Pulipati1, Suresh Madishetty4, Diego Coelho3, Ted Rappaport2, Leonid Belostotski2
1Electrical and Computer Engineering, Florida International University (FIU), Miami, FL
2Electrical and Computer Engineering, University of Pernambuco, Recife, Pernambuco, BRAZIL
3Electrical and Computer Engineering, Case Western Reserve University, Cleveland, OH
4Electrical and Computer Engineering, University of Akron, Akron, OH

14:40 C3–5
WIDEBAND LEAKAGE CANCELLATION NETWORK FOR MONOSTATIC CONTINUOUS–WAVE RADARS
Farnaz Foroughian*, Aly E. Fathy
The University of Tennessee, Knoxville, TN

Session CDEJ: Spectrum Issues and Solutions for Next–Generation Wireless Systems
Room 135
Session Co–Chairs: Lawrence Cohen, Naval Research Laboratory;
Eric Mokole, The MITRE Corporation;
Zoya Popovic, University of Colorado Boulder

15:20 CDEJ–1
APPROACH FOR REAL–TIME SYNTHESIS OF SIMULTANEOUS RADAR AND SPATIALLY SECURE COMMUNICATIONS FROM A COMMON PHASED ARRAY
Gordon L. Ledford*, Pedro Rodriguez–Garcia, Charles Baylis,
13:40 D1–2 (Invited)
220 GHz AND 680 GHz DIRECT DETECTION POLARIMETRIC RECEIVERS FOR CLOUD ICE MEASUREMENTS
Caitlyn M. Cooke*1, Kevin M. K. H. Leong1, Xiaoa Bing Mei1, Jennifer Arroyo1, Manuel A. Vega1, Dong L. Wu2, William R. Deal3
1Northrop Grumman Corporation, Redondo Beach, CA
2Nuotronics Inc., Durham, NC
3NASA Goddard Space Flight Center, Greenbelt, MD

14:00 D1–3 (Invited)
A COMPACT 670–GHZ POLARIMETRIC RADIOMETER FOR CUBESAT CLOUD ICE OBSERVATIONS
Eric Bryerton*, Theodore Reck, Daniel Koller, Yiwei Duan, Jeffrey Hesler
Virginia Diodes, Inc., Charlottesville, VA

14:20 D1–4 (Invited)
SUBMILLIMETER–WAVE SCHOTTKY DIODES BASED ON HETEROGENEOUS INTEGRATION OF GAAS ONTO SILICON
Robert M. Weikle*1, Linli Xie, Souheil Naadri, Masoud Jafari, Christopher M. Moore, Naser Alijabbari, Michael E. Cyberey, N S. Barker, Arthur W. Lichtenberger
Electrical and Computer Engineering, University of Virginia, Charlottesville, VA

14:40 D1–5 (Invited)
BROADBAND ULTRA–COMPACT HIGH–POWER ARRAY LOCAL OSCILLATOR SOURCES FOR HIGH–SPECTRAL RESOLUTION SUBMILLIMETER–WAVE RECEIVERS
Jose V. Siles*, Jonathan H. Kawamura, Imran Mehdi
NASA Jet Propulsion Laboratory, Pasadena, CA

15:00 Break

15:20 D1–6 (Invited)
PICTURE THIS SELFII: A TECHNOLOGY MATURATION PROJECT FOR A SUBMILLIMETER ENCELADUS LIFE FUNDAMENTALS INSTRUMENT (SELFII)
Paul Racette*, Carrie Anderson1, Damon Bradley, Gordon Chin1, Negar Ehsan1, Terry Hurford1, Tilak Hewagama1, Tracee Jamison1, Tim Livengood2
1NASA Goddard Space Flight Center, Greenbelt, MD
2University of Maryland, College Park, MD

15:40 D1–7 (Invited)
μ–SPEC: AN INTEGRATED SPECTROMETER FOR THz SPECTROSCOPY
Emily M. Barrentine*1, Ari D. Brown1, Berhanu T. Bulcha1, Giuseppe Cataldo1, Negar Ehsan1, Larry Hess1, Omid Noroozian1,2, Thomas R. Stevenson1, Eric R. Switzer1, Kongpop U–Yen1, Edward J. Wollack1, S. H. Moseley1
1NASA–Goddard Space Flight Center, Greenbelt, MD
2Northrop Grumman Corporation, Redondo Beach, CA

Session D1: Submillimeter–Wave/ Terahertz Circuits and Applications
Room 1B51
Session Co–Chairs: Negar Ehsan, NASA Goddard Space Flight Center; Berhanu Bulcha, NASA Goddard Space Flight Center; Jonathan Chisum, University of Notre Dame

13:20 D1–1 (Invited)
SWIRP: COMPACT SUBMM–WAVE AND LWIR POLARIMETERS FOR CIRRUS ICE PROPERTIES
Dong L. Wu1,2, Manuel Vega1, William R. Deal1, William Gaines2, Caitlyn M. Cooke2, Russell Chipman3, Kira Hart1, Ping Yang4
1NASA Goddard Space Flight Center, Greenbelt, Maryland
2Aerospace Systems, Northrop Grumman Corp, Redondo Beach, CA
3College of Optical Sciences, University of Arizona, Tucson, AZ
4Atmospheric Sciences, Texas A&M University, College Station, TX
WEDNESDAY AFTERNOON, continued

13:20 F2–1
RELATING CYGNSS OBSERVATIONS TO SOIL MOISTURE VARIATIONS DURING THE 2018 HURRICANE SEASON
Orhan Eroglu*, Dylan R. Boyd, Ali C. Gurbuz, Mehmet Kurum
Electrical and Computer Engineering, University of Michigan, Ann Arbor, MI

13:40 F2–2
L–BAND HIGH SPATIAL RESOLUTION SOIL MOISTURE MAPPING USING SMALL UNMANNED AERIAL SYSTEMS
Eryan Dai1, Aravind Venkitasubramony1, Albin Gasiewski1, Maciej Stachura2, Jack Elston3
1ECEE, University of Colorado Boulder, Boulder, CO
2Black Swift Technologies (BST) LLC, Boulder, CO

14:00 F2–3
INVESTIGATION OF ROOT–ZONE SOIL MOISTURE PROFILE SENSITIVITY TO MULTIPLE SIGNAL OF OPPORTUNITY SOURCES
Dylan R. Boyd1, Mehmet Kurum1, Orhan Eroglu1, Ali Gurbuz1, James Garrison2, Benjamin Nold2, Manuel Vega3, Jeffrey Piepmeier1, Rajat Bindlish1
1Electrical and Computer Engineering, University of Michigan, Ann Arbor, MI
2National Radio Astronomy Observatory, Charlottesville, VA
3NASA Goddard Space Flight Center, Greenbelt, MD

14:20 F2–4
NON–DESTRUCTIVE DIELECTRIC CONSTANT MEASUREMENT OF A LOSS–LESS DIELECTRIC SLAB USING COHERENT MULTIPATH INTERFERENCE OF A WIDEBAND RADIATION
Seyedmohammad Mousavi1, Roger De Roo2, Kamal Sarabandi1, Anthony England3
1Electrical Engineering and Computer Science, University of Michigan, Ann Arbor, MI
2Climate and Space Sciences and Engineering, University of Michigan, Ann Arbor, MI
3College of Engineering and Computer Science, University of Michigan, Dearborn, MI

14:40 F2–5
USING 0.5–2 GHZ MICROWAVE RADIOMETRY FOR ARCTIC SEA–ICE THICKNESS AND SALINITY RETRIEVAL
Oguz Demir1, Mark Andrews1, Joel T. Johnson1, Kenneth Jezek2
1Byrd Polar and Climate Research Center, The Ohio State University, Columbus, OH
2ElectroScience Laboratory, The Ohio State University, Columbus, OH

15:00 Break

15:20 F2–6
EXPERIMENTAL VALIDATION OF AN ENDFIRE SAR AMBIGUITY FUNCTION
Onkar P. Pradhan*, Albin J. Gasiewski
University of Colorado Boulder, Boulder CO

15:40 F2–7
DETECTION, ANALYSIS AND MITIGATION OF SEA CLUTTER IN POLARIMETRIC WEATHER RADAR
Amit Dutta*, Chandrasekar Venkatachalam
Electrical and Computer Engineering, Colorado State University, Fort Collins, CO

16:00 F2–8
SIMULATIONS OF 3D CLOUD RADIATION FIELDS USING THE HORIZONTALLY INHOMOGENEOUS UNIFIED MICROWAVE RADIATIVE TRANSFER MODEL
Kun Zhang*, Albin J. Gasiewski
University of Colorado Boulder, Boulder, CO

16:20 F2–9
IDENTIFYING LIQUID CLOUD DROPLETS AND FROZEN HYDROMETEORS IN MIXED–PHASE CLOUDS USING 35–GHZ VERTICALLY POINTING RADAR VELOCITY SPECTRA
Christopher R. Williams*, Maximilian Maahn1, Joseph C. Hardin1, Gjis de Boer1
1Smead Aerospace Engineering Science, University of Colorado Boulder, Boulder, CO
2Cooperative Institute for Research in Environmental Sciences, University of Colorado Boulder, Boulder, CO
3NOAA Earth System Research Laboratory, Boulder, CO
4Pacific Northwest National Laboratory, Richland, WA

16:40 F2–10
UTILIZATION OF CONVOLUTIONAL NEURAL NETWORKS IN CLASSIFICATION OF SNOWFLAKES BASED ON IMAGES BY A MULTI–ANGLE SNOWFLAKE CAMERA
Adam C. Hicks*, V.N. Bringi, Branislav M. Notarros
Electrical and Computer Engineering, Colorado State University, Fort Collins, CO

Session G3: Space Plasma Measurement Techniques
Room 151
Session Co–Chairs: Thomas Gaussiran, The University of Texas at Austin;
Terry Bullett, University of Colorado Boulder

13:20 G3–1
JULIA STUDIES OF POST–MIDNIGHT EQUATORIAL SPREAD F EVENTS OBSERVED DURING THE 2008/2009 SOLAR MINIMUM
Fabiano S. Rodrigues1, Weijia Zhan1, Marco A. Milla2
1The University of Texas at Dallas, Richardson, TX
2Jicamarca Radio Observatory, Lima, PERU
HEATING CAMPAIGN
EPOP–RRI OBSERVATION DURING AN ARECIBO HF POLARIZATION MEASUREMENTS OF AN UNEXPECTED

14:00 G3–3
ANALYSIS OF SEVERE PHASE SCINTILLATION EVENTS OBSERVED IN THE AURORAL OVAL
James P. Conroy*, Kshitija Deshpande, Wayne Scales, Amir Zaghloul
1 Virginia Polytechnic Institute & State University, Blacksburg, VA
2 Embry–Riddle, Daytona Beach, FL

