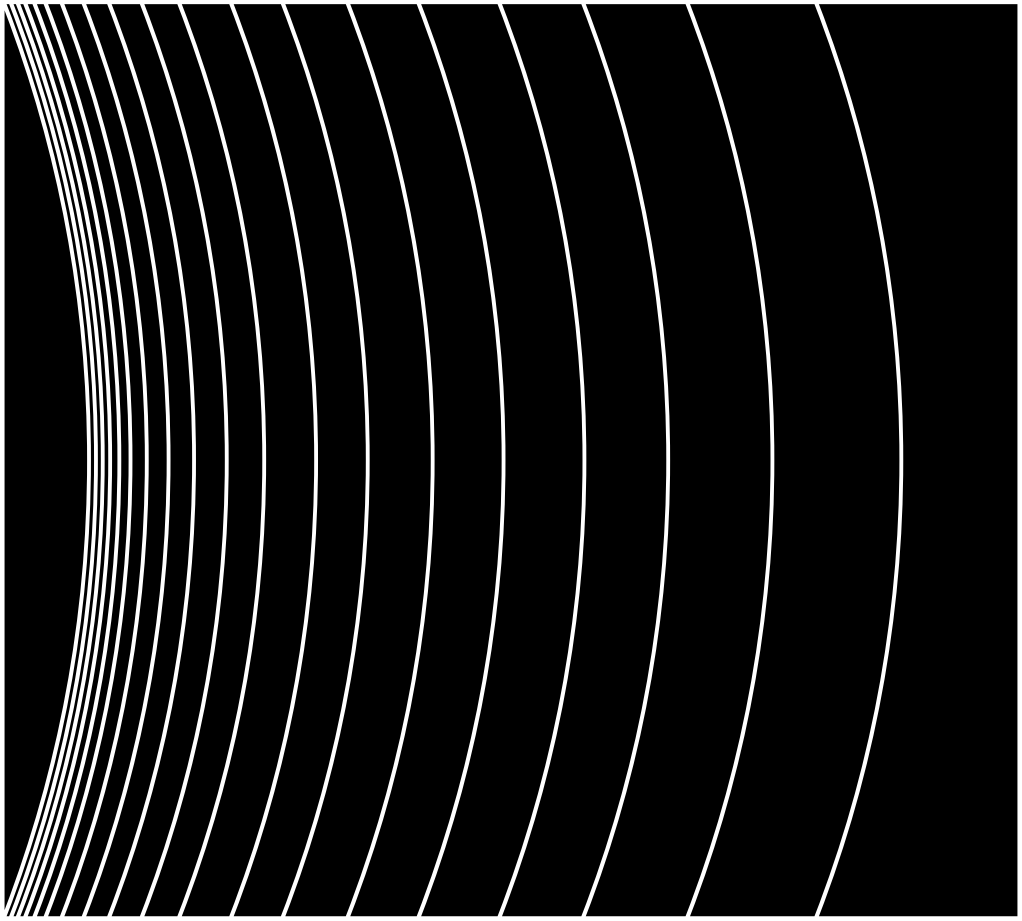
USNC-URSI National Radio Science Meeting

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



4–9 January 2021

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

UNITED STATES NATIONAL COMMITTEE
INTERNATIONAL UNION OF RADIO SCIENCE

National Radio Science Meeting
4–9 January 2021
University of Colorado Boulder

PROGRAM

Meetings and Events Overview
[All times are in MST.]

MONDAY, 4 January 2021

12:00 – 16:30	USNC-URSI Business Meeting

TUESDAY MORNING, 5 January 2021

10:00 – 12:00	NRSM Tutorial: "Successful Proposal Writing for Sustainable and Impactful Research — From Tenure Track to Endowed Chair"

TUESDAY AFTERNOON, 5 January 2021

Commission Business Meetings

13:00	Commission B	14:15	Commission A	15:30	Commission H
13:00	Commission D	14:15	Commission C	15:30	Commission J
13:00	Commission G	14:15	Commission E	15:30	Commission K
		14:15	Commission F		

TUESDAY EVENING, 5 January 2021

17:00	Women in Radio Science (WIRS) Business Meeting

WEDNESDAY, 6 January 2021

08:00 – 08:20	NRSM Welcome & Opening Remarks
08:20 – 12:00	Technical Sessions
12:10 – 13:00	Women in Radio Science (WIRS) Invited Speaker
13:10 – 15:50	Technical Sessions
15:10 – 17:00	Vendor Booths and Small Group Discussions
17:00 – 18:40	Student Paper Competition

THURSDAY, 7 January 2021

08:20 – 11:30	Plenary Session & SPC Awards
11:40 – 13:10	Student Mentoring Session
13:50 – 15:30	Technical Sessions
15:10 – 17:00	Vendor Booths and Small Group Discussions
17:00 – 18:30	Women in Radio Science (WIRS) Reception

FRIDAY, 8 January 2021

08:00 – 08:20	Opening Remarks
08:20 – 12:00	Technical Sessions
12:10 – 13:00	Eighth Hans Liebe Lecture
13:10 – 15:30	Technical Sessions
15:10 – 17:00	Vendor Booths and Small Group Discussions

SATURDAY MORNING, 9 January 2021

10:00 – 13:00	USNC–URSI Executive Council Meeting

2021 National Radio Science Meeting Overview: Technical Program

	Time [MST] \ Room	1	2	3	4	5	6	7
Wednesday, 6 January	08:00–08:20	**NRSM Welcome & Opening Remarks**						
	08:20–12:00	A1 - Electromagnetic Metrology - Antennas	BE* - High Power Electromagnetics	C1 - RF Systems, Processing, and Interference Mitigation	F1* - Memorial Session for V.I. Tatarskii: Part I	B1* - Antennas and Sensors for Harsh Environments	HG1* - Lightning and the Ionosphere	B3* - Complex EM and Meta Structures
		A2 - Electromagnetic Metrology - Millimeter Wave Communications		J1* - Understanding Low-Frequency Sky and Diffuse Structures		B2 - Antenna Theory, Design, and Measurements	HG2* - Physics of the Radiation Belts	
	Lunch Break 12:10–13:00	**Women in Radio Science Invited Speaker**						
	13:10–15:50	K1 - Human Body Interactions with Antennas and Other EM Devices	B4 - Numerical Methods	C2 - Sensor Array Processing, Imaging, and AI/ML	F2* - Memorial Session for V.I. Tatarskii: Part II	B5 - Antenna Arrays	G1 - Ionospheric Remote Sensing	B6 - RF Design Using Metamaterials and Complex Media
	15:10–17:00	**Vendor Booths & Small Group Discussions with Invited Speaker**						
	17:00–18:40	**Student Paper Competition**						

Thursday, 7 January	08:20–11:30	**Plenary Session & SPC Awards Ceremony** **Plenary Talks:** **(1) Four-Dimensional Spatiotemporal Metamaterials** **(2) Embodied Intelligence in Electronics: A New Era in High Frequency Circuit Design** **(3) Multi-Messenger Exploration of the Transient Radio Sky with LIGO**						
	Lunch Break 11:40–13:10	**Student Mentoring Session**						
	13:50–15:30	K2* - Therapeutic and Rehabilitative Applications	B7* - Antennas for CubeSats and UAVs	J2 - Epoch of Reionization: Global Signal and Cosmic Structures	FGH* - GNSS and Radio Beacon Remote Sensing	B8* - 5G and Millimeter Wave Antennas and Applications	GH* - Meteors, Orbital Debris, and Dusty Plasmas	F3 - Point-to-Point Propagation Effects
	15:10–17:00	**Vendor Booths & Small Group Discussions with Invited Speakers**						
	17:00–18:30	**Women in Radio Science Reception**						
Friday, 8 January	08:00–08:20	**Closing Day Remarks**						
	08:20–12:00	K3 - Electromagnetic Imaging and Sensing Applications	B9 - Microstrip and Printed Antennas and Devices	J3* - Epoch of Reionization: Calibration Effects	F4 - Microwave Remote Sensing of the Earth: I	B10 - RF Design and Metrology for Radiation and Sensing	H1* - Waves and Turbulence in Laboratory and Space Plasmas	D1 - Electronic Devices, Circuits, and Applications
				J4 - Epoch of Reionization: Instrumentation Effects				
	Lunch Break 12:10–13:00	**Special Events: Eighth Hans Liebe Lecture**						
	13:10–15:30	ACEJ* - Spectrum Harmonization in Contentious Electromagnetic Environments	B11* - Low-Profile Antennas from Gigahertz to Terahertz	J5 - New Telescopes, Techniques, and Technology	F5 - Microwave Remote Sensing of the Earth: II	B12* - Multiscale and Stochastic Modeling in Computational Electromagnetics	H2* - Heliospheric Observations of Waves in Plasmas	F6* - Weather Impacts on Electromagnetic Sensors and Operations
	15:10–17:00	**Vendor Booths & Small Group Discussions with Invited Speakers**						

* Indicates a Special Session

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 (NRSM) each January in Boulder, Colorado. This meeting is technically co–sponsored by the Antennas and Propagation Society of the Institute of Electrical and Electronics Engineers (IEEE/AP–S). The IEEE International Symposium on Antennas and Propagation and USNC–URSI Radio Science Meeting (RSM), co–sponsored by the IEEE/AP–S and USNC–URSI, is held each summer. Every five to eight years, a North American Radio Science Meeting (NARSM) is organized, co–sponsored by the U.S. and Canadian National Committees for URSI. The last NARSM was held virtually 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 28 – September 4, 2021.