14:20 G3–4
DETERMINATION AND ANALYSIS OF THE REFRACTIVE CONTRIBUTION TO GPS PHASE VARIATIONS
Anthony M. McCaffrey, P. T. Jayachandran
Physics, University of New Brunswick, Fredericton, CANADA

Session GH1: Ionospheric Modification
Room 151
Session Co–Chairs: Eliana Nossa, Arecibo Observatory; Robert McCoy, Geophysical Institute University of Alaska Fairbanks; Stanley Briczinski, Naval Research Laboratory

15:20 GH1–1
EXCITATION AND MODELING OF ARTIFICIAL AURORA AT HAARP
Beket Tulegenov, Anatoly V. Streltsov, Elizabeth Kendall, Mike McCarrick, Ivan Galkin
1 Physical Sciences, Embry-Riddle Aeronautical University, Daytona beach, FL
2 SRI International, Menlo Park, CA
3 Naval Research Laboratory, Washington, DC
4 University of Massachusetts Lowell, Lowell, MA

15:40 GH1–2
INVESTIGATION OF STIMULATED ELECTROMAGNETIC EMISSION SECOND HARMONIC GENERATION
Augustine D. Yellu, Alirea Mahmoudian, Paul Bernhardt, Carl Siefring
1 Electrical and Computer Engineering, Virginia Polytechnic Institute & State University, Blacksburg, VA
2 Electrical and Computer Engineering, InterAmerican University, PUERTO RICO
3 Plasma Physics Division, Naval Research Laboratory, Washington, DC

16:00 GH1–3
HF TRANSMITTED POWER EXPERIMENT AND THE ISR DIAGNOSTICS AT ARECIBO
Eliana Nossa, Michael Sulzer, Phil Perillat, Nestor Aponte
Arecibo Observatory, Arecibo, PUERTO RICO

16:20 GH1–4
POLARIZATION MEASUREMENTS OF AN UNEXPECTED EPOP–RRI OBSERVATION DURING AN ARECIBO HF HEATING CAMPAIGN

WEDNESDAY AFTERNOON, continued

Ashanthi S. Maxworth, Glenn C. Hussey, Paul Bernhardt, Eliana Nossa, Fraser Hird
1 University of Saskatchewan, Saskatoon, Saskatchewan, CANADA
2 Naval Research Laboratory, Washington, DC
3 Arecibo Observatory, Arecibo, PUERTO RICO

Session H2: Physics of the Radiation Belts II
Room 245
Session Co–Chairs: Poorya Hosseini, University of Colorado, Denver; Christopher Crabtree, Naval Research Laboratory

13:20 H2–1
ACCELERATION OF RELATIVISTIC ELECTRONS IN EARTH’S OUTER RADIATION BELT BY WHISTLER MODE CHORUS: EVIDENCE AND THE IMPORTANCE OF ENERGETIC PARTICLE INJECTIONS
Drew L. Turner
The Aerospace Corporation, El Segundo, CA

13:40 H2–2
THE DEVELOPMENT OF CHORUS, SOURCE AND SEED ELECTRONS, AND THE RADIATION BELT RESPONSE DURING ICME AND CIR STORMS
Samuel T. Bingham, Christopher G. Mouikis, Lynn M. Kistler, Kristoff W. Paulson, Charlie J. Farrugia, Chia–Lin Huang, Harlan E. Spence, Craig A. Kletzing
Institute for the Study of Earth, Oceans, and Space, University of New Hampshire, Durham, NH

14:00 H2–3
CONSEQUENCES OF OBLIQUE CHORUS WAVES ON THE LOSS AND ACCELERATION OF THE OUTER RADIATION BELT ELECTRONS
Oleksiy Agapitov, Anton Artemyev, Didier Mourenas, Forrest Mozer, Vladimir Krasnoselskikh
1 Space Science Laboratory, University of California, Berkeley, Berkeley
2 University of California, Los Angeles, Los Angeles, CA
3 CEA, Arpajon, FRANCE
4 LPC2E/CNRS–University of Orleans, Orleans, FRANCE

14:20 H2–4
CHORUS AND MICROBURSTS: QUANTIFYING THE CONNECTION WITH A SUBSTANTIAL DATASET OF SIMULTANEOUS LOW- AND HIGH–ALTITUDE HIGH TIME RESOLUTION OBSERVATIONS
Aaron W. Breneman, Chris Colpitts, John G. Sample, Arlo Johnson, Mykhaylo Shumko, Alexander Crew, David Klumpar, Harlan Spence, Bernard Blake, John Wygant, Robyn Millan, Alexa Halford, Leslie Woodger
1 School of Physics and Astronomy, University of Minnesota, Minneapolis, MN
2 Physics, Montana State University, Bozeman, MT
3 Applied Physics Laboratory, Johns Hopkins University, Laurel, MD
4 Physics and Astronomy, University of New Hampshire, Durham, NH
5 The Aerospace Corporation, El Segundo, CA
6 Physics and Astronomy, Dartmouth College, Hanover, NH
**Wednesday Afternoon, continued**

14:40 J2–5
REMOTE SENSING OF RADIATION BELT ENERGETIC ELECTRONS USING LIGHTNING TRIGGERED UPPER BAND CHORUS
Poorya Hosseini*, Mark Golkowski, Vijay Harid
University of Colorado Denver, Denver, CO

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**Session J2: New Telescopes, Techniques and Technology**

**Room 265**

Session Co-Chairs: Jeffery Mangum, National Radio Astronomy Observatory; Alyson Ford, University of Arizona

13:20 J2–1
FULL MUELLER AW PROJECTION
Presanath Jagannathan**, Sanjay Bhatnagar¹, Urvashi Rau¹, Andrew R. Taylor²,³
¹National Radio Astronomy Observatory, Socorro, NM
²Astronomy, University of Cape Town, Cape Town, SOUTH AFRICA
³Physics, University of Western Cape, Western Cape, SOUTH AFRICA

13:40 J2–2
NEW RADIO FREQUENCY INTERFERENCE MITIGATION TECHNIQUES IN THE CONTEXT OF 21-CM COSMOLOGY
Mike J. Wilensky*
University of Washington, Seattle, WA

14:00 J2–3
CAN WE CALIBRATE OUT THE WEDGE WITH HERA AND ITS SUCCESSORS?
Aaron Parsons*, Joshua Dillon
University of California, Berkeley, Berkeley, CA

14:20 J2–4
RFI MITIGATION FOR PULSAR TIMING USING SPECTRAL KURTOSIS
Anastasia Kuske*, Luke Hawkins²
¹Physics and Astronomy, Franklin & Marshall College, Lancaster, PA
²Green Bank Observatory, Green Bank, WV

14:40 J2–5
DIGITAL BACK-END FOR THE NEW ULTRA-WIDEBAND FEED AND RECEIVER FOR THE PARKES RADIO TELESCOPE
Paul Roberts, Daniel George, John Tuthill*, Mark Leach, Ron Beresford, Michael Brothers, Tasso Tzioumis
CSIRO Astronomy and Space Science, Sydney, NSW, AUSTRALIA

15:00 Break

15:20 J2–6
MODULAR DIGITAL INFRASTRUCTURE FOR RADIO TELESCOPE ARRAYS
Sylas Ashton*
National Radio Astronomy Observatory, Socorro, NM

15:40 J2–7
REAL-TIME, ALL-SKY, EXTREME TIME-RESOLUTION IMAGING FROM THE LWA–SEVILLETTE TELESCOPE USING THE EPIC ARCHITECTURE
Nithyanandan Thyagarajan**, James Kent¹, Jayce Dowell¹, Adam P. Beardsley¹, Judd Bowman¹, Greg Taylor¹
¹National Radio Astronomy Observatory, Socorro, NM
²Cavendish Laboratories, University of Cambridge, Cambridge, UNITED KINGDOM
³Physics and Astronomy, University of New Mexico, Albuquerque, NM
⁴School of Earth and Space Exploration, Arizona State University, Tempe, AZ

16:00 J2–8
HIRAX INSTRUMENT CHARACTERIZATION
Emily R. Kuhn*, Benjamin R. Salwanchik, Laura B. Newburgh
Physics, Yale University, New Haven, CT

16:20 J2–9
ASKAP: THE AUSTRALIAN SKA PATHFINDER
Douglas C. – J. Bock*
CSIRO Astronomy and Space Science, Marsfield, NSW, AUSTRALIA

16:40 J2–10
COMMISSIONING RESULTS AND FUTURE WORK WITH THE FOCAL-PLANE L-BAND ARRAY FEED FOR THE GREEN BANK TELESCOPE (FLAG)
Mark W. Ruzindana**, Karl F. Warnick¹, Brian D. Jeffs¹, Richard A. Black¹, Mitchell C. Burnett¹, D.J. Pisano², Duncan R. Lorimer², Nicholas Pingel², Kaustubh Rajwade², Richard M. Prestage², Steve White², Bob Simon¹, Luke Hawkins³, William Shillue³, A. D. Roshit³, Devash Ghawri³
¹Electrical/Computer Engineering, Brigham Young University, Provo, UT
²Physics and Astronomy, West Virginia University, Morgantown, WV
³Green Bank Observatory, Green Bank, WV
⁴National Radio Astronomy Observatory CDL, Charlottesville, VA

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**Session K1: Biomedical Sensors and Devices**

**Room 150**

Session Co-Chairs: Majid Manteghi, Virginia Polytechnic Institute & State University; Asimina Kiourti, The Ohio State University

13:20 K1–1 (Invited)
A PORTABLE DOPPLER/FSK/FMCW MULTI-MODE RADAR WITH ANALOG DC OFFSET CANCELLATION FOR BIOMEDICAL APPLICATIONS
Jing Wang*, Changzhi Li
Electrical Engineering, Texas Tech University, Lubbock, TX

13:40 K1–2 (Invited)
GLUCOSE-DEPENDENT DIELECTRIC PROPERTIES OF BLOOD PLASMA FOR 500 MHZ TO 50 GHZ
Sydney Wojcieszak**, Nikhat Nusrat²,³, Madeline Hayes¹, Lynn Secondo¹, Erdem Topsakal²
¹Chemical and Life Sciences Engineering, Virginia Commonwealth University College of Engineering, Richmond, VA
²Electrical and Computer Engineering, Virginia Commonwealth University College of Engineering, Richmond, VA
³Biomedical Engineering, Virginia Commonwealth University College of Engineering, Richmond, VA
14:00 K1–3 (Invited)
BREAKING THE BOUNDARIES: MONITORING JOINT FLEXION USING RADIO–FREQUENCY COILS
Vigyanshu Mishra*, Asimina Kiourti
Electrical and Computer Engineering, The Ohio State University, Columbus, OH