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 next AT–RASC meeting will be held on May 30 – June 4, 2022 in Gran Canaria, Spain. The next AP–RASC meeting will be held on August 20–25, 2022 in Sydney Australia. Please visit www.ursi.org for more information on these URSI conferences.

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

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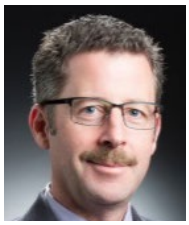

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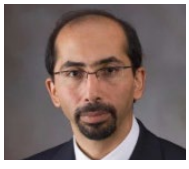

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1 Jamesina Simpson is replaced by Branislav Notaros, Colorado State University, in 2021.

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:

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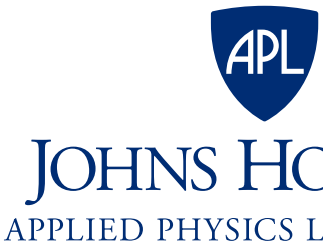
Satish K. Sharma
Ting-Yen Shih
Carl Siefring
Erik Tejero
Julio Urbina
Ata Zadehgol

New for 2021

The 2021 NRSM is being held in a virtual environment due to the COVID-19 restrictions on travel and large gatherings. USNC-URSI and CU Boulder will be using the award-winning Whova Mobile Event App to provide a seamless, interactive agenda of meeting events, including the first-ever NRSM tutorial, technical sessions, Plenary and Invited Speakers, Student Paper Competition and Virtual Exhibitor Booths.

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).

USNC-URSI would like to thank the following Platinum Sponsors for their support of the 2021 NRSM:



Wednesday, January 6 | 08:00 - 08:20
Event | Main Room

NRSM Welcome & Opening Remarks

Wednesday, January 6 | 08:20 - 10:00
A1 | Room 1

Electromagnetic Metrology - Antennas

Session Co-Chairs: Jeanne Quimby, NIST; Chris Anderson, USNA

A1.1 **08:20**
Investigation of E-textile Dipole Antenna Performance Based on Embroidery Parameters
Daniel Agu, Baylor University, United States; Rachel Eike, Iowa State University, United States; Dawn Michaelson, Rinn Cloud, Yang Li, Baylor University, United States

A1.2 **08:40**
Investigation of On-body Antenna Performance Using Motion-Capture and Statistical Analysis
George Lee, University of Oklahoma, United States; Daniel Agu, Yang Li, Baylor University, United States

A1.3 **09:00**
Antenna Comparison for Additive Manufacturing versus Traditional Manufacturing Methods
Gregory Mitchell, Theodore Anthony, Army Research Laboratory, United States; Zachary Larimore, Paul Parson, DeLUX Engineering, United States

A1.4 **09:20**
A Compact Beam Steering Dielectric Resonator Antenna for Wireless Power Transfer
Reza Karimian, George Washington University, United States; Mansoor Dashti Ardakani, Institut National de la Recherche Scientifique (INRS), Canada; Behzad Koosha, Shahrokh Ahmadi, Mona Zaghloul, George Washington University, United States

A1.5 **09:40**
Planar Millimeter Wave Antenna Design for On-Chip Electro-Optical Sensing Devises
Abe akhiyat, John L. Volakis, Florida International University, United States

Wednesday, January 6 | 08:20 - 09:40
B1 | Special Session | Room 5

Antennas and Sensors for Harsh Environments

Session Co-Chairs: Sima Noghanian, Wafer LLC and American Public University; Sayan Roy, South Dakota School of Mines and Technology

B1.1 **08:20**
Describing Asymmetric Faults with Multiconductor Transmission Lines for SSTDR
Hunter Ellis, Cynthia Furse, James Nagel, University of Utah, United States; Cody LaFlamme, University of Florida, United States

B1.2 **08:40**
Divergent Exceptional Points: A Promising Tool for Telemetric Sensing
Maryam Sakhdari, Mehdi Hajizadegan, Pai-Yen Chen, University of Illinois at Chicago, United States

B1.3 **09:00**
The Variation of Wearable and Implanted Antennas' Performance due to Body Temperature
Sima Noghanian, Wafer LLC and Sand Diego State University, United States; Josh Stout, PADT Inc., United States

B1.4 **09:20**
On the Effect of 2-D Hexagonal Boron Nitride for Radio Frequency Circuits in Harsh Environments
Ahsan Aqueeb, Venkataramana Gadhamshetty, Sayan Roy, South Dakota School of Mines & Technology, United States

Wednesday, January 6 | 08:20 - 12:00
B3 | Special Session | Room 7

Complex EM and Meta Structures

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

B3.1 **08:20**
Advances on Passive and Active Huygens' Metasurfaces
George Eleftheriades, University of Toronto, Canada

B3.2 **08:40**
Introducing Inkjet Printing Technology to the Fabrication of Flat-Layered Meta-Lens Antennas
Anastasios Papathanasopoulos, University of California, Los Angeles, United States; Ryan A. Bahr, Yepu Cui, Manos M. Tentzeris, Georgia Tech, United States; Yahya Rahmat-Samii, University of California, Los Angeles, United States

B3.3 **09:00**
Adjoint-based Design Optimization of MIMO Metamaterial Devices
Luke Szymanski, University of Michigan, United States; Gurkan Gok, Raytheon Technologies Research Center, United States; Anthony Grbic, University of Michigan, United States

B3.4 **09:20**
Exceptional Points of Degeneracy in a Transmission Line Periodically Loaded with Gain and Radiation Loss
Ehsan Hafezi, Ahmed Abdelshafy, Tarek Mealy, Alireza Nikzamir, Filippo Capolino, University of California, Irvine, United States

B3.5 **09:40**
Virtual Absorption and Gain Through Excitation at Complex Frequencies
Andrea Alù, CUNY Advanced Science Research Center, United States

Break **10:00**

B3.6 **10:20**
A Study of Asymmetric Epsilon-Negative and Near-Zero Metamaterial-Lined Plasmonic Nanoapertures as Metasurface Unit Cells
Mitchell Semple, Ashwin Iyer, University of Alberta, Canada

B3.7 **10:40**
Passive and Bias-free Nonreciprocal Transmission Based on Nonlinear Asymmetric Dielectric Metasurfaces
Boyuan Jin, Christos Argyropoulos, University of Nebraska Lincoln, United States

B3.8 **11:00**
Discrete Space Optical Signal Processing with Metamaterials
Dimitrios Sounas, Mohammad Moein Moeini, Wayne State University, United States

B3.9 **11:20**
Broadband and Efficient Surface Plasmon Generation on Drift-biased Graphene-based Hyperbolic Metasurfaces
Luqi Wang, Nayan K. Paul, J. Sebastian Gomez Diaz, University of California, Davis, United States

B3.10 **11:40**
Drifting Electrons: Nonreciprocal Plasmonics and Thermal Photonics
Seyyed Ali Hassani Gangaraj, Francesco Monticone, Cornell University, United States

Wednesday, January 6 08:20 - 10:00
C1 Room 3

RF Systems, Processing, and Interference Mitigation

Session Co-Chairs: Charles Baylis, Baylor University; Felix Vega, Technology Innovation Institute

C1.1 **08:20**
An Algorithm for the Optimization of a Dual-Beam Steerable Phased Array System with Real-Time Reconfigurable Element-wise Power Amplifier Load Impedance Tuners
Adam Goad, Charles Baylis, Robert Marks, Baylor University, United States; Sarah Seguin, Resonant Frequency, United States

C1.2 **08:40**
A Comparison of Fixed Broadband and Tunable Narrowband Output Matching Networks in a Power Amplifier for Improvements in Radar Range
Justin Roessler, Adam Goad, Austin Egbert, Charles Baylis, Robert Marks, Baylor University, United States; Anthony Martone, Benjamin Kirk, CCDC Army Research Laboratory, United States

C1.3 **09:00**
Experimental and Theoretical Assessment of UWB Secure Communication in Presence of Dynamic Interference
Md Rakibur Rahman, Satheesh Bojja Venkatakrishnan, John L. Volakis, Florida International University, United States

C1.4 **09:20**
Clutter Removal of GPR Data using Complex Natural Resonance Extraction
John Pantoja, Technology Innovation Institute, United Arab Emirates; Eder F. Ruiz, Universidad Nacional de Colombia, Colombia; Felix Vega, Technology Innovation Institute, United Arab Emirates; Daniel Chaparro-Arce, Universidad Nacional de Colombia, Colombia; Chaouki Kasmi, Technology Innovation Institute, United Arab Emirates

C1.5 **09:40**
A Secure Telecommunication Link using Spread Spectrum Technique for 5G Applications
Marzie Tabatabaefar, Mansoor Dashti Ardakani, Institut National de la Recherche Scientifique (INRS), Canada; Reza Karimian, George Washington University, United States; Serioja Ovidiu Tatu, Institut National de la Recherche Scientifique (INRS), Canada

Wednesday, January 6 08:20 - 11:40
BE Special Session Room 2

High Power Electromagnetics

Session Co-Chairs: D. V. Giri, University of New Mexico; Robert Gardner, Georgia Tech Research Institute

BE.1 **08:20**
Proper Orthogonal Decomposition for Analysis of High-Power Virtual Cathode Oscillations
Julio de Lima Nicolini, Fernando Teixeira, The Ohio State University, United States

BE.2 **08:40**
Review of Electrical - Power Transformer Responses to Fast Transients
D. V. Giri, University of New Mexico, United States; F. M. Tesche, EMConsultant, United States

BE.3 **09:00**
Full-Wave Transmission Line Theory (FWTLT) for a Thin-Wire Transmission Line inside a Rectangular Resonator
Sergey Tkachenko, Juergen Nitsch, Moustafa Raya, Ralf Vick, Otto-von-Guericke University Magdeburg, Germany

BE.4 **09:20**
Modeling and Statistical Characterization of Electromagnetic Coupling to Electronic Devices
James Hunter, Shengxuan Xia, Aaron Harmon, Missouri University of Science & Technology, United States; Ahmed Hassan, University of Missouri-Kansas City, United States; Victor Khilkevich, Daryl Beetner, Missouri University of Science & Technology, United States

BE.5 **09:40**
Simulation of RF Effects on Electronics
Robert Gardner, Georgia Tech Research Institute, United States

Break **10:00**

BE.6 **10:20**
The Science of Electronics in Extreme Electromagnetic Environments I – Coupling
Edl Schamiloglu, Sameer Hemmady, Zhen Peng, Ghadeh Hadi, Evelyn Dohme, Shen Lin, University of New Mexico, United States; Thomas Antonsen, Jr., Steven Anlage, Ed Ott, University of Maryland, United States

BE.7 **10:40**
The Science of Electronics in Extreme Electromagnetic Environments II – Circuit Effects
Sameer Hemmady, Edl Schamiloglu, University of New Mexico, United States

BE.8 **11:00**
Theoretical Modeling of High Power Electromagnetic Waves Interacting with Plasmonic Materials and Nanostructures
Dhananjay Mishra, Larousse K. Khorashad, Christos Argyropoulos, University of Nebraska Lincoln, United States

BE.9 **11:20**
A Concept of a Mesoband Source Combining a Reflectarray Antenna and a Switched Oscillator
Felix Vega, Fernando Albarracin-Vargas, Chaouki Kasmi, Technology Innovation Institute, United Arab Emirates

Wednesday, January 6 08:20 - 11:00
F1 Special Session Room 4

Memorial Session for V.I. Tatarskii: Part I

Session Co-Chairs: Gary Brown, Virginia Tech; Saba Mudaliar, Air Force Research Laboratory

F1.1 **08:20**
Tatarskii's Extraordinary Work, and Some Current Problems in the Field
Akira Ishimaru, University of Washington, United States

F1.2 **08:40**
Remembering Professor Valerian Tatarskii
Valery Zavorotny, University of Colorado Boulder, United States

F1.3 **09:00**
Contribution of Anderson Localization to the Beyond-the-Horizon Propagation of Microwaves in the Troposphere
Valentin Freilikher, Bar Ilan University, Israel

F1.4 **09:20**
Prof. V. I. Tatarskii and Strong Scintillation Theory
Mikhail Charnotskii, Independent researcher, United States

F1.5 **09:40**
V. I. Tatarskii as a Mentor and Advisor, and a Perspective on Extra-Wide-Angle Parabolic Equations
Vladimir Ostashev, D. Keith Wilson, U.S. Army Engineer Research and Development Center, United States

Break **10:00**

F1.6 **10:20**
An Approximate Approach For Altering The Current Kernel In Rough Surface Scattering
Gary Brown, Virginia Tech, United States

F1.7 **10:40**
Ultra-low Electromagnetic Resonances and Monitoring of the Greenland and Antarctica Ice sheets
Alexander Voronovich, NOAA/ESRL, United States; Paul Johnston, NOAA/ESRL and CU/CIRES, United States; Richard Lataitis, Jesse Leach, NOAA/ESRL, United States

Wednesday, January 6 08:20 - 09:40
HG1 Special Session Room 6

Lightning and the Ionosphere

Session Co-Chairs: Victor Pasko, Pennsylvania State University; Mark Golkowski, University of Colorado Denver

HG1.1 **08:20**
VLF Remote Sensing of Lightning Induced Ionospheric Perturbations using Overlapping Paths of VLF Signal Propagation
Mark Golkowski, Chad Renick, University of Colorado Denver, United States; Morris Cohen, Georgia Institute of Technology, United States

HG1.2 **08:40**
UV Rayleigh Scattering as a Source of Seed Electrons for Initiation of Streamers in the System of two Approaching Hydrometeors
Victor Pasko, Pennsylvania State University, United States; Jaroslav Jansky, University of Defense, Brno, Czech Republic

HG1.3 **09:00**
Photodetachment Rate of Negative Ions of the Lower Ionosphere due to Optical Emissions from Lightning
Reza Janalizadeh, Victor Pasko, Pennsylvania State University, United States

HG1.4 **09:20**
The Discovery of Novel Ionospheric Phenomena using Ionospheric High Frequency Software-Defined Radar
Salih Mehmed Bostan, Bursa Teknik University, Turkey; Julio Urbina, John D. Mathews, Pennsylvania State University, United States

Wednesday, January 6 10:20 - 12:00
A2 Room 1

Electromagnetic Metrology - Millimeter Wave Communications

Session Co-Chairs: Chris Anderson, USNA; Jeanne Quimby, NIST

A2.1 **10:20**
A Large Intelligent Surface Prototype for 5G and Beyond Wireless Communications
Panagiotis Theofanopoulos, Anuj Modi, Aditya Singh Shekhawat, Bharath Kashyap, Anand Pratap Singh Sengar, Sanjay Kumar Vijaya Kumar, Arkajyoti Chang, Craig Birtcher, Ahmed Alkhateeb, Georgios Trichopoulos, Arizona State University, United States

A2.2 **10:40**
Multi-Bit Unit-Cell Configurations for Efficient Sub-Millimeter-Wave Reconfigurable Reflective Surfaces
Panagiotis Theofanopoulos, Georgios Trichopoulos, Arizona State University, United States

A2.3 **11:00**
Millimeter-Wave Beamforming Receiver Fabrication Challenges
Kefayet Ullah, Satheesh Bojja Venkatakrishnan, John L. Volakis, Florida International University, United States

A2.4 **11:20**
Anchor-Shaped Antenna-Based Wireless Charging Platform for Internet of Things
Dieff Vital, John L. Volakis, Shubhendu Bhardwaj, Florida International University, United States

A2.5 **11:40**
Verification of an Evaluator for a New-Radio Channel Estimator
Alec Weiss, Atef Elsherbeni, Colorado School of Mines, United States; Jeanne Quimby, National Institute of Standards and Technology, United States

Wednesday, January 6 10:20 - 12:00
J1 Special Session Room 3

Understanding Low-Frequency Sky and Diffuse Structures

Session Co-Chairs: David DeBoer, University of California, Berkeley; Bryna Hazelton, University of Washington

J1.1 **10:20**
Implementation of a Van Vleck Correction for the MWA
Pyxie Star, Bryna Hazelton, Miguel Morales, Michael Wilensky, Ruby Byrne, University of Washington, United States

J1.2 **10:40**
Linear Foreground Filters and Results from their Application to HERA Low-Band data.
Aaron Ewall-Wice, University of California, Berkeley, United States

J1.3 **11:00**
Polarized Imaging for Reionization, with an Application to HERA
James Aguirre, Zachary Martinot, Jianrong Tan, University of Pennsylvania, United States; Kaelyn Dauer, California State University, Fresno, United States; Adriana Gavidia, Cal Poly San Luis Obispo, United States; Jennifer Locke, Alexander Seidel, University of Pennsylvania, United States; Gonzalo Tucker, San Diego State University, United States

J1.4 **11:20**
Recent Progress of the Mapper of the IGM Spin Temperature (MIST)
Raul Monsalve, McGill University, Canada

J1.5 **11:40**
Long Baseline Interferometry of the Solar Corona below 100 MHz
Hariharan Krishnan, Arizona State University, United States

Wednesday, January 6 10:20 - 11:40
HG2 Special Session Room 6

Physics of the Radiation Belts

Session Co-Chairs: Dong Lin, Virginia Tech; Vijay Harid, University of Colorado Denver

HG2.1 **10:20**
Van Allen Belt Punctures and their Correlation with Solar Wind, Geomagnetic Activity and ULF Waves
Jayasri Joseph, Allison Jaynes, University of Iowa, United States; Dan Baker, Xinlin Li, University of Colorado Boulder, United States; Shri Kanekal, Goddard Space Flight Center, United States

HG2.2 **10:40**
Scattering and Energization by Large-amplitude Whistler-mode Waves in the Evolution of Solar Wind Electron Distributions and Hamiltonian Analysis of Resonant Interactions
Tien Vo, Cynthia Cattell, Aaron West, Robert Lysak, University of Minnesota - Twin Cities, United States

HG2.3 **11:00**
Driving of Outer Belt Electron Loss by Solar Wind Dynamic Pressure Structures: Analysis of Balloon and Satellite data
Aaron Breneman, University of Minnesota, United States

HG2.4 **11:20**
Timescales of Electrons Wave-Particle Interactions with Chorus and Hiss in the Outer Radiation Belts: The Van Allen Probes results
Oleksiy Agapitov, University of California, Berkeley, United States; Didier Mourenas, CEA, France; Anton Artemyev, UCLA, United States; John Bonnell, Forrest Mozer, University of California, Berkeley, United States

Wednesday, January 6 10:20 - 11:40
B2 Room 5

Antenna Theory, Design, and Measurements

Session Co-Chairs: Branislav Notaros, Colorado State University; Danilo Erricolo, University of Illinois at Chicago (UIC)

B2.1 **10:20**
Reconfigurable Leaky Wave Antenna Based On Embedded Liquid Crystal
Elahehsadat Torabi, Pai-Yen Chen, Danilo Erricolo, University of Illinois at Chicago, United States

B2.2 **10:40**
Fast and Accurate Radiation Pattern Evaluation Using Generative Adversarial Network
Yi-Huan Chen, Pai-Yen Chen, University of Illinois at Chicago, United States