14:20 K1–4 (Invited)
IMPROVING ACCURACY OF INKJET PRINTED CORE BODY WRAP TEMPERATURE SENSOR USING RANDOM FOREST REGRESSION IMPLEMENTED WITH AN ANDROID APP
Md Juber Rahman, Bashir I. Morshed*
The University of Memphis, Memphis, TN

14:40 K1–5 (Invited)
SUBCUTANEOUS BIOCOMPATIBLE CONTINUOUS GLUCOSE MONITORING SENSOR
Shanze I. Eshai*, Lynn E. Secondo, Sydney Wojcieszak, Madeline Hays, Nastassja Lewinski, Vitaliy Avrutin, Erdem Topsakal
Electrical and Computer Engineering, Virginia Commonwealth University, Richmond, VA

15:00 Break

15:20 K1–6
ULTRA LOW–POWER OTA FOR BIOMEDICAL APPLICATIONS
Shahram Hatefi Hesari*, Ava Hedayatipour1, Shaghayegh Aslanzadeh1, Syed K. Islam2
1The University of Tennessee, EECS Dept., Knoxville, TN
2University of Missouri, Columbia, MO

15:40 K1–7
IN VIVO RECORDING OF EPILEPTIFORM NEURAL ACTIVATION USING A NOVEL FULLY–PASSIVE IMPLANTABLE SYSTEM
Carolina Moncion*, Lakshmini Balachandar1, Satheesh Bojja–Venkatakrishnan1, Jorge Riera Diaz1, John L. Volakis2
1Biomedical Engineering, Florida International University, Miami, FL
2Electrical Engineering, Florida International University, Miami, FL

16:00 K1–8
LOW–POWER HIGHLY EFFICIENT VOLTAGE–BOOSTING RECTIFIER FOR WIDE–BAND INDUCTIVELY–COUPLED POWER TELEMETRY
Ramaa Saket Suri*, Nishat Tarannum Tasneem, Ifana Mahbub
Electrical Engineering, University of North Texas, Denton, TX

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

WEDNESDAY EVENING, 9 January 2019
The Reception will be held in the lobby of the Engineering Center (ECCR) from 18:30 to 21:00. All registrants are welcome to attend the Reception. Guests are also welcome to attend, as long as the registrants have indicated on their registration form that they are bringing a guest.
THURSDAY MORNING, 10 January 2019

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) IEEE SmartAg Initiative: Technology Applied to the Food Supply Chain
(2) Atacama Large Millimeter Array (ALMA) in 2030

Co–Chairs: Eric Mokole, The Mitre Corporation; Jeff Mangum, National Radio Astronomy Observatory

10:00  P1–1
IEEE SMART AG INITIATIVE: TECHNOLOGY APPLIED TO THE FOOD SUPPLY CHAIN
John P. Verboncoeur*
Michigan State University, East Lansing, MI

10:50  P1–2
ATACAMA LARGE MILLIMETER ARRAY (ALMA) IN 2030
Sean Dougherty*
ALMA Observatory, Santiago, CHILE

11:40 Awards Ceremony for Student Paper Competition

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

THURSDAY AFTERNOON, 10 January 2019

Session B6: Numerical Methods
Room 200

Session Co–Chairs: Fernando Teixeira, The Ohio State University; Branislav Notaros, Colorado State University

13:20  B6–1
ANALYSIS OF MULTIPACTOR EFFECTS BY A PARTICLE–IN–CELL ALGORITHM COUPLED WITH THE FUHRMAN–PIVI SECONDARY ELECTRON EMISSION MODEL
Dong–Yeop Na*, Julio L. Nicolini, Fernando L. Teixeira
ElectroScience Laboratory, The Ohio State University, Columbus, OH

13:40  B6–2
PROPER ORTHOGONAL DECOMPOSITION FOR PARTICLE–IN–CELL SIMULATIONS
Julio de Lima Nicolini*, Dong–Yeop Na, Fernando L. Teixeira
The Ohio State University, Columbus, OH

14:00  B6–3
FAR–FIELD EXTRAPOLATION OF THE BODY–OF–REVOLUTION PARABOLIC WAVE EQUATION
Reid K. McCargar1,2, Mark C. Strother1
1Applied Physics Laboratory, The Johns Hopkins University, Laurel, MD
2Electrical and Computer Engineering, The George Washington University, Washington, DC

14:20  B6–4
A STUDY OF FIREFLY ALGORITHM, ANT COLONY OPTIMIZATION, AND ARTIFICIAL BEE COLONY ALGORITHM
Utsav Poudel*, Sembiam R. Rengarajan
Electrical and Computer Engineering, California State University, Northridge, CA

14:40  B6–5
PREDICTING PML PERFORMANCE AT NORMAL INCIDENCE IN CYLINDRICAL FDTD
Mohammed F. Had*, Aref Z. Elsherbeni
Electrical Engineering, Colorado School of Mines, Golden, CO

15:00  Break

15:20  B6–6
COMPARISON OF TLBO, DE, AND BBO ALGORITHMS FOR APPLICATIONS IN ELECTROMAGNETICS
Edwin E. Rebollo*, Sembiam R. Rengarajan
Electrical and Computer Engineering, California State University, Northridge, CA

15:40  B6–7
NATURE INSPIRED METAHEURISTIC OPTIMIZATION ALGORITHMS AND APPLICATIONS
Samuel Gaxiola*, Sembiam R. Rengarajan
Electrical and Computer Engineering, California State University, Northridge, CA

16:00  B6–8
ANALOG COPROCESSORS FOR SOLVING LINEAR– AND NON–LINEAR PARTIAL DIFFERENTIAL EQUATIONS
Arjuna Madanayake1, Soumyajit Mandal2, Nilan Udayanga3, Jifu Liang2, Subramaniya I. Hariharan1, Leonid Belostotski4
1Florida International University (FIU), Miami, FL
2Case Western Reserve University (CWRU), Cleveland, OH
3University of Akron, Akron, OH
4University of Calgary, Calgary, AB, CANADA

16:20  B6–9
ADJOINT–BASED A POSTERIORI ERROR ESTIMATION AND ITS APPLICATIONS IN CEM: DHO FEM TECHNIQUES AND 3D SCATTERING PROBLEMS
Jake J. Harmon*, Cam L. Key2, Blake A. Troksa1, Troy D. Butler2,
Donald Estep¹, Branislav M. Notaros¹
¹Electrical and Computer Engineering, Colorado State University, Fort Collins, CO
²Mathematical and Statistical Sciences, University of Colorado Denver, Denver, CO
³Statistics, Colorado State University, Fort Collins, CO

16:40 B6–10
SCHOTTKY DIODE FULL–WAVE SIMULATION FOR ZERO–BIASED DETECTOR DESIGN
Colton R. Dunlap*
Boulder Environmental Sciences and Technology, Boulder, CO

Session BK: Wearable, Implants, and Body–Area Networks
Room 1B40
Session Co–Chairs: Ryan Green, Virginia Commonwealth University;
Bashir Morshed, The University of Memphis

13:20 BK–1 (Invited)
ULTRA LOW–POWER INDUCTIVELY COUPLED WEARABLE ECG SENSOR DESIGN WITH INKJET PRINTED DRY ELECTRODES
Bashir I. Morshed*
Electrical and Computer Engineering, The University of Memphis, Memphis, TN

13:40 BK–2 (Invited)
BIO–MAGNETIC DETECTION OF CARDIAC ACTIVITY USING WEARABLES
Keren Zhu, Vigyanshu Mishra*, Asimina Kiourti
Electrical and Computer Engineering / ElectroScience Laboratory, The Ohio State University, Columbus, OH

14:00 BK–3 (Invited)
ANALYSIS AND MULTI–CLASS CLASSIFICATION OF PATHOLOGICAL HEART MURMURS BASED ON SEGMENTED PHONOCARDIOGRAM RECORDINGS
Ali Elhouderi*, Kimberly Newman, Frank Barnes
Electrical, Computer and Energy Engineering, University of Colorado Boulder, Boulder, CO

14:20 BK–4 (Invited)
MULTI–MODE SMART WEARABLE FABRIC ANTENNAS FOR AUGMENTED TOUCH TRACKING AND MOTION DETECTION ON HUMAN SKIN
Umar Hasni*, Erdem Topsakal
Electrical and Computer Engineering, Virginia Commonwealth University, Richmond, VA

14:40 BK–5 (Invited)
TOWARDS EMBROIDERED TEXTILE ANTENNA SYSTEMATIC DESIGN AND ACCURATE MODELING: INVESTIGATION OF STITCH DENSITY
Lingnan Song*, Daisong Zhang, Yahya Rahmat–Samii
Electrical and Computer Engineering, University of California, Los Angeles, Los Angeles, CA

15:00 Break

16:00 BK–8 (Invited)
LOW–POWER RF ENERGY HARVESTER CIRCUIT DESIGN FOR WEARABLE MEDICAL APPLICATIONS
Taeho Oh¹, Omiya Hassan², Samira Shamsir²*, Syed K. Islam²
¹EECS, The University of Tennessee, Knoxville, TN
²EECS, University of Missouri–Columbia, Columbia, MO

16:20 BK–9 (Invited)
MICS BAND DIGITAL VOLTAGE–CONTROLLED OSCILLATOR (DVCO) FOR LOW–POWER BIOMEDICAL DATA TRANSMISSION
Hanfeng Wang¹, Samira Shamsir²*, Shahram H. Hesari¹, Syed K. Islam²
¹Electrical Engineering and Computer Science, University of Tennessee, Knoxville, TN
²Electrical Engineering and Computer Science, University of Missouri–Columbia, Columbia, MO

16:40 BK–10 (Invited)
INVESTIGATION OF ELECTROMAGNETIC WAVE PROPAGATION FOR IN–BODY TO ON–BODY WIRELESS COMMUNICATIONS
Mary E. Leece*, Yang Li
Baylor University, Waco, TX

Session D2: Components and Circuits for Wireless Applications
Room 1B51
Session Co–Chairs: Jonathan Chisum, University of Notre Dame;
Negar Ehsan, NASA Goddard Space Flight Center

13:20 D2–1
FREQUENCY–SELECTIVE FERRITE–BASED CIRCULATORS
Andrea Ashley*, Laila Marzall, Zoya Popovich, Dimitra Psychogiou
Electrical, Computer, and Energy Engineering, University of Colorado Boulder, Boulder, CO
THURSDAY AFTERNOON, continued

13:40 D2–2
RF CHARACTERIZATION OF 3D-PRINTED COAXIAL CAVITY RESONATORS
Kshitij Sadasivan*, Dimitra Psychogiou
Electrical, Computer, and Energy Engineering, University of Colorado Boulder, Boulder, CO