B2.3 **11:00**
Design and Optimization of Helical RF Coils for Use in High-Field Strength Magnetic Resonance Imaging at 4.7T
Jeremiah Corrado, Pranav Athalye, Milan Ilic, Branislav Notaros, Colorado State University, United States

B2.4 **11:20**
Bandwidth Enhanced Folded Unipole Antenna for VLF Measurements
Patrick Deibler, Ashanthi Maxworth, University of Southern Maine, United States

Wednesday, January 6 12:10 - 13:00
Event Main Room

Women in Radio Science Invited Speaker

Taking the Leap and the (RF) Path Less Traveled; Melissa Midzor, NIST

Wednesday, January 6 13:10 - 14:50
K1 Room 1

Human Body Interactions with Antennas and Other EM Devices

Session Co-Chairs: Majid Manteghi, Virginia Tech; Erdem Topsakal, Virginia Commonwealth University

K1.1 **13:10**
Fabrication Challenges of Bio-Matched Antennas
Allyanna Rice, Asimina Kiourti, Ohio State University, United States

K1.2 **13:30**
Non-contact Method of Controlling Heated Area using Developed Rectangular Resonant Cavity Applicator
Tomokage Takamatsu, Meiji University, Japan; Yuya Iseki, Hachinohe National College of Technology, Japan; Yasuhiro Shindo, Toyo University, Japan; Kazuo Kato, Meiji University, Japan

K1.3 **13:50**
Dielectric and Magnetic Properties of PANI-CA Composites
Balaji Dontha, Asimina Kiourti, The Ohio State University, United States

K1.4 **14:10**
Analysis of Human Vital Signs Using Millimeter-Wave Radar and ESPRIT Algorithm
Drew Bresnahan, Baylor University, United States

K1.5 **14:30**
Measurement and Simulation of the Human Body Channel Electromagnetic Coupling Characteristics
Jose Alcala-Medel, Yang Li, Baylor University, United States

Wednesday, January 6 13:10 - 15:30
C2 Room 3

Sensor Array Processing, Imaging, and AI/ML

Session Co-Chairs: Greg Huff, Penn State University; Anthony Martone, Army Research Laboratory

C2.1 **13:10**
Super-Resolution Generative Adversarial Network for Weather Radar Images
Jacob Garcia, Chandra.V Chandrasekar, Colorado State University, United States

C2.2 **13:30**
ACCURACy: Adaptive Calibration of CUbesat RAdiometer Constellations
John Bradburn, Mustafa Aksoy, Henry Ashley, University at Albany, State University of New York, United States

C2.3 **13:50**
Near-field Compensation Techniques for Coherent Processing using Distributed Receivers
Chanci King, Albin Gasiewski, University of Colorado, United States

C2.4 **14:10**
Random Forest-Based Surrogate Modeling in RF Optimizations
Md Rayhan Khan, Shubhendu Bhardwaj, Constantinos L. Zekios, Stavros Georgakopoulos, Florida International University, United States

C2.5 **14:30**
GNU Radio and Public Engagement at the Allen Telescope Array
Ellie White, Marshall University, United States; Steve Croft, University of California, Berkeley, United States; Alexander Pollak, SETI Institute, United States; Derek Kozel, SETI Institute (GNU Radio), United States

Break **14:50**

C2.6 **15:10**
Deep Learning Enhanced Joint Geophysical Inversion for Crosswell Monitoring
Yanyan Hu, Yuchen Jin, Xuqing Wu, Jiefu Chen, Jiuping Chen, Qiuyang Shen, Yueqin Huang, University of Houston, United States

Wednesday, January 6 13:10 - 14:50
G1 Room 6

Ionospheric Remote Sensing

Session Co-Chairs: Julio Urbina, Pennsylvania State University; James Conroy, Virginia Tech

G1.1 **13:10**
Results of Ionospheric Wave Studies from First Deployments of the Transportable Dynasonde System
Nikolay Zabotin, Albin Gasiewski, David Kraft, Arvind Aradhya, Liudmila Zabotina, University of Colorado Boulder, United States; Robert Livingston, Scion Associates Inc., United States

G1.2 **13:30**
Passively Characterizing and Tracking Sporadic E using Radio Emission from the Electrical Grid
Kenneth Obenberger, Air Force Research Laboratory, United States; Jayce Dowell, University of New Mexico, United States; Christopher Fallen, Jeffrey Holmes, Air Force Research Laboratory, United States; Gregory Taylor, Savin Varghese, University of New Mexico, United States

G1.3 **13:50**
A Lightning-Based, Passive, Portable Ionospheric Sounder: The Lionosonde
Kenneth Obenberger, Eugene Dao, Air Force Research Laboratory, United States

G1.4 **14:10**
A Modern Approach to the Detection and Classification of Meteor Radar Echoes
Yanlin Li, Freddy Galindo, Julio Urbina, Pennsylvania State University, United States

G1.5 **14:30**
Analysis of Scintillation Events in the Auroral and Polar Cap Regions
James Conroy, Virginia Tech, United States; Kshitija Deshpande, Embry-Riddle, United States; Wayne Scales, Amir Zaghloul, Virginia Tech, United States

Wednesday, January 6 13:10 - 15:50
B4 Room 2

Numerical Methods

Session Co-Chairs: Branislav Notaros, Colorado State University; Donald Wilton, University of Houston

B4.1 **13:10**
Electromagnetic Modeling of Thin Wire with Multilayered Coating in Layered Media
Chaoxian Qi, Shubin Zeng, Xuqing Wu, Jiefu Chen, University of Houston, United States; Jiuping Chen, Yueqin Huang, Cyentech Consulting LLC, United States

B4.2 **13:30**
Enhancing Adaptive Mesh Refinement Efficiency: Adjoint-Based Error Estimation and Targeted Refinement in 3-D FEM
Jake Harmon, Branislav Notaroš, Colorado State University, United States

B4.3 **13:50**
Extraction of Nonlinear X-Parameters from FDTD Simulation of a One-Port Device
Joshua Kast, Atef Elsherbeni, Colorado School of Mines, United States

B4.4 **14:10**
Comparative Study of Propagation Modeling of Tunnel Environments Using Asymptotic and Full-Wave Techniques
Stephen Kasdorf, Blake Troksa, Branislav Notaros, Colorado State University, United States

B4.5 **14:30**
Evaluation of 6-D Reaction Integrals via Double Application of the Divergence Theorem
Javier Rivero, Politecnico di Torino, Italy; Donald Wilton, University of Houston, United States; Francesca Vipiana, Politecnico di Torino, Italy; William Johnson, Electromagnetics Consultant, United States

Break **14:50**

B4.6 **15:10**
A Study of Series Acceleration Using Shank's Transform and Variations
Sembiam Rengarajan, Shailesh Sahu, California State University, Northridge, United States

B4.7 **15:30**
Receive-Beamforming-Enhanced Qualitative Inverse Scattering
Matthew Burfeindt, Hatim Alqadah, US Naval Research Laboratory, United States

Wednesday, January 6 13:10 - 15:30
B5 Room 5

Antenna Arrays

Session Co-Chairs: John Volakis, Florida International University; Steven Ellingson, Virginia Tech

B5.1 **13:10**
Wideband UHF Apertures on Textile Substrates for Space Applications
Jorge Caripidis Troccola, Alexander Johnson, Vignesh Manohar, Satheesh Bojja Venkatakrishnan, John L. Volakis, Florida International University, United States

B5.2 **13:30**
Simple Pattern Synthesis for Complicated Arrays
Steven Ellingson, Virginia Tech, United States

B5.3 **13:50**
360° Switched Beam SIW Horn Arrays at 60 GHz, Phase Centers, and Friis Equation
Prabhat Baniya, Kathleen Melde, University of Arizona, United States

B5.4 **14:10**
Lossy Beam Generation of Circular Arrays
Kristopher Buchanan, Naval Information Warfare Center Pacific, United States; Nam Nicholas Mai, Naval Information Warfare Center Pacific; The Pennsylvania State University, United States; Sara Wheeland, Carlos Flores-Molina, Naval Information Warfare Center Pacific, United States; Gregory Huff, Pennsylvania State University, United States

B5.5 **14:30**
Deployable and Reconfigurable Ultra-Wideband Apertures on Origami Lattices
Maxence Carvalho, John L. Volakis, Florida International University, United States

Break **14:50**

B5.6 **15:10**
Ultra Wideband (UWB) Slot Antenna Array for Low Profile, High Power Applications
Alexander Hovsepian, Satheesh Bojja-Venkatakrishnan, Elias Alwan, John L. Volakis, Florida International University, United States

Wednesday, January 6 13:10 - 15:50
B6 Room 7

RF Design Using Metamaterials and Complex Media

Session Co-Chairs: Filippo Capolino, Department of Electrical Engineering and Computer Science, University of California, Irvine; Andrea Alù, The City University of New York

B6.1 **13:10**
Self-Anticrossing Band Knots in Plasmonic Arrays with Broken Symmetries
Shixiong Yin, City College of New York of The City University of New York, United States; Andrea Alù, City University of New York, United States

B6.2 **13:30**
Position-Independent Gain for Arbitrarily Polarized Antennas Using Phase Conjugating Metasurfaces
Shixiong Yin, City College of New York of The City University of New York, United States; Sander Mann, Andrea Alù, City University of New York, United States

B6.3 **13:50**
Investigation of Exceptional Point of Degeneracy in Space-Time Modulated Transmission Line
Kasra Rouhi, Hamidreza Kazemi, Alexander Figotin, Filippo Capolino, University of California, Irvine, United States