14:00 D2–3
FREQUENCY-AGILE RECONFIGURATION FOR A HIGH-POWER RESONANT CAVITY TUNER USING PREVIOUS SEARCH RESULTS
Angelique Dockendorf**, Ellie Langley†, Austin Egbert†, Charles Baylis†, Abbas Semnani†, Dimitrios Peroulis**, Anthony Martone†, Ed Viveiros†, Robert Marks II†
1Baylor University, Waco, TX
2Purdue University, West Lafayette, IN

14:20 D2–4
COUPLED-RESONATOR-BASED DESIGN OF THIN-FILM BULK ACOUSTIC RESONATOR (FBAR)-BASED BANDPASS FILTERS
Nikolaus Luhrs S. Luhrs*, Dimitra Psychogiou
Electrical, Computer, and Energy Engineering, University of Colorado Boulder, Boulder, CO

14:40 D2–5
THE ROLE OF THE REFLECTION COEFFICIENT PHASE IN THE DESIGN OF ACOUSTIC WAVE FILTERS
Patricia M. Silveira*, Jordi Verdú, Pedro de Paco
Telecommunications and Systems Engineering, Autonomous University of Barcelona, Barcelona, SPAIN

15:00 Break

15:20 D2–6
LOW COST POWER EFFICIENT BEAMFORMER WITH ELEMENT-TO-ELEMENT MIXING (BEEM)
Rimon J. Hokayem*, John L. Volakis, Elias A. Alwan
Electrical and Computer Engineering, Florida International University, Miami, FL

15:40 D2–7
SUPPLY MODULATION OF LOAD-MODULATED POWER AMPLIFIERS
Dan Fisher*, Tommaso Cappello, Zoya Popovic, Taylor Barton
Electrical, Computer, and Energy Engineering, University of Colorado Boulder, Boulder, CO

16:00 D2–8
A 2.45 GHz TEXTILE-BASED RF RECTENNA ARRAY FOR SENSOR APPLICATIONS
Dieff Vital*, Shubhendu Bhardwaj, John L. Volakis
Electrical and Computer Engineering, Florida International University, Miami, FL

16:20 D2–9
ON-TEXTILE COUPLED MAGNETIC RESONATORS FOR WIRELESS POWER HARVESTING APPLICATIONS
Dieff Vital*, John L. Volakis, Shubhendu Bhardwaj
Electrical and Computer Engineering, Florida International University, Miami, FL

Session F3: RF Propagation Utilizing Numerical Weather Prediction
Room 155
Session Co-Chairs: Tracy Haack, Naval Research Laboratory – Marine Meteorology Division
Thomas Hanley, Johns Hopkins University/Applied Physics Laboratory

13:20 F3–1
PERFORMANCE OF FORECAST MODELS DURING CASPER WEST CAMPAIGN
Tracy Haack††, Thomas Hanley†, Qing Wang†
†Marine Meteorology Division, Naval Research Laboratory, Monterey, CA
††Johns Hopkins University/Applied Physics Laboratory, Laurel, MD

13:40 F3–2
FIXED-LINK AND RANGE-DEPENDENT X-BAND EM PROPAGATION MEASUREMENTS IN THE MARINE ATMOSPHERIC BOUNDARY LAYER FOR TESTING NUMERICAL WEATHER PREDICTION OF REFRACTIVITY
Qi Wang†, Robert Burkholder†, Caglar Yardim†, Tracy Haack†, Qing Wang†, Denny Alappattu†, Ryan Yamaguchi†, Joseph Fernando†, Adam Christman†, Djamal Khelif†
1The Ohio State University, Columbus, OH
2Office of Naval Research, Arlington, VA
3Naval Postgraduate School, Monterey, CA
4University of Notre Dame, Notre Dame, IN
5The University of California, Irvine, Irvine, CA

14:00 F3–3
LOW ATMOSPHERIC PROPAGATION SYSTEM (LATPROP) MEASUREMENT RESULTS ON CASPER-WEST
Luyao Xu†, Caglar Yardim†, Robert Burkholder†, Qing Wang†, Ryan T. Yamaguchi†, David G. Ortiz-Suslow†, Harindra Joseph S. Fernandez†, Raghu Krishnamurthy†, Kyle B. Franklin†, Denny P. Alappattu†, Benjamin Wauer†
1The Ohio State University, Columbus, OHIO
2Naval Postgraduate School, Monterey CA
3University of Notre Dame, Notre Dame, IN

14:20 F3–4
LOWER ATMOSPHERIC PROPAGATION MEASUREMENT SYSTEM (LATPROP) RADAR CASPER WEST RESEARCH CAMPAIGN POST PROCESSING UPDATE
ToJoshua D. Compaleo††, Caglar Yardim†, Luyao Xu†, Shanka Wijesundara†, Joel Johnson†, Bob Burkholder†, Qing Wang†
†ElectroScience Laboratory, The Ohio State University, Columbus, OH
††Metereology, Naval Post Graduate School, Monterrey CA

14:40 F3–5
ANALYSIS OF EVAPORATIVE DUCT VARIABILITY FROM LARGE EDDY SIMULATIONS
Kyle B. Franklin†, Qing Wang†, Tao Cao†, Lian Shen†
†Meteorology, Naval Postgraduate School, Monterey, CA
†University of Minnesota, Minneapolis, MN
15:00 Break

15:20 F3–6
MESOSCALE NUMERICAL WEATHER PREDICTIONS USED FOR RADIO FREQUENCY PROPAGATION ALONG A LOW ELEVATION OVER WATER PATH
Abby Anderson*, Katherine L. Mulreamy, Zachary B. Ratliff, Matthew L. Jackson, Victor R. Wiss
NSWC Dahlgren, Dahlgren, VA

15:40 F3–7
BLENDING SURFACE LAYER, NWP MODEL AND CLIMATOLOGICAL REFRACTIVITY PROFILES: METHODS AND ISSUES
Paul A. Frederickson
Metereology, Naval Postgraduate School, Monterey, CA

16:00 F3–8
INVESTIGATING CORRELATION DROPOUTS OF NWP FORECAST EM PROPAGATION FOR TAPS FIELD CAMPAIGN
Andrew J. Kammerer*, Tracy Haack1, Hedley Hansen2
1Marine Meteorology Division, Naval Research Laboratory, Monterey, CA
2Cyber and Electronic Warfare Division, Defense Science and Technology Organization, Adelaide, AUSTRALIA

Session G4: Radar and Radio Techniques for Ionospheric Diagnostics
Room 151
Session Co-Chairs: Thomas Gaussiran, The University of Texas at Austin;
Y. Jade Morton, University of Colorado Boulder

13:20 G4–1
THE DISCOVERY OF NOVEL IONOSPHERIC PHENOMENA USING IONOSPHERIC HIGH FREQUENCY SOFTWARE–DEFINED RADAR
Salih M. Bostan, Julio V. Urbina*, John D. Mathews
Electrical Engineering, The Pennsylvania State University, University Park, PA

13:40 G4–2
HAMSCI PERSONAL SPACE WEATHER STATION: A NEW TOOL FOR CITIZEN SCIENCE GEOSPACE RESEARCH
Joshua S. Vega*, Nathaniel A. Frissell, Philip J. Erickson, Andrew J. Gerrard
1New Jersey Institute of Technology, Newark, NJ
2MIT Haystack Observatory, Westford, MA

14:00 G4–3
HIGH ALTITUDE ISR EXPERIMENTS AT JICAMARCA
Sevag Derghazarian*
Earth and Atmospheric Sciences, Cornell University, Ithaca, NY

14:20 G4–4
IRREGULARITY PARAMETER ESTIMATION FOR INTERPRETATION OF SCINTILLATION DOPPLER AND INTENSITY SPECTRA
Charles S. Carrano*, Charles L. Rino
Institute for Scientific Research, Boston College, Chestnut Hill, MA

THURSDAY AFTERNOON, continued

14:40 G4–5
ELECTRON–ELECTRON COLLISION EFFECTS ON ISR TEMPERATURE MEASUREMENTS
William J. Longley*, Meers M. Oppenheim, Yakov S. Dimant
Center for Space Physics, Boston University, Boston, MA

15:00 Break

15:20 G4–6
RADIO PROPAGATION EFFECTS FROM INFRASONIC WAVES IN THE IONOSPHERE
Justin J. Mabie*, Terrence Bullet
CIRES, University of Colorado Boulder, Boulder, CO

15:40 G4–7
IONTV: USING TIMING REFERENCE SIGNALS TO OBSERVE IONOSPHERIC VARIATION
Joseph Dusenbury*, William Liles, Philip Erickson1, Kiersten C. Kerby–Patel1
1University of Massachusetts Boston, Boston, MA
2Independent Consultant, Reston, VA
3MIT Haystack Observatory, Westford, MA

16:00 G4–8
SOUNDING THE IONOSPHERE WITH SIGNALS OF OPPORTUNITY IN THE HIGH–FREQUENCY (HF) BAND
Ethan S. Miller*, Gary S. Bust1, Gareth W. Perry2, Stephen R. Kaeppler1, Juha Vierinen4, Nathaniel A. Frissell1, Andrew A. Knuth1, Phil J. Erickson4, Romina Nikoukar1, Alex T. Chartier1, Pedrina Santos2, Christiano Brum2, Jonathan T. Fentzke7,8, Thomas R. Hanley1, Andrew J. Gerrard3
1 Johns Hopkins University Applied Physics Laboratory, Laurel, MD
2University of Calgary, Calgary, AB, CANADA
3Clemson University, Clemson, SC
4University of Tromsø, Tromsø, NORWAY
5New Jersey Institute of Technology, Newark, NJ
6Haystack Observatory, MIT, Westford, MA
7Arecibo Observatory, Arecibo, PUERTO RICO
8Scientific Solutions, Inc, Computational Physics, Inc, North Chelmsford, MA

Session H3: Waves and Turbulence in Laboratory and Space Plasmas
Room 245
Session Co-Chairs: Carl Siefring, Naval Research Laboratory; Jim Schroeder, University of Iowa;
Vijay Harid, University of Colorado Denver

13:20 H3–1
FARLEY–BUNEMAN INSTABILITIES IN THE AURORAL E–REGION: HYBRID SIMULATIONS AND CONVECTION ESTIMATES
Enrique L. Rojas Villalba*, David L. Hysell
Earth and Atmospheric Sciences, Cornell University, Ithaca, NY
THURSDAY AFTERNOON, continued

13:40 H3–2
GLOBAL SIMULATION OF ELECTRON CYCLOTRON HARMONIC WAVE INSTABILITY IN A STORM–TIME MAGNETOSPHERE
Xu Liu1, Lunjin Chen1, Miles A. Engel2, Vania K. Jordanova2
1Physics, University of Texas at Dallas, Richardson, TX
2Los Alamos National Laboratory, Los Alamos, NM

14:00 H3–3
RESONANT HEATING OF THERMAL IONS BY ELECTROMAGNETIC ION CYCLOTRON WAVES IN THE MAGNETOSPHERE
Qianli Ma1, Chao Yue1, Wen Li1, Jacob Bortnik1, Richard M. Thorne1
1Atmospheric and Oceanic Sciences, University of California, Los Angeles, Los Angeles, CA
2Center for Space Physics, Boston University, Boston, MA

14:20 H3–4
INVESTIGATION OF RESONANT ULTRA–LOW FREQUENCY WAVES IN FIELD LINE RESONATOR AND IONOSPHERIC ALFVÉN RESONATOR AT LOW AND MIDDLE LATITUDES
Mergen Alimanagbetov*, Anatoly V. Streltsov
Physical Sciences, Embry–Riddle Aeronautical University, Daytona Beach, FL

14:40 H3–5
PROPAGATION CHARACTERISTICS OF IONOSPHERIC HISS WAVES
Zhiyang Xia*, Lunjin Chen
Physics, University of Texas at Dallas, Richardson, TX

15:00 Break

15:20 H3–6
TWO DIMENSIONAL FULL–WAVE MODELING OF PROPAGATION OF LOW–ALTITUDE HISS IN THE IONOSPHERE
Xiang Xu1, Lunjin Chen
William B. Hanson Center for Space Sciences, University of Texas at Dallas, Richardson, TX

15:40 H3–7
ELECTRON–ION HYBRID INSTABILITY IN A QUASI–STATIC NEAR–EARTH DIPOLARIZATION FRONT
Dong Lin1, Wayne A. Scales1, Gurudas Ganguli1, Xiangrong Fu1, Erik Tejero2, Chris Crabtree2, Yuxi Chen1, Alex Fletcher2
1Electrical and Computer Engineering, Virginia Polytechnic Institute & State University, Blacksburg, VA
2Naval Research Laboratory, Washington, DC
3New Mexico Consortium, Los Alamos, NM
4Center for Space Environment Modeling, University of Michigan, Ann Arbor, MI

16:00 H3–8
POLARIZATION MEASUREMENTS OF NATURAL LOW–FREQUENCY RADIO EMISSIONS OBSERVED BY EPOP– RRI
Ashanthi S. Maxworth1, Glenn C. Hussey1, Fraser Hird1, George Sofko1, Gordon James2, Andrew W. Yau3
1Physics and Engineering Physics, University of Saskatchewan, Saskatoon, Saskatchewan, CANADA
2Physics, University of Calgary, Calgary, Alberta, CANADA

16:20 H3–9
POLARIZATION MEASUREMENTS OF H+ ION CYCLOTRON WHISTLERS OBSERVED BY EPOP– RRI
Ashanthi S. Maxworth1, Glenn C. Hussey1, George Sofko1, Fraser Hird1, Gordon James2, Andrew W. Yau3
1Physics and Engineering Physics, University of Saskatchewan, Saskatoon, CANADA
2Physics, University of Calgary, Calgary, Alberta, CANADA

16:40 H3–10
SPACE MEASUREMENTS OF A ROCKET–RELEASED TURBULENCE (SMART) IS A FUTURE EXPERIMENT TO STUDY TURBULENCE EFFECTS ON THE RADIATION BELTS
Carl L. Siefring*, Gurudas Ganguli, Chris E. Crabtree, Alex Fletcher
Plasma Physics Division, Naval Research Laboratory, Washington, DC

17:00 H3–11
A FRAMEWORK FOR MICROSCOPIC/MACROSCOPIC SIMULATIONS OF MAGNETIZED PLASMAS
Gian Luca Delzanno1, Vadim Roytershteyn1, Oleksandr Koshkarov1, Cecília Pagliantini1, Gianmarco Manzini1
1Los Alamos National Laboratory, Los Alamos, NM
2Space Science Institute, Boulder, CO
3École Polytechnique Fédérale de Lausanne, Lausanne, SWITZERLAND

17:20 H3–12
PHASE–SPACE DYNAMIC OF COHERENT WAVE–PARTICLE INTERACTION IN THE RADIATION BELT
Poorya Hosseini*, Vijay Harid, Mark Golkowski
University of Colorado Denver, Denver, CO

17:40 H3–13
HYBRID–PIC SIMULATION OF WHISTLER MODE WAVE–PARTICLE INTERACTIONS IN THE EARTH’S RADIATION BELTS
Hoyoung Kim*, Vijay Harid
Electrical Engineering, University of Colorado Denver, Denver, CO

Session J3: Radio Emission from Extrasolar Planets
Room 265
Session Co-Chairs: Joseph Lazio, Jet Propulsion Laboratory, California Institute of Technology; Alex Woloszczan, The Pennsylvania State University
13:20 J3–1 (Invited)
OBSERVING JUPITER’S AURORAL RADIO SOURCES AND EMISSIONS WITH JUNO
Masafumi Imat1*, William S. Kurth1, George B. Hospodarsky1, Yasmina M. Martos2, Philippe Louarn3, Scott J. Bolton4, John E. P. Connerney5, Corentin K. Louis4, Laurent Lamy5, Philippe Zarka6, Tracy E. Clarke6, Charles A. Higgins7, Baptiste Cecconi7
1University of Iowa, Iowa City, IA
2NASA Goddard Space Flight Center, Greenbelt, MD
3IRAP, Toulouse, FRANCE
4Southwest Research Institute, San Antonio, TX
5LESA, CNRS, Observatoire de Paris, Meudon, FRANCE
6Naval Research Laboratory, Washington, DC
7Middle Tennessee State University, Murfreesboro, TN

14:00 J3–2
USING RADIO EMISSION FROM PLANETARY-MASS BROWN DWARFS TO UNDERSTAND PLANETARY MAGNETISM
Melodie M. Kao*, Evgenya Shkolnik1, Gregg Hallinan1, J. S. Pineca1, Adam Burgasser2, David Stevenson1
1School of Earth and Space Exploration, Arizona State University, Tempe, AZ
2Astronomy, California Institute of Technology, Pasadena, CA
3School of Earth and Space Exploration, University of Colorado Boulder, Boulder, CO
4Center for Astrophysics and Space Science, University of California, San Diego, San Diego, CA
5Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA

14:20 J3–3
THE SEARCH FOR RADIO EMISSION FROM EXOPLANETS USING LOFAR BEAM-FORMED OBSERVATIONS
Jake D. Turner*, Jean-Mathias Griessmeier1,2, Philippe Zarka3, Iaroslava Vasyliova4
1Astronomy, Cornell University, Ithaca, NY
2Laboratoire de Physique et Chimie de l’Environnement et de l’Espace (LPC2E), Université d’Orléans/CNRS, Orleans, FRANCE
3Station de Radiosastronomie de Nancay, Observatoire de Paris, CNRS, PSL, Nancay, FRANCE
4LESA, Observatoire de Paris, CNRS, PSL, Meudon, FRANCE
5Institute of Radio Astronomy, National Academy of Sciences of Ukraine, Kharkiv, UKRAINE

14:40 J3–4
MONITORING NEARLY 4000 NEARBY STELLAR SYSTEMS FOR RADIO EXOPLANETS WITH THE OVRO-LWA
Marin M. Anderson*, Gregg Hallinan
Astronomy, California Institute of Technology, Pasadena, CA

THURSDAY AFTERNOON, continued

15:40 J3–6
USING SUNRISE AS A PATHFINDER FOR DETECTING LOW FREQUENCY RADIO EMISSION FROM EXTRASOLAR PLANETS WITH SPACE BASED RADIO ARRAYS
Alexander M. Hagedus*, Justin C. Kasper1, Joseph Lazio1, Andrew Romero–Wolf2, Timothy S. Bastian1
1Climate and Space Sciences and Engineering, University of Michigan, Ann Arbor, MI
2Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA
3National Radio Astronomy Observatory, Charlottesville, VA

Session K2: RF, Microwave and THz Diagnostics/Therapeutics
Room 150
Session Co-Chairs: John Stang, University of Southern California; Erdem Topsakal, Virginia Commonwealth University

13:20 K2–1
NEURAL NETWORK ASSISTED MULTI-MODALITY MICROWAVE INVERSE SCATTERING FOR BRAIN DIELECTRIC IMAGING
Guangbo Chen, Pratik Shah, John Stang*, Mahta Moghaddam
EE – Electrophysics, University of Southern California, Los Angeles, CA

13:40 K2–2
EFFECT OF WEAK STATIC MAGNETIC FIELDS ON CELL PROLIFERATION AND REACTIVE OXYGEN SPECIES OF HT-1080 HUMAN FIBROSARCOMA CELLS
Hakki Gurhan*, Sahithi Kandala, Frank Barnes
Electrical Engineering, University of Colorado Boulder, Boulder, CO

14:00 K2–3
IN VITRO BIOCOMPATIBILITY OF DUAL-BAND TIN ANTENNA IN EXCITED AND NON-EXCITED ENVIRONMENTS IN REAL TIME
Madeline Hays*,1,2 Lynn E. Secondo1, Ryan Green2, Nastassja Lewinski1, Erdem Topsakal1
1Biomedical Engineering, Virginia Commonwealth University, Richmond, VA
2Electrical and Computer Engineering, Virginia Commonwealth University, Richmond, VA

15:00 Break

15:20 J3–5
SEARCHING FOR LOW-FREQUENCY RADIO EMISSIONS FROM NEARBY STARS AND EXOPLANETS
Jason Ling*, Andrea Isella1, Christopher M. Johns-Krull1, Joseph T. Lazio2
1Physics and Astronomy, Rice University, Houston, TX
2Interplanetary Network Directorate, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA

14:20 K2–4
DIELECTRIC PROPERTIES OF BROWN AND WHITE ADIPOSE TISSUE IN RODENT MODEL FROM 0.5 GHZ TO 50 GHZ
Nikhat Nusrat*, Sydney Wojcieszak, Madeline Hays, Erdem Topsakal
Virginia Commonwealth University, Richmond, VA
14:40  K2–5
AIRBORNE INSECTS RADAR SCATTERING
CHARACTERISTICS UTILIZING ELECTROMAGNETIC
MODELING
Omar Alzaabi*1, Diego Peñaloza-Aponte1, Julio Urbina1,
James Breakall1, Michael Lanagan2
1Electrical Engineering, The Pennsylvania State University, University
Park Pennsylvania
2Engineering Science and Mechanics, The Pennsylvania State University,
University Park, PA