B6.4 **14:10**
Hybrid Lens with Near Unitary Numerical Aperture in Transmissive Mode
Yoshiaki Kasahara, University of Texas at Austin, United States; Younes Ra'di, Andrea Alù, City University of New York, United States

B6.5 **14:30**
Mimicking the Faraday Effect with Temporal Modulations
Robert Duggan, University of Texas at Austin, United States; Andrea Alù, City University of New York, United States

Break **14:50**

B6.6 **15:10**
Frozen Modes in 3-Way Coupled Microstrip Lines
Raed Almhmadi, University of Jeddah, Saudi Arabia

B6.7 **15:30**
Reconfigurable Shielding Architecture Using Multiferroics in 1 to 6 GHz Frequency Band
Pawan Gaire, Shubhendu Bhardwaj, Markondeyaraj Pulugurtha, John L. Volakis, Florida International University, United States

Wednesday, January 6 13:10 - 14:50
F2 Special Session Room 4

Memorial Session for V.I. Tatarskii: Part II

Session Co-Chairs: Gary Brown, Virginia Tech; Saba Mudaliar, Air Force Research Laboratory

F2.1 **13:10**
Remarks on the Parabolic Equation Model for Waves in Random Media
Saba Mudaliar, Air Force Research Laboratory, United States

F2.2 **13:30**
Frequency Correlations Functions for 2D-Trunk Dominated Forest
Roger Lang, George Washington University, United States; Saul Torrico, Comsearch, United States; Cuneyt Utku, TUBITAK BILGEM, Turkey

F2.3 **13:50**
Characterizing the Coherent Reflected Power Dependence on Rough Surface Height at Low Signal Levels
Ethan Raines, Joel Johnson, Robert Burkholder, The Ohio State University, United States

F2.4 **14:10**
A Space-angle Discontinuous Galerkin Method for One-Dimensional Cylindrical Radiative Transfer Equation with Angular Decomposition
Hang Wang, Reza Abedi, University of Tennessee Space Institute, United States; Saba Mudaliar, Air Force Research Laboratory, United States

F2.5 **14:30**
Backscattering from Martian Regolith Layer over an Underlying Half Space of Water/Ice
Jiaxing Yang, Roger Lang, George Washington University, United States; Rafael Rincon, Jim Garvin, NASA Goddard Space Flight Center, United States

Wednesday, January 6 15:10 - 17:00
Event Main Room

Vendor Booths & Small Group Discussions with Invited Speaker

Wednesday, January 6 17:00 - 18:40
Event Main Room

Student Paper Competition

Thursday, January 7 | 08:20 - 11:30
Event | Main Room

Plenary Session & SPC Awards Ceremony

Plenary Talks:

(1) Four-Dimensional Spatiotemporal Metamaterials; Nader Engheta, University of Pennsylvania

(2) Embodied Intelligence in Electronics: A New Era in High Frequency Circuit Design; Linda P. B. Katehi, Texas A&M University

(3) Multi-Messenger Exploration of the Transient Radio Sky with LIGO; Alessandra Corsi, Texas Tech University

Thursday, January 7 | 11:40 - 13:10
Event | Main Room

Student Mentoring Session

Thursday, January 7 | 13:50 - 15:30
B7 | Special Session | Room 2

Antennas for CubeSats and UAVs

Session Co-Chairs: Reyhan Baktur, Utah State University; David Jackson, University of Houston

B7.1 **13:50**
K-Band Circularly Polarized Beam Steerable Reflectarray Enabling CubeSat Internet of Space: Conceptualization and Validation
Junbo Wang, University of California, Los Angeles, United States; Vignesh Manohar, Florida International University, United States; Yahya Rahmat-Samii, University of California, Los Angeles, United States

B7.2 **14:10**
A Deployable Hexagonal Reflectarray Antenna for Space Applications
Antonio Rubio, Abdul-Sattar Kaddour, Stavros Georgakopoulos, Florida International University, United States; Collin Ynchausti, Spencer Magleby, Larry Howell, Brigham Young University, United States

B7.3 **14:30**
Mechanically Actuated Low-Profile Reconfigurable Circularly Polarized Antenna for CubeSats
Michail Anastasiadis, Alexander Johnson, Vignesh Manohar, Satheesh Bojja Venkatakrishnan, John L. Volakis, Florida International University, United States

B7.4 **14:50**
VHF/UHF Tightly Coupled Dipole Array for CubeSats
Vignesh Manohar, Shubhendu Bhardwaj, Satheesh Bojja Venkatakrishnan, John L. Volakis, Florida International University, United States

B7.5 **15:10**
Beam Focusing by Scattering from an Array of Scatterers on a Drone
Neil Egarguin, University of the Philippines Los Baños, Philippines; David Jackson, Daniel Onofrei, Julien Leclerc, Aaron Becker, University of Houston, United States

Thursday, January 7 | 13:50 - 15:30
B8 | Special Session | Room 5

5G and Millimeter Wave Antennas and Applications

Session Co-Chairs: Ting-Yen Shih, University of Idaho; Adrew Chrysler, Idaho State University

B8.1 **13:50**
A Kirigami-Inspired Pattern-Reconfigurable Antenna with Switchable Omnidirectional and Unidirectional Beams
Qianyi Li, Ting-Yen Shih, University of Idaho, United States

B8.2 **14:10**
Fabrication and Characterization of a 900-Element 222.5 GHz Single-bit Reflective Surface with Suppressed Quantization Lobes
Bharath Kashyap, Panagiotis Theofanopoulos, Yiran Cui, Georgios Trichopoulos, Arizona State University, United States

B8.3 **14:30**
An Electronic Beam-steering Antenna with Active FSS for 5G Applications
Shuo Liu, Jennifer Bernhard, University of Illinois at Urbana-Champaign, United States

B8.4 **14:50**
Beamsteering Reflectarray Antenna for CubeSat Application
Sakshi Srivastava, Neil Stimpson, Jennifer Bernhard, University of Illinois at Urbana-Champaign, United States

B8.5 **15:10**
Analysis of Reconfigurable and Deployable Miura-Ori Reflectarrays for Satellite Applications
Carlos Velez, Abdul-Sattar Kaddour, Stavros Georgakopoulos, Florida International University, United States; Diana Bolanos, Collin Ynchausti, Spencer Magleby, Larry Howell, Brigham Young University, United States

Thursday, January 7 | 13:50 - 15:10
J2 | Room 3

Epoch of Reionization: Global Signal and Cosmic Structures

Session Co-Chairs: David DeBoer, University of California, Berkeley; Bryna Hazelton, University of Washington

J2.1 **13:50**
Update on the REACH Experiment
Eloy de Lera Acedo, University of Cambridge, United Kingdom

J2.2 **14:10**
Beam Chromaticity of the EDGES Low-Band Blade Dipole
Nivedita Mahesh, Judd Bowman, Thomas Mozdzen, Arizona State University, United States; Alan E.E. Rogers, Massachusetts Institute of Technology, United States; Raul Monsalve, McGill University, Canada; Steven Murray, David Lewis, Arizona State University, United States

J2.3 **14:30**
Detection of Cosmic Structures using Bispectrum Phase: Theory and Application
Nithyanandan Thyagarajan, Chris Carilli, National Radio Astronomy Observatory, United States; Bojan Nikolic, James Kent, University of Cambridge, United Kingdom; Gianni Bernardi, Instituto Nazionale di Astrofisica (INAF), Italy

J2.4 **14:50**
2020 Measurements of the Sky Brightness Temperature with EDGES
Raul Monsalve, McGill University, Canada; Judd Bowman, Arizona State University, United States; Alan E.E. Rogers, Massachusetts Institute of Technology, United States; Steven Murray, Nivedita Mahesh, Arizona State University, United States; John Barrett, Massachusetts Institute of Technology, United States; Titu Samson, Arizona State University, United States

Thursday, January 7 | 13:50 - 15:10
FGH | Special Session | Room 4

GNSS and Radio Beacon Remote Sensing

Session Co-Chairs: Jade Morton, University of Colorado; Clara Chew; Carl Siefring, NRL

FGH.1 **13:50**
Measuring GPS EIRP in Real-Time with a Spaceborne GNSS-Reflectometry Remote Sensing System
Tianlin Wang, Christopher Ruf, University of Michigan, United States

FGH.2 **14:10**
On the Application of Low-cost Ionospheric Scintillation Monitors to Distributed Sensor Studies of Ionospheric Irregularities
Fabiano Rodrigues, Josemaria Socola, Isaac Wright, University of Texas at Dallas, United States; Alison Moraes, IAE, United States; Moises Freitas, ITA, United States

FGH.3 **14:30**
Detection of Dominant Scattering Modes Over Land and Ocean Surfaces Using CYGNSS Level-1 Delay Doppler Maps
Mohammad Al-Khaldi, University Cooperation for Atmospheric Research, United States; Joel Johnson, The Ohio State University, United States; Scott Gleason, University Cooperation for Atmospheric Research, United States; Eric Loria, NASA, United States; Yuchan Yi, The Ohio State University, United States

FGH.4 **14:50**
Matched Filter Maximum Hurricane Wind Retrievals Using CYGNSS's Special Downlink Modes
Mohammad Al-Khaldi, University Cooperation for Atmospheric Research, United States; Joel Johnson, The Ohio State University, United States; Stephen Katzberg, NASA, United States; Younghun Kang, Ethan Kubatko, The Ohio State University, United States

Thursday, January 7 | 13:50 - 14:50
K2 | Special Session | Room 1

Therapeutic and Rehabilitative Applications

Session Co-Chairs: Ryan Green, Mississippi State University; Majid Manteghi, Virginia Tech