15:00  Break

15:20  K2–6
VALIDATION OF AN ARM–SWINGING HUMAN
PHANTOM MODEL FOR THE STUDY OF WIRELESS
BODY AREA NETWORKS
George Lee*, Brian Garner, Yang Li
School of Engineering and Computer Science, Baylor University, Waco, TX

15:40  K2–7
TITANIUM NITRIDE ANTENNAS FOR MEDICAL
WIRELESS DATA TELEMETRY
Ryan Assi*, Ryan Green, Vitaliy Avrutin, Erdem Topsakal
Electrical and Computer Engineering, Virginia Commonwealth
University, Richmond, VA

Commission Business Meetings
17:00  Commission B  Room 1B40
17:00  Commission G  Room 151
18:00  Commission D  Room 1B51
18:00  Commission H  Room 245
18:00  Commission K  Room 150

THURSDAY EVENING, 10 January 2019
Women’s Reception (TBD)
FRIDAY MORNING, continued

Session B9: Wireless Communications and Periodic Structures
Room 200
Session Co-Chairs: Satish Sharma, San Diego State University; Nader Behdad, University of Wisconsin–Madison

10:20 B9–1
A RECIPROCAL TERRESTRIAL BACKHAUL ARCHITECTURE FOR THE INTEGRATION OF 5G IN HTS NETWORKS
Behzad Koosha*, Hermann Helgert, Reza Karimian
The George Washington University, Washington, DC

10:40 B9–2
INTERFERENCE MITIGATION FOR 5G MILLIMETER WAVE COMMUNICATION LINKS
Dimitrios Siafarikas*, Elias A. Alwan, John L. Volakis
Florida International University, Miami, FL

11:00 B9–3
A HYBRID BEAM HOPPING DESIGN FOR NON–UNIFORM TRAFFIC IN HTS NETWORKS
Behzad Koosha*, Hermann Helgert, Reza Karimian
The George Washington University, Washington, DC

11:20 B9–4
LOW–PROFILE POLARIZATION ROTATING SURFACES WITH SECOND–ORDER BAND PASS RESPONSES
Konstantinos Mavrakakis*, Hung Luyen, John H. Booske, Nader Behdad
Electrical Engineering, University of Wisconsin–Madison, Madison, WI

11:40 B9–5
FROZEN–LIGHT MODES IN 3–WAY COUPLED SILICON RIDGE WAVEGUIDES
Raed Almhmadi*, Kubilay Sertel
Electrical and Computer Engineering, ElectroScience Laboratory, The Ohio State University, Columbus, OH

Session F4: Remote Sensing: Small Satellites and RFI Mitigation
Room 155
Session Co-Chairs: Steven Reising, Colorado State University; Albin Gasiewski, University of Colorado Boulder

08:20 F4–1
RAINCUBE, A KA–BAND PRECIPITATION RADAR MISSION IN A CUBESAT
Eva Peral1, Shannon Statham1, Simone Tanelli1, Shivani Joshi1*, Travis Imken1, Douglas Price1, Jonathan Sauder1, Nacer Chahat1, Austin Williams2
1Jet Propulsion Laboratory, Pasadena, CA
2Tyvak Nano–Satellite Systems, Inc., Irvine, CA
FRIDAY MORNING, continued

08:40 F4–2
ICECUBE’S 15–MONTH EXPERIMENT WITH A COMMERCIAL 883–GHZ CLOUD RADIOMETER
Dong L. Wu1, Jeffrey R. Piepmeier1, Jaime Esper1, Negar Ehsan1, Paul E. Racette2, Thomas E. Johnson1, Brian S. Abresh1, Eric Bryerton2
1NASA Goddard Space Flight Center, Greenbelt, MD
2Virginia Diodes, Inc., Charlottesville, VA

09:00 F4–3
STATUS OF THE MICROMAS–2 AND TROPICS CUBESAT MISSIONS
William Blackwell*
MIT Lincoln Laboratory, Lexington, MA

09:20 F4–4
THE CUBESAT RADIOMETER RADIO FREQUENCY INTERFERENCE TECHNOLOGY VALIDATION (CUBERRT) MISSION
Joel T. Johnson1, Christa McKelvey1, Chris Ball1, Chi-Chih Chen1, Graeme Smith1, Mark Andrews1, Sidharth Misra2, Shannon Brown2, Robert Jarnot1, Rudi Bendig2, Carl Felten3, Kevin Horgan1, Jared Lucey1, Jinzheng Peng1, Jeffrey Piepmeier1, Michael Solly1, Joseph Knuble1, Jonathon Kocz1, Doug Laczkowski1, Matt Pallas1
1The Ohio State University, Columbus, OH
2NASA Jet Propulsion Laboratory, Pasadena, CA
3NASA Goddard Space Flight Center, Greenbelt, MD
4California Institute of Technology, Pasadena, CA
5Blue Canyon Technologies, Inc., Boulder, CO

09:40 F4–5
EARLY RESULTS OF HURRICANE AND SEVERE STORM OBSERVATIONS FROM TEMPORAL EXPERIMENT FOR STORMS AND TROPICAL SYSTEMS – DEMONSTRATION (TEMPEST–D) MISSION
Steven C. Reising1, Todd C. Gaier1, Sharmila Padmanabhan2, Boon H. Lim3, Shannon T. Brown4, Cate Heneghan4, Wesley Berg5, Christian D. Kummerow1, V. Chandrasekar1, Matthew Pallas2, Doug Laczkowski1, C Radhakrishnan1
1Colorado State University, Fort Collins, CO
2Jet Propulsion Laboratory, California Institute of Technology Pasadena, CA
3Blue Canyon Technologies, Boulder, CO

10:00 Break

10:20 F4–6
INITIAL RADIANCE VALIDATION OF ON–ORBIT MICROMAS–2A DATA
Angela Crews1, William Blackwell2, R. Vincent Leslie2, Michael Grant1, Idahosa Osaretin1, Michael DiLiberto1, Adam Milstein1, Kerri Cahoy1
1MIT, Cambridge, MA
2MIT Lincoln Laboratory, Lexington, MA
3NASA Langley, Hampton, VA

10:40 F4–7
RADIO FREQUENCY INTERFERENCE PROCESSING FOR THE CUBESAT RADIOMETER RADIO FREQUENCY INTERFERENCE TECHNOLOGY VALIDATION (CUBERRT) MISSION
Joel T. Johnson1, Christa McKelvey1, Chris Ball1, Graeme Smith1, Mark Andrews1, Sidharth Misra2, Shannon Brown2, Robert Jarnot1, Rudi Bendig2, Carl Felten3, Kevin Horgan1, Jinzheng Peng1, Jeffrey Piepmeier1, Jonathon Kocz4
1The Ohio State University, Columbus, OH
2NASA Jet Propulsion Laboratory, Pasadena, CA
3NASA Goddard Space Flight Center, Greenbelt, MD
4California Institute of Technology, Pasadena, CA

11:00 F4–8
ATMOSPHERIC AND IONOSPHERIC RADIO OCCULTATION MEASUREMENTS OBTAINED FROM SPIRE’S NANO SATELLITE CONSTELLATION
Vu Nguyen1, Vladimir Irisov1, Tim Duly1, Olehuer Nogues–Correig1, Linus Tan1, Takayuki Yuasa1, Dallas Masters1
1Spire Global, Inc., Boulder, CO
2Spire Global, Inc., Glasgow, UNITED KINGDOM
3Spire Global, Inc., Singapore, SINGAPORE

11:20 F4–9
 SIGNALS OF OPPORTUNITY P–BAND INVESTIGATION (SNOOPI)
 James L. Garrison1, Jeffrey R. Piepmeier1, Rashmi Shah1, David Spencer1, Manuel A. Vega2
1School of Aeronautics and Astronautics, Purdue University, West Lafayette, IN
2555, NASA Goddard Spaceflight Center, Greenbelt, MD
3NASA Jet Propulsion Laboratory, Pasadena, CA

11:40 F4–10
DIGITAL BACK END FOR PERFORMING HIGH RESOLUTION SPECTROMETRY IN CORRELATION RADIOMETERS
Aravind Venkitasubramony1, Eryan Dai1, Albin J. Gasiewski1, Maciej Stachura2, Jack Elston3
1University of Colorado Boulder, Boulder, CO
2Blackswift Technologies LLC, Boulder, CO

Room 151
Session Co–Chairs: Philip Erickson, MIT Haystack Observatory; Julio Urbina, The Pennsylvania State University

08:20 G5–1
COMPARISON OF METER–SCALE PLASMA IRREGULARITIES PROBED BY TWO EQUATORIAL RADARS LOCATED IN PERU: JICAMARCA AND HUANCAYO
Adriyel Nieves, Julio Urbina*
Electrical Engineering, The Pennsylvania State University, University Park, PA
08:40 G5–2
NEW OBSERVATIONS OF THE HF PLASMA LINE OVERTSHOOT AT THE ARECIBO OBSERVATORY
Anthea Coster*1, Eliana Nossa2, Phil Perrilaro3, Elizabeth Kendall4, Asti Bhatt5
1MIT Haystack Observatory, Westford, MA
2Johns Hopkins Applied Physics Laboratory, Laurel, MD
3Arecibo Observatory, Arecibo, PR
4SRI International, Palo Alto, CA

09:00 G5–3
USING THE LWA RADIO TELESCOPE TO OBSERVE THE IONOSPHERE
Kenneth S. Obenberger*
Space Vehicles Directorate, Air Force Research Laboratory, NM

09:20 G5–4
AN INVESTIGATION OF IONOSPHERIC FORECASTING USING TIE–GCM AND ENKF
Scott M. Rabidoux*, Roy S. Calfas, Thomas L. Gaussiran
Applied Research Laboratories, The University of Texas at Austin, Austin, TX

09:40 G5–5
COMPARING MSTIDS GENERATED FROM TROPOSPHERIC WEATHER TO THE HOOKE MODEL
Katherine A. Zawdie*, Sarah E. McDonald, Stephen Eckermann, Fabrizio Sassi
Space Science Division, Naval Research Laboratory, Washington, DC

10:00 Break

10:20 G5–6
EXAMINING THE USE OF THE EMPIRICAL CANADIAN HIGH ARCTIC IONOSPHERIC MODEL (E–CHAIM) USING IN SITU MEASUREMENTS
David R. Themens*, P. T. Jayachandran, Anthony M. McCaffrey
Physics, University of New Brunswick, Fredericton, CANADA

10:40 G5–7
EXPLORING THE FORMATION OF POLAR CAP PATCHES VIA MODEL–BASED LAGRANGIAN COHERENT STRUCTURES IN THE IONOSPHERE
Ningchao Wang*, Seebany Datta–Barua1, Uriel Ramirez1, Alex Chartier2
1Illinois Institute of Technology, Chicago, IL
2Johns Hopkins University, Laurel, MD

Session HEG: Lightning and the Ionosphere
Room 245
Session Co–Chairs: Robert Marshall, University of Colorado Boulder;
Victor Pasko, The Pennsylvania State University

08:40 HEG–1 (Invited)
HIGH–ENERGY ATMOSPHERIC PHYSICS THEORY AND MODELING
Joseph R. Dwyer*, Ningyu Liu, Kevin M. A. Ihaddadene
Physics, University of New Hampshire, Durham NH

09:00 HEG–3
SPRITE STREAMER INITIATION DUE TO IONIZATION OF METALLIC SPECIES AT SPRITE ALTITUDES
Reza Janalizadeh Choobbasti*, Victor P. Pasko
Communications and Space Sciences Laboratory, Electrical Engineering, The Pennsylvania State University, University Park, PA

09:40 HEG–5 (Invited)
EXPLAINING THE SPECTRUM OF NARROW BIPOLAR EVENTS WITH A SYSTEM OF STREAMERS
Ningyu Liu*, Joseph Dwyer1, Julia Tilles1, Mark Stanley1, Paul Krehbiel2, William Rison2, Robert Brown1, Jennifer Wilson3
1Physics and Space Science Center (EOS), University of New Hampshire, Durham, NH
2Physics, New Mexico Institute of Mining and Technology, Socorro, NM
3NASA, Kennedy Space Center, FL

10:00 Break

10:20 HEG–6
THE RADIO FREQUENCY EMISSION SPECTRUM OF COLLIDING STREAMERS
Jacob H. Koile*, Ningyu Liu1, Feng Shi1, Joseph R. Dwyer1
1Physics, University of New Hampshire, Durham, NH
2Physics, Auburn University, Auburn, AL

10:40 HEG–7
INVESTIGATING IONOSPHERIC LIGHTNING RETURNS USING THE LONG WAVELENGTH ARRAY
Joseph B. Malins*, Kenneth Obenberger1, Gregory Taylor1
1Physics and Astronomy, University of New Mexico, Albuquerque, NM
2Kirtland AFB, Air Force Research Laboratory, Albuquerque, NM

Session J4: Cosmology and Astrophysics at Low Frequencies I
Room 265
Session Co–Chairs: Greg Taylor, University of New Mexico; Nithyanandan Thyagarajan, National Radio Astronomy Observatory; Judd Bowman, Arizona State University
FRIDAY MORNING, continued

08:20 J4–1 (Invited)
THE LOW FREQUENCY TRANSIENT SKY
Gregg Hallinan*
California Institute of Technology, Pasadena, CA

08:35 J4–2 (Invited)
STRENGTHENING THE COSMOLOGICAL INTERPRETATION OF THE EDGES SIGNAL THROUGH INSTRUMENTAL VERIFICATION
Raul A. Monsalve*1, Judd D. Bowman2, Alan E. Rogers1, Thomas J. Mozdzen1, Nivedita Mahesh2
1Physics, McGill University, Montreal, Quebec, CANADA
2School of Earth and Space Exploration, Arizona State University, Tempe, AZ
3Haystack Observatory, Massachusetts Institute of Technology, Westford, MA

08:50 J4–3 (Invited)
PULSARS AT LOW RADIO FREQUENCIES, CYCLIC SPECTROSCOPY, AND PULSAR TIMING ARRAYS
Timothy Dolch
Physics, Hillsdale College, Hillsdale, MI

09:05 J4–4 (Invited)
STATUS OF THE HYDROGEN EPOCH OF REIONIZATION ARRAY
David R. DeBoer*
University of California, Berkeley, CA

09:20 J4–5
DARK COSMOLOGY: INVESTIGATIONS OF DARK MATTER IN THE DARK AGES WITH THE SPACE–BASED DARK AGES POLARIMETER PATHFINDER (DAPPER)
Jack O. Burns*1, Stuart Bale2, Richard Bradley1, Keith Tauscher1, David Rapetti1
1CASA, University of Colorado Boulder, Boulder, CO
2Space Sciences Laboratory, University of California, Berkeley, Berkeley, CA
3Central Development Laboratory, National Radio Astronomy Observatory, Charlottesville, VA

09:30 J4–6
FUNDAMENTAL LIMITATIONS ON THE CALIBRATION OF REDUNDANT 21–CM COSMOLOGY INSTRUMENTS AND IMPLICATIONS FOR HERA AND THE SKA
Ruby L. Byrne1, Miguel F. Morales1, Bryna Hazelton1, Wenyang Li2, Nichole Barry3
1Physics, University of Washington, Seattle, WA
2Physics, Brown University, Providence, RI
3Physics, University of Melbourne, Melbourne, Victoria, AUSTRALIA

09:40 J4–7
A RADIO SCREAM AT COSMIC DAWN: MODELING THE IMPACT OF RADIO–LOUD BLACK HOLES IN THE 21 CM SIGNAL
Aaron Éwall–Wice*, Tzu-Ching Chang, Joseph Lazio
Jet Propulsion Laboratory, Pasadena, CA

09:50 J4–8
THE HIGH–Z 21–CM GLOBAL SPECTRUM EXPERIMENT
Jeffrey B. Peterson*
Carnegie Mellon University, Pittsburgh PA

10:00 Break

10:20 J4–9
SPECTRAL INDEX OF THE DIFFUSE RADIO BACKGROUND BETWEEN 50 AND 100 MHZ
Thomas J. Mozdzen1, Nivedita Mahesh*1, Raul A. Monsalve2, Alan E. E. Rogers1, Judd D. Bowman1
1Astrophysics, Arizona State University, Tempe, AZ
2University of Colorado Boulder, Boulder, CO
3MIT Haystack Observatory, Westford, MA

10:30 J4–10 (Invited)
FRB DETECTION & CHARACTERIZATION AT THE DAWN OF THE CHIME ERA
Emmanuel Fonseca*
McGill University, Montreal, CANADA

10:45 J4–11 (Invited)
THE CANADIAN HYDROGEN INTENSITY MAPPING EXPERIMENT (CHIME): UPDATE AND STATUS
Laura Newburgh*
Physics, Yale University, New Haven, CT

11:00 J4–12 (Invited)
AN ANTI–COINCIDENCE SEARCH FOR COSMIC TRANSIENTS WITH THE LWA RADIO TELESCOPES
Kenneth S. Obenberger*, Savin S. Varghese2, Gregory B. Taylor2
1Space Vehicles Directorate, Air Force Research Laboratory, KAFB, NM
2Space Sciences Laboratory, University of California, Berkeley, CA
3Physics and Astronomy, University of New Mexico, Albuquerque, NM

11:15 J4–13 (Invited)
PREDICTIONS AND DETECTIONS OF HIGH MASS GALAXIES IN CHILES
Monica C. Sanchez*12, Patricia A. Henning2, Emmanuel Momjian1, Jacqueline van Gorkom3
1National Radio Observatory, Socorro, NM
2Physics and Astronomy, University of New Mexico, Albuquerque, NM
3Astronomy, Columbia University, New York, NY

11:30 J4–14
A RE–ANALYSIS OF PAPER–64 WITH THE SIMPLEDS PIPELINE
Matthew Kolopanis*, Daniel C. Jacobs1, Carina Cheng2
1School of Earth and Space Exploration, Arizona State University, Tempe, AZ
2Jet Propulsion Laboratory, Pasadena, CA

11:40 J4–15
FULL DATA ANALYSIS PIPELINE FOR LOW RADIO FREQUENCY MEASUREMENTS OF THE DARK AGES AND COSMIC DAWN
David Rapetti*12, Keith Tauscher1, Jack O. Burns1, Jordan Mirocha1
1Center for Astrophysics and Space Astronomy, Astrophysical and Planetary Science, University of Colorado Boulder, Boulder, CO
2NASA Ames Research Center, Moffett Field, CA
3Physics, McGill University, Montreal, Quebec, CANADA
11:50 J4–16
RECENT RESULTS FROM THE MWA AND LESSONS LEARNED AT THE FOREFRONT OF EOR PS ANALYSIS EFFORTS
Miguel F. Morales*
University of Washington, Seattle, WA

FRIDAY NOON, 1 January 2019
Sixth Hans Liebe Lecture Event
Math 100

12:15 HL –1
FOSTERING GROUND–BASED MICROWAVE RADIOMETRY: FROM UNCERTAINTY TO NETWORKING
Domenico Cimini*
Institute of Methodologies for Environmental Analysis (CNR–IMAA)
C.da S.Loja, Tito Scalo (Potenza), ITALY

FRIDAY AFTERNOON, 1 January 2019
Session B10: Low–Profile Antennas from Gigahertz to Terahertz
Room 1B40
Session Co–Chairs: Goutam Chattopadhyay, Jet Propulsion Laboratory, California Institute of Technology; Satish Sharma, San Diego State University

13:20 B10–1 (Invited)
A MECHANICALLY CONFIGURABLE MICROSTRIP PATCH ANTENNA FOR IEEE 802.11 WLAN BAND
Payam Nayeri*, Randy Haupt
Electrical Engineering, Colorado School of Mines, Golden, CO

13:40 B10–2
DESIGN OF STRONGLY MINIATURIZED, INHERENTLY MATCHED, AND SCALABLE FOLDED DIPOLE ANTENNAS
Sanghamitro Das†, David J. Sawyer†, Nectaria Diamanti†,²,³, A. P. Annan†, Ashwin K. Iyer†*†
¹Electrical and Computer Engineering, University of Alberta, Edmonton, Alberta, CANADA
²Aristotle University of Thessaloniki, Thessaloniki, GREECE
³Sensors & Software Inc., Mississauga, Ontario, CANADA

14:00 B10–3
A 2D PERIODIC CROSS–SHAPED LEAKY–WAVE ANTENNA
Sohini Sengupta*,¹, David R. Jackson¹, Ahmed T. Almutawa³, Hamidreza Kazemi¹, Filippo Capolino³
¹Energous Corporation, San Jose, California
²Electrical and Computer Engineering, University of Houston, Houston, TX
³Electrical Engineering and Computer Science, University of California, Irvine, Irvine, CA

14:20 B10–4 (Invited)
3D–PRINTED FREQUENCY SCANNING SLOTTED WAVEGUIDE ARRAY WITH WIDE BAND POWER DIVIDER
Kunchen Zhao*, Grant Senger, Nima Ghalichechian
Electrical and Computer Engineering, ElectroScience Laboratory, The Ohio State University, Columbus, OH
FRIDAY AFTERNOON, continued