K2.1 **13:50**
Bovine Calf Serum: Broadband Dielectric Properties and an Emulating Phantom
Vigyanshu Mishra, Zeke Dalisky, Asimina Kiourti, The Ohio State University, United States

K2.2 **14:10**
Inkjet-Printed RFIDs for Wearable Applications
McKenzie Piper, Tania Dobrescu, James Forsberg, Erdem Topsakal, Virginia Commonwealth University, United States

K2.3 **14:30**
Development of AR System to Visualize Electromagnetic Fields Based on Numerical Analysis Results
Dai Onuma, Yasuhiro Shindo, Toyo university, Japan

Thursday, January 7 | 13:50 - 14:50
GH | Special Session | Room 6

Meteors, Orbital Debris, and Dusty Plasmas

Session Co-Chairs: Robert Marshall, University of Colorado Boulder; Mark Golkowski, University of Colorado Denver

GH.1 **13:50**
Meteoroid Mass Estimation Based on Single-Frequency Radar Cross Section Measurements
Liane Tarnecki, Robert Marshall, University of Colorado Boulder, United States

GH.2 **14:10**
A Metamaterial-inspired Solution to the RF Blackout Problem Associated with Plasmasonic Vehicles
Bruce Webb, University of Arizona, United States; Richard Ziolkowski, University of Technology Sydney, Australia

GH.3 **14:30**
A Study of the Correlation between Enhanced LHR, VLF Turbulences and Earthquakes
Ashanthi Maxworth, University of Southern Maine, United States; Mark Golkowski, University of Colorado Denver, United States; Gareth Perry, New Jersey Institute of Technology, United States

Thursday, January 7 | 13:50 - 14:30
F3 | Room 7

Point-to-Point Propagation Effects

Session Co-Chairs: Thomas Hanley, Johns Hopkins University Applied Physics Laboratory; Michael Newkirk, Johns Hopkins University Applied Physics Laboratory

F3.1 **13:50**
An Evaluation of Coupled Ocean Atmosphere Mesoscale Prediction System Performance for an Over the Horizon, Over Water Geometry using Long Term, Multi-Band Radio Frequency Measurements
Abby Anderson, Matt Wilbanks, Russell Wiss, Benita Brown, NSWCDD, United States

F3.2 **14:10**
LTE Coverage Analysis Using TEMPER and Wireless Insite
Kenneth Morgan, Julia Andrusenko, Jonathan Gehman, Oscar Somerlock, Steve Yao, Avinash Sharma, Johns Hopkins University Applied Physics Laboratory, United States

Thursday, January 7 | 15:10 - 17:00
Event | Main Room

Vendor Booths & Small Group Discussions with Invited Speakers

Thursday, January 7 | 17:00 - 18:30
Event | Main Room

Women in Radio Science Reception

Friday, January 8 08:00 - 08:20
Event Main Room

Closing Day Remarks

Friday, January 8 08:20 - 11:40
K3 Room 1

Electromagnetic Imaging and Sensing Applications

Session Co-Chairs: Erdem Topsakal, Virginia Commonwealth University; Majid Manteghi, Virginia Tech

K3.1 **08:20**
Toward Non-Invasive Core Body Temperature Sensing
Katrina Guido, Alexandra Bringer, Asimina Kiourti, The Ohio State University, United States

K3.2 **08:40**
Passive Wireless Neurosensing System for Multi-unit Neuronal Activity Monitoring
Carolina Moncion, Lakshmini Balachandar, Satheesh Bojja-Venkatakrishnan, Florida International University, United States; Asimina Kiourti, The Ohio State University, United States; Jorge Riera Diaz, John L. Volakis, Florida International University, United States

K3.3 **09:00**
Characterization of Screen-Printed Fabric and Ink Antennas
Jonathan Lundquist, McKenzie Piper, James Forsberg, Erdem Topsakal, Virginia Commonwealth University, United States

K3.4 **09:20**
Three-Dimensional Wearable Sensor for Real-Time Imaging using a Back-Projection Technique
Asif Hassan, Florida International University, United States; Md. Asiful Islam, Bangladesh University of Engineering and Technology, Bangladesh; Vignesh Manohar, Satheesh Bojja Venkatakrishnan, John L. Volakis, Florida International University, United States

K3.5 **09:40**
Wearable Loops for Unobtrusive Electromagnetic Detection of Joint Effusion
Zeke Dalisky, Vigyanshu Mishra, Asimina Kiourti, The Ohio State University, United States

Break **10:00**

K3.6 **10:20**
Air-core Coil Gradiometer for Biomagnetic Sensing in Non-shielded Environments
Keren Zhu, Asimina Kiourti, The Ohio State University, United States

K3.7 **10:40**
Artifacts of Capturing Unintentional RF Energy Transfer During In Vitro Tonsillectomy
Vigyanshu Mishra, The Ohio State University, United States; Weston Niermeyer, Tendy Chiang, Nationwide Children's Hospital, United States; Asimina Kiourti, The Ohio State University, United States

K3.8 **11:00**
A Wireless Power Transfer System on Clothes Using Conductive Threads
Juan Barreto, Abdul-Sattar Kaddour, Stavros Georgakopoulos, Florida International University, United States

K3.9 **11:20**
Entomological Target Radar Cross Section: Numerical Modelling and Estimation
Omar Alzaabi, Khalifa University, United Arab Emirates; Mohammad Al-Khaldi, University Corporation for Atmospheric Research, United States; Diego Peñaloza, Julio Urbina, James Breakall, Michael Lanagan, Pennsylvania State University, United States

Friday, January 8 08:20 - 11:40
B9 Room 2

Microstrip and Printed Antennas and Devices

Session Co-Chairs: Reyhan Baktur, Utah State University; Satheesh Bojja Venkatakrishnan, Florida International University

B9.1 **08:20**
Transparent Antennas Designed from Hybrid Silver Nanowire with Carbon Nanotube on Flexible Polycarbonate
Rakib Hasan, Reyhan Baktur, Utah State University, United States

B9.2 **08:40**
Optically Transparent Antenna Array for Smart City Networks
Ryan Green, Mississippi State University, United States; Kai Ding, Vitaliy Avrutin, Virginia Commonwealth University, United States; Umit Ozgur, Erdem Topsakal, Mississippi State University, United States

B9.3 **09:00**
Curving Effect on The Curved Trapezoid Patch for On-Wrist Power Harvesting at 2.45 GHz
Moein Noferesti, Tarek Djerafi, Institut National de la Recherche Scientifique (INRS), Canada

B9.4 **09:20**
Wideband Proximity-Fed Low Profile Circularly Polarized Patch Antenna
Christian Cavalier, Brad Jackson, California State University, Northridge, United States

B9.5 **09:40**
Voltage Pulse Propagation on a Dispersive Microstrip Transmission Line
Katherine Aho, Kurt E. Oughstun, University of Vermont, United States

Break **10:00**

B9.6 **10:20**
High Isolation and High Gain Planar Patch Array for In-Band Full-Duplex Applications
Tuan Nguyen, Tutku Karacolak, Washington State University, United States

B9.7 **10:40**
Commutated Networks for Phase Conjugation and Time Reversal
Ahmed Mekawy, Andrea Alù, City College of The City University of New York, United States

B9.8 **11:00**
Joint Design for Finite Thickness Miura Folded Antenna Arrays
Matthew Nichols, Alexander Johnson, Satheesh Bojja Venkatakrishnan, John L. Volakis, Florida International University, United States

B9.9 **11:20**
Design of a Non-Reciprocal Reconfigurable Phase Shifter for Phased Array Applications
Reza Karimian, George Washington University, United States; Mansoor Dashti Ardakani, Institut National de la Recherche Scientifique (INRS), Canada; Shahrokh Ahmadi, Mona Zaghloul, George Washington University, United States

Friday, January 8 | 08:20 - 11:40
B10 | Room 5

RF Design and Metrology for Radiation and Sensing

Session Co-Chairs: Pai-Yen Chen, University of Illinois at Chicago (UIC); Jiefu Chen, University of Houston

B10.1 **08:20**
Radio-Transparent Dielectric Core Metasurface Antenna
Diego Chachayma Farfan, University of Texas at Austin, United States; Younes Ra'di, Andrea Alù, Advanced Science Research Center, United States

B10.2 **08:40**
Circularly Polarized RFID Tag Antenna Design for Underground Localization System
Yiming Chen, Atef Elsherbeni, Colorado School of Mines, United States

B10.3 **09:00**
Multimodal Vortex Wave Propagation in Dielectric-Filled Circular Waveguides
Md Khadimul Islam, Shubhendu Bhardwaj, Arjuna Madanayake, Florida International University, United States

B10.4 **09:20**
Design of Narrow-Band Filters and Power Dividers for Sub-Millimeter Wave Direct Detection Atmospheric Sounding Radiometers
Samantha Williams, Steven C. Reising, Yuriy Goncharenko, Colorado State University, United States

B10.5 **09:40**
Wireless Telemetry System for Long-term Real-time Subsurface Monitoring
Xiaoliang Li, Chenpei Huang, Debing Wei, Miao Pan, Xiaonan Shan, Jiefu Chen, University of Houston, United States

Break **10:00**

B10.6 **10:20**
Foldable Miura-Ori Tightly Coupled Dipole Array (TCDA) With Integrated Planar Feed Using LET Joints
Md Rakibul Islam, Alexander Johnson, Vignesh Manohar, Satheesh Bojja Venkatakrishnan, John L. Volakis, Florida International University, United States

B10.7 **10:40**
Accurate On-Wafer Measurement Technique for E-Band MHMIC Communication Systems
Mansoor Dashti Ardakani, Nima Souzandeh, Institut National de la Recherche Scientifique (INRS), Canada; Reza Karimian, George Washington University, United States; Sonia Aïssa, Serioja Ovidiu Tatu, Institut National de la Recherche Scientifique (INRS), Canada

B10.8 **11:00**
Aeronautical Communications using Hybrid Satellite Constellations with Feeder Links for Backhaul
Behzad Koosha, Hermann Helgert, George Washington University, United States

B10.9 **11:20**
A 3D Printed Microstrip Patch Antenna using Electrifi Filament for In-Space Manufacturing
Dipankar Mitra, Ryan Striker, Jerika Cleveland, Benjamin Braaten, North Dakota State University, United States; Kazi Kabir, Ahsan Aqueeb, Ellie Burczek, Sayan Roy, South Dakota School of Mines & Technology, United States; Shengrong Ye, Multi3D Inc., United States

Friday, January 8 | 08:20 - 10:40
D1 | Room 7

Electronic Devices, Circuits, and Applications

Session Co-Chairs: Jonathan Chisum, University of Notre Dame; Negar Ehsan, NASA Goddard Space Flight Center

D1.1 **08:20**
Band-Pass Nonreciprocal Switch Based on Asymmetric Nonlinearities for Radar Applications
Hady Moussa, Andrea Alù, Advanced Science Research Center, United States

D1.2 **08:40**
Toward a High Power, High Speed Plasma-Switch Impedance Tuner Under Software-Defined Radio Control
Caleb Calabrese, Austin Egbert, Justin Roessler, Baylor University, United States; Alden Fisher, Purdue University, United States; Charles Baylis, Baylor University, United States; Mohammad Abu Khater, Dimitrios Peroulis, Purdue University, United States; Robert Marks, Baylor University, United States

D1.3 **09:00**
A 10MHz-1GHz Mitigated Shunt Capacitance Hybrid LNA for Use in a Ka-Band Envelope Detector Baseband Output
Nicholas Estes, Jonathan Chisum, University of Notre Dame, United States

D1.4 **09:20**
Exceptional Points of Degeneracy in Gyrator-Based Coupled Resonator Circuit
Alireza Nikzamir, Kasra Rouhi, Alexander Figotin, Filippo Capolino, University of California, Irvine, United States

D1.5 **09:40**
VCSEL-Based Optoelectronic Oscillator for High-Speed Signal Processing: A Review
Juan Coronel, Technology Innovation Institute, United Arab Emirates; Angelique Rissons, ISAE-SUPAERO, Colombia; Margarita Varon, Universidad Nacional de Colombia, Colombia; Guillaume Matras, Abdellatif Bouchalkha, Chaouki Kasmi, Technology Innovation Institute, United Arab Emirates

Break **10:00**

D1.6 **10:20**
60-GHz-band MHMIC Frequency Multiplier Module for Multi-port Interferometer Receivers
Mansoor Dashti Ardakani, Institut National de la Recherche Scientifique (INRS), Canada; Reza Karimian, George Washington University, United States; Serioja Ovidiu Tatu, Institut National de la Recherche Scientifique (INRS), Canada

Friday, January 8 | 08:20 - 10:00
J3 | Special Session | Room 3

Epoch of Reionization: Calibration Effects

Session Co-Chairs: David DeBoer, University of California, Berkeley; Bryna Hazelton, University of Washington

J3.1 **08:20**
Precision Calibration for 21 cm Cosmology with the Hydrogen Epoch of Reionization Array
Joshua Dillon, University of California, Berkeley, United States

J3.2 **08:40**
Effect of Model Incompleteness on Auto-correlation Based Calibration in 21 cm Cosmology Experiments
Bharat Kumar Gehlot, Daniel Jacobs, Judd Bowman, Arizona State University, United States

J3.3 **09:00**
A Unified Calibration Framework for 21 cm Cosmology
Ruby Byrne, Miguel Morales, Bryna Hazelton, Michael Wilensky, University of Washington, United States

J3.4 **09:20**
The Consequences of RFI and RFI Excision on 21 cm EoR Power Spectrum Measurements
Michael Wilensky, University of Washington, United States

J3.5 **09:40**
Robust Radio Interferometer Simulation for 21 cm Cosmology and Beyond
Daniel Jacobs, Arizona State University, United States

Friday, January 8 | 08:20 - 10:00
H1 | Special Session | Room 6

Waves and Turbulence in Laboratory and Space Plasmas

Session Co-Chairs: Alex Fletcher, Naval Research Lab; Erik Tejero, Naval Research Lab

H1.1 **08:20**
Effects of a Southward Shift of the Heliospheric Current Sheet on Faraday Rotation Observations of a Coronal Mass Ejection
Madison Ascione, Georgetown University, United States; Jason Kooi, U.S. Naval Research Laboratory, United States; Mohammad Ashas, California State University at Long Beach, United States

H1.2 **08:40**
Modeling the Faraday Rotation of Coronal Mass Ejections with Increasingly Complex Forms of Plasma Density
Mohammad Ashas, California State University at Long Beach, United States; Madison Asicone, Georgetown University, United States; Jason Kooi, U.S. Naval Research Laboratory, United States

H1.3 **09:00**
Electrostatic Waves with Rapid Frequency Shifts in the Solar Wind from PSP observations
Lily Kromyda, David Malaspina, Robert Ergun, University of Colorado Boulder / Laboratory of Atmospheric and Space Physics, United States; Jasper Halekas, University of Iowa, United States; Michael Stevens, Harvard-Smithsonian Center for Astrophysics, United States; Jennifer Verniero, University of California, Berkeley / Space Sciences Laboratory, United States; Alexandros Chasapis, Daniel Vech, University of Colorado Boulder / Laboratory of Atmospheric and Space Physics, United States; Stuart Bale, John Bonnell, University of California, Berkeley / Space Sciences Laboratory, United States; Thierry Dudok de Wit, LPC2E, CNRS, and University of Orleans, France; Keith Goetz, University of Minnesota, United States; Katherine Goodrich, Peter Harvey, University of California, Berkeley / Space Sciences Laboratory, United States; Robert MacDowall, NASA Goddard Space Flight Center, United States; Marc Pulupa, University of California, Berkeley / Space Sciences Laboratory, United States; Anthony Case, Harvard-Smithsonian Center for Astrophysics, United States; Justin Kasper, University of Michigan Ann Arbor, United States; Kelly Korreck, Harvard-Smithsonian Center for Astrophysics, United States; Davin Larson, Roberto Livi, Phyllis Whittlesey, University of California, Berkeley / Space Sciences Laboratory, United States

H1.4 **09:20**
Electrostatic Solitary Waves in the Martian Magnetosheath
Scott Thaller, Laila Andersson, Steven Schwartz, Laboratory for Atmospheric and Space Physics, United States; Christian Mazelle, University Paul Sabatier Toulouse III, France; Chris Fowler, Katherine Goodrich, University of California, Berkeley, United States; Jasper Halekas, University of Iowa, United States; Marcin Pilinski, Laboratory for Atmospheric and Space Physics, United States

H1.5 **09:40**
On the Solar Wind Proton Temperature Anisotropy at Mars' Orbital Location
Christy Lentz, Alexandros Chasapis, Laboratory for Atmospheric and Space Physics, United States; Jasper Halekas, University of Iowa, United States; Dan Baker, Laboratory for Atmospheric and Space Physics, United States

Friday, January 8 | 08:20 - 10:40
F4 | Room 4

Microwave Remote Sensing of the Earth: I

Session Co-Chairs: Kamal Sarabandi, University of Michigan; Thomas Hanley, Johns Hopkins University Applied Physics Laboratory

F4.1 **08:20**
Potential of the Global Precipitation Measurement Constellation for Characterizing the Polar Firn
Rahul Kar, Mustafa Aksoy, Jerusha Devadason, Pranjal Atrey, University at Albany, State University of New York, United States

F4.2 **08:40**
Examining Machine Learning Models as An Alternative to DARTS for Nowcasting in Dallas Forth Worth Urban Testbed
EunYeol Kim, Chandra.V Chandrasekar, Colorado State University, United States

F4.3 **09:00**
Microphysical Evolution of Convective Clouds during Hurricane Harvey (2017) Observed by Coastal Polarimetric Radars
Xu Zhou, Haonan Chen, Colorado State University, United States

F4.4 **09:20**
Quantitative Precipitation Estimation by X-Band Dual-Polarization Radars in Complex Terrain
Sounak Biswas, Colorado State University, United States; Robert Cifelli, NOAA ESRL, United States; Chandra.V Chandrasekar, Colorado State University, United States

F4.5 **09:40**
Identifying Insects and Clouds in the Vertical Column using 35-GHz Radar Polarimetric Doppler Velocity Spectra
Christopher Williams, University of Colorado Boulder, United States; Karen Johnson, Scott Giangrande, Brookhaven National Laboratory, United States

Break **10:00**

F4.6 **10:20**
A Signal Sub-space Based Approach for Mitigating Wind Turbine Clutter in Fast Scanning Weather Radar
Amit Dutta, Chandra.V Chandrasekar, Colorado State University, United States; Evan Ruzanski, Vaisala, United States

Friday, January 8 | 10:20 - 12:00
J4 | Room 3

Epoch of Reionization: Instrumentation Effects

Session Co-Chairs: David DeBoer, University of California, Berkeley; Bryna Hazelton, University of Washington