Session F5: Point–to–Point Propagation Effects: Measurements and Models
Room 155
Session Co-Chairs: Michael Newkirk, Johns Hopkins University
Applied Physics Laboratory;
David Michelson, University of British Columbia

13:20 F5–1
A PHYSICS–DRIVEN DEEP LEARNING NETWORK FOR SUBSURFACE INVERSION
Yuchen Jin*, Xuqing Wu, Yueqin Huang, Jiefu Chen
1University of Houston, Houston, TX
2Cyentech Consulting LLC, Cypress, TX

13:40 F5–2
PARABOLIC WAVE EQUATION PROPAGATION IN A MARITIME DUCT WITH A ROUGH SEA SURFACE AND VOLUME TURBULENCE
Frank Ryan*
Applied Technology, Inc., San Diego, CA

14:00 F5–3
MEASURED CHARACTERISTICS OF URBAN DEPOLARIZATION IN GROUND–TO–GROUND UHF WIDEBAND CHANNELS
Daniel J. Breton*, Caitlin E. Haedrich, Garrett R. Hoch
Signature Physics Branch, U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH

14:20 F5–4
HEIGHT GAIN FUNCTIONS FOR RADIO–WAVE PROPAGATION MODELS
Nicholas N. DeMinco*
Telecommunication Theory Division, Institute for Telecommunication Sciences, Boulder, CO

14:40 F5–5
RECOGNITION AND CLASSIFICATION OF BODY POSTURE AND GESTURES USING MULTIFREQUENCY SIGNALS
Muneeba Raja, Aidan Hughes, Xiyuan Xu, Parham Zarei, David Michelson, Stephan Sigga
1Communication and Networking, Aalto University, Espoo, FINLAND
2Electrical and Computer Engineering, University of British Columbia, Vancouver, BC, CANADA

Session FGH: GNSS and Radio Beacon Remote Sensing
Room 105
Session Co-Chairs: Clara Chew, UCAR;
Carl Stiefring, Naval Research Laboratory

13:40 FGH–1
REMOTE SENSING OF IONOSPHERIC IRREGULARITIES OVER RESOLUTE BAY WITH GNSS AND BEACON SIGNAL PROPAGATION THROUGH GRADIENT–DRIFT INSTABILITY
Kshitija B. Deshpande*, Leslie Lamarche, Matt Zettergren, Roger Varney, Carl Stiefring
1Physical Sciences, Embry-Riddle Aeronautical University, Daytona Beach, FL
2SRI International, Menlo Park, CA
3Plasma Physics Division, Naval Research Laboratory, Washington, DC

14:00 FGH–2
AN ANALYSIS OF MAXIMUM HURRICANE WIND RETRIEVALS USING SPACEBORNE GNSS–R SYSTEMS
Mohammad M. Al–Khalidi*, Alexandra Bringer, Joel T. Johnson, Stephen J. Katzberg, Ethan Kubatko
1ElectroScience Laboratory, Electrical and Computer Engineering, The Ohio State University, Columbus, OH
2South Carolina State University, Orangeburg, SC

14:40 FGH–4
TIME SERIES SOIL MOISTURE RETRIEVALS USING THE CYGNSS CONSTELLATION
Mohammad M. Al–Khalidi, Joel T. Johnson
ElectroScience Laboratory, Electrical and Computer Engineering, The Ohio State University, Columbus, OH

15:00 Break

15:20 FGH–5
SIMULATION STUDY OF CYGNSS RETRIEVAL ALGORITHMS FOR WETLAND EXTENT
Eric Loria*, Andrew O’Brien
The Ohio State University, Columbus, OH

15:40 FGH–6
A GNSS–REFLECTOMETRY INSTRUMENT FOR WETLAND EXTENT AND DYNAMICS
Stephen T. Lowe, Jeff Dickson, Casey Handmer, David Robison, Larry Young
Jet Propulsion Laboratory, Pasadena, CA

Session GH2: Meteors, Orbital Debris, and Dusty Plasmas
Room 245
Session Co-Chairs: Julio Urbina, The Pennsylvania State University;
Sigrid Close, Stanford University;
Alex Fletcher, Naval Research Laboratory
13:20 GH2–1
MULTI-STATIC METEOR RADAR
John Marino*, Nicholas Rainville, Scott Palo
University of Colorado Boulder, Boulder, CO

13:40 GH2–2
TRANSMIT ARRAY MULTISTATIC METEOR RADAR
Nicholas Rainville*, Scott Palo, John Marino
Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, CO

14:00 GH2–3
INVESTIGATION OF DUSTY PLASMA EFFECTS ON RADIO FREQUENCY EMISSIONS GENERATED BY HYPERVELOCITY IMPACTS ON SPACECRAFT
Gil Shoshet*, Sigrid Close
Stanford University, Stanford, CA

14:20 GH2–4
STUDIES OF PLASMA INSTABILITIES ON SPECULAR METEOR TRAIL DECAY TIMES
Freddy R. Galindo¹, Julio V. Urbina¹, Steven J. Franke², Lars P. Dyrud³
¹Electrical Engineering, The Pennsylvania State University, University Park, PA
²Electrical Engineering, University of Illinois at Urbana Champaign, Urbana, IL
³EagleView, Washington, DC

14:40 GH2–5
ESTIMATING WIND FIELDS IN THE LOWER THERMOSPHERE WITH SIMONE, A SPREAD–SPECTRUM, INTERFEROMETRIC, MULTISTATIC METEOR OBSERVATION NETWORK
Ryan Volz¹, Jorge L. Chau¹, Juha Vierinen¹, Juan M. Urco², Matthias Claohsen¹, Nico Pfeffer¹, Jörg Trautner¹, Philip J. Erickson¹
¹MIT Haystack Observatory, Westford, MA
²Leibniz Institute of Atmospheric Physics at the University of Rostock, Kühlungsborn, GERMANY
³UiT Arctic University of Norway, Tromsø, NORWAY

Session J5: Cosmology and Astrophysics at Low Frequencies II
Room 265

13:20 J5–1
COMMISSIONING OF THE HIRAX EIGHT-ELEMENT PATHFINDER
Austine A. Gumba*
University of KwaZulu Natal, Durban, SOUTH AFRICA

13:30 J5–2 (Invited)
A SIMULTANEOUS SEARCH FOR PROMPT RADIO EMISSION ASSOCIATED WITH GRBS USING THE OVRO-LWA
Marin M. Anderson*, Gregg Hallinan
Astronomy, California Institute of Technology, Pasadena, CA

FRIDAY AFTERNOON, continued

13:45 J5–3 (Invited)
CONFRONTING THE CHALLENGES OF GLOBAL EOR DETECTION
Keith Tauscher¹,², David Rapetti¹,³, Jack O. Burns¹
¹Center for Astrophysics and Space Astronomy, University of Colorado Boulder, Boulder, CO
²Physics, University of Colorado Boulder, Boulder, CO
³NASA Ames Research Center, Mountain View, CA

14:00 J5–4 (Invited)
OBSERVING THE A-TEAM WITH THE ELWA
Frank K. Schinzel¹, Paul Demorest¹, Kevin Stovall¹, Jayce Dowell¹, Gregory B. Taylor²
¹National Radio Astronomy Observatory, Socorro, NM
²Physics and Astronomy, University of New Mexico, Albuquerque, NM

14:15 J5–5 (Invited)
COMMENSAL LOW FREQUENCIES ON THE NRAO VLA: THE VLA LOW–BAND IONOSPHERE AND TRANSIENT EXPERIMENT (VLITE) AND VLITE–FAST
Tracy Clarke¹, Wendy Peters¹, Simona Giacintucci¹, Namir Kassim¹, Matthew Kerr², Paul S. Ray², Julia Deneva¹
¹Code 7213, Naval Research Laboratory, Washington, DC
²Code 7655, Naval Research Laboratory, Washington, DC
³George Mason University, Washington, DC

14:30 J5–6 (Invited)
TOWARD EXPERIMENTAL EVIDENCE OF COSMIC DAWN
Lincoln J. Greenhill*
Harvard University / Smithsonian Astrophysical Observatory, Cambridge, MA

14:45 J5–7 (Invited)
THE SWARM TELESCOPE CONCEPT
Jayce Dowell*, Greg B. Taylor
University of New Mexico, Albuquerque, NM

15:00 Break

15:20 J5–8
ALBATROS: A NEW ARRAY FOR LOW–FREQUENCY OBSERVATIONS
Nivek Ghazi*
School of Mathematics, Statistics and Computer Science, University of KwaZulu–Natal, Durban, SOUTH AFRICA

15:30 J5–9
THE COSMIC TWILIGHT POLARIMETER
David D. Bordenave¹,², Bang D. Nhan¹,², Richard F. Bradley¹,², Jack O. Burns³
¹Astronomy, University of Virginia, Charlottesville, VA
²Central Development Laboratory, National Radio Astronomy Observatory, Charlottesville, VA
³Center for Astrophysics and Space Astronomy, Astrophysical and Planetary Sciences, University of Colorado Boulder, Boulder, CO
15:40 J5–10 (Invited)
A NOVEL APPROACH TO DETECTING 21CM EOR POWER SPECTRUM
Chris L. Carilli*1,2, Nithyanandan Thyagarajan1, Bojan Nikolic2, James Kent2, Kingsley Gale–Sides2
1 National Radio Astronomy Observatory (for the HERA Team), Socorro, NM
2 Cambridge University, Cavendish Astrophysics Group, Cambridge, UNITED KINGDOM

15:55 J5–11 (Invited)
SCATTERING STUDY OF PULSARS BELOW 100 MHZ
Karishma Bansal*, Greg Taylor1, Kevin Stovall2, Jayce Dowell1
1 Physics and Astronomy, University of New Mexico, Albuquerque
2 National Radio Astronomy Observatory, Socorro, NM

16:10 J5–12 (Invited)
MILLIARCSECOND IMAGING OF THE HIGHEST REDSHIFT RADIO–LOUD QUASARS
Emmanuel Momjian*
National Radio Astronomy Observatory, Socorro, NM

16:25 J5–13 (Invited)
MAPPING THE UNIVERSE’S ACCELERATED EXPANSION WITH HIRAX
Hsin C. Chiang*
McGill University, Montreal, Quebec, CANADA

16:40 J5–14 (Invited)
REALFAST: REAL–TIME, COMMENSAL FAST TRANSIENT SURVEYS WITH THE VERY LARGE ARRAY
Geoffrey C. Bower*
ASIAA, HI

16:55 J5–15 (Invited)
PERSPECTIVES ON COSMOLOGY & ASTROPHYSICS AT LOW FREQUENCIES
Anthony J. Beasley*
National Radio Astronomy Observatory, Charlottesville, VA