J4.1 **10:20**
The External Calibrator for Radio Observatories (ECHO)
Mrudula Gopalkrishna, Michael Horn, Shanika Davis, David Lewis, Daniel Jacobs, Arizona State University, United States

J4.2 **10:40**
Constraining the HERA's chromatic instrument response through antenna feed positioning
Scott Dynes, Honggeun Kim, Massachusetts Institute of Technology, United States; Alec Josaitis, University of Cambridge, United Kingdom; Jacqueline Hewitt, Eleanor Rath, Massachusetts Institute of Technology, United States; Eloy de Lera Acedo, University of Cambridge, United Kingdom

J4.3 **11:00**
Detailed Modelling of the HERA Antenna Response due to Variations in Feed Positions
Bang Nhan, National Radio Astronomy Observatory, United States; Scott Dynes, Massachusetts Institute of Technology, United States; Eloy de Lera Acedo, Nicolas Fagnoni, University of Cambridge, United Kingdom; Michael Horn, Arizona State University, United States; Jacqueline Hewitt, Honggeun Kim, Massachusetts Institute of Technology, United States

J4.4 **11:20**
The Effect of Antenna Beam Variation on Redundant Calibration and Power Spectrum Estimation with HERA
Honggeun Kim, Jacqueline Hewitt, Massachusetts Institute of Technology, Korea (South); Eloy de Lera Acedo, University of Cambridge, United Kingdom; Scott Dynes, Massachusetts Institute of Technology, United States; Bang Nhan, National Radio Astronomy Observatory, United States; Joshua Dillon, University of California, Berkeley, United States

J4.5 **11:40**
Patterns of Non-redundancy in Close-packed 21 cm Array Observations
Samir Choudhuri, Queen Mary University of London, United Kingdom

Friday, January 8 | 12:10 - 13:00
Event | Main Room

Special Events: Eighth Hans Liebe Lecture

Molecular Oxygen Absorptions from Red to Radio; Brian Drouin, Jet Propulsion Lab

Friday, January 8 13:10 - 15:30
H2 Special Session Room 6

Heliospheric Observations of Waves in Plasmas

Session Co-Chairs: Kristoff Paulson, Center for Astrophysics | Harvard & Smithsonian; David Malaspina, University of Colorado, Boulder

H2.1 **13:10**
Properties and propagation effects on EMIC wave k vectors: Outer magnetospheric observations from MMS
Sarah Vines, Aditi Madabushi, Joan Ojukwu, Brian Anderson, Robert Allen, Johns Hopkins University Applied Physics Laboratory, United States; Jay Johnson, Andrews University, United States; Mark Engebretson, Augsburg University, United States; Richard Denton, Dartmouth College, United States; Justin Lee, The Aerospace Corporation, United States; Eun-Hwa Kim, Princeton Plasma Physics Laboratory, United States

H2.2 **13:30**
Minimum Variance Analysis of Diverse Heliospheric Environments: From Universal to Endemic Wave Geometries and their Relationships to Astrophysical Phenomena
Alexandra Brosius, Goddard Space Flight Center; The Pennsylvania State University, United States; Lynn Wilson III, Goddard Space Flight Center, United States

H2.3 **13:50**
Examining Ion-Scale Wave Properties in the Inner Heliosphere Observed by Parker Solar Probe data
Stephanie Colón, University of Puerto Rico, Río Piedras Campus, United States; Kristoff Paulson, Tatiana Niembro, Anthony Case, Michael Stevens, Kelly Korreck, Center for Astrophysics | Harvard & Smithsonian, United States; Justin Kasper, University of Michigan, United States; Stuart Bale, University of California, Berkeley, United States; Mary Eby, Texas Lutheran University, United States

H2.4 **14:10**
Ion-Scale Waves With Rising Frequency Tones Observed by Parker Solar Probe
Kristoff Paulson, Tatiana Niembro, Michael Stevens, Anthony Case, Harvard-Smithsonian Center for Astrophysics, United States; Jenny Verniero, Trevor Bowen, University of California, Berkeley, United States; Kelly Korreck, Harvard-Smithsonian Center for Astrophysics, United States; Justin Kasper, University of Michigan, United States; Stuart Bale, University of California, Berkeley, United States

H2.5 **14:30**
Whistler Waves in the Young Solar Wind from Parker Solar Probe Measurements
Oleksiy Agapitov, University of California, Berkeley, United States

Break **14:50**

H2.6 **15:10**
Wave Mode Identification and Implications of Plasma Waves Near the Electron Cyclotron Frequency in the Near Sun Solar Wind
David Malaspina, University of Colorado Boulder, United States; Robert Ergun, University of Colorado, United States; Lynn Wilson, NASA Goddard Space Flight Center, United States; Stuart Bale, John Bonnell, University of California, Berkeley, United States; Thierry Dudoc de Wit, LPC2E, CNRS, and University of Orleans, France; Keith Goetz, University of Minnesota, United States; Peter Harvey, University of California, Berkeley, United States; Robert MacDowall, Goddard Space Flight Center, United States; Marc Pulupa, University of California, Berkeley, United States

Friday, January 8 13:10 - 14:50
J5 Room 3

New Telescopes, Techniques, and Technology

Session Chair: Jeff Mangum, NRAO

J5.1 **13:10**
A Broadband Downconverter for the K-band Radio Astronomy Reciever on the NASA 70 m Canberra Antenna
Zubair Abdulla, Jet Propulsion Lab, United States

J5.2 **13:30**
The Green Bank Telescope: Pointing Model and Metrology Systems
Ellie White, Marshall University, United States; Frank Ghigo, Dave Frayer, Green Bank Observatory, United States; Richard Prestage, West Virginia University, United States; Joe Brandt, Dennis Egan, Ronald Maddalena, J.D. Nelson, Jason Ray, Green Bank Observatory, United States

J5.3 **13:50**
Aperture Array Radio Transient Imaging SysTem (AARTIST)
Hariharan Krishnan, Matthew Kolopanis, Arizona State University, United States; Jayce Dowell, University of New Mexico, United States; James Kent, University of Cambridge, United Kingdom; Adam Beardsley, Winona State University, United States; Judd Bowman, Arizona State University, United States; Greg Taylor, University of New Mexico, United States; Nithyanandan Thyagarajan, National Radio Astronomy Observatory, United States; Daniel Jacobs, Arizona State University, United States

J5.4 **14:10**
An Ultra-wideband Spectrometer for The Next Generation of the Event Horizon Telescope Project
Arash Roshanineshat, Dan Marrone, David Forbes, University of Arizona, United States; Kari Haworth, Center for Astrophysics | Harvard & Smithsonian, United States

J5.5 **14:30**
Geometric Intuition and Methods for Measuring Closure Phase for Robust Feature Recognition in Interferometric Imaging
Nithyanandan Thyagarajan, Christopher Carilli, National Radio Astronomy Observatory, United States

Friday, January 8 13:10 - 14:50
B11 Special Session Room 2

Low-Profile Antennas from Gigahertz to Terahertz

Session Co-Chairs: Satish Sharma, San Diego State University; Goutam Chattopadhyay, JPL, Pasadena

B11.1 **13:10**
Dual Mode Phased Array Antenna using Silicon RFICs based Integrated Beamforming Network
Connor Laffey, Satish Sharma, San Diego State University, United States; Raif Farkouh, Jia-Chi Chieh, Naval Information Warfare Center Pacific, United States

B11.2 **13:30**
Wideband Dual-Polarized Low-Profile Filtering Microstrip Patch Antenna
Sanghoon Lee, Georgia Institute of Technology, United States; Kirti Dhwaj, Indian Institute of Technology Delhi, India

B11.3 **13:50**
All Metal Heat Sink Dual Linear Polarized Phased Array Antenna for X-Band Communication Applications
Rudraishwarya Banerjee, Satish Sharma, San Diego State University, United States; Raif Farkouh, Jia-Chi Chieh, Naval Information Warfare Center Pacific, United States

B11.4 **14:10**
Design and Fabrication of an Origami Multimode Ring Antenna
Nicholas Russo, Constantinos L. Zekios, Stavros Georgakopoulos, Florida International University, United States; Hyeon An, Anand Mishra, Robert Shepherd, Cornell University, United States

B11.5 **14:30**
Compact Millimeter-Wave Antenna Designs for Line-of-Sight Communications in Permissive Operating Environments
Sudhakar Rao, Suzanna Lamar, Northrop Grumman Corporation, United States; Maxim Ignatenko, Clency Lee-Yow, Custom Microwave Incorporated, United States; Anura Jayasumana, Colorado State University, United States

Friday, January 8 13:10 - 15:30
B12 Special Session Room 5

Multiscale and Stochastic Modeling in Computational Electromagnetics

Session Co-Chairs: Ata Zadehgol, University of Idaho; Johannes Russer, Technical University of Munich

B12.1 **13:10**
Stochastic Analysis of Human Exposure Assessment by Surrogate Model
Botian Zhang, Yahya Rahmat-Samii, University of California, Los Angeles, United States

B12.2 **13:30**
Dynamic Mode Decomposition Reduced-Order Models for Multiscale Kinetic Plasma Analysis
Indranil Nayak, Fernando Teixeira, The Ohio State University, United States

B12.3 **13:50**
H-matrix Fast Direct Solution of Scattering Problems with Locally Corrected Nystrom Discretized Combined Field Integral Equation
Reza Gholami, University of Toronto, Canada; Emrah Sever, Tianke Qiu, Vladimir Okhmatovski, University of Manitoba, Canada

B12.4 **14:10**
A Probabilistic Approach to Radiated Electromagnetic Interference
Michael Haider, Johannes A. Russer, Technical University of Munich, Germany

B12.5 **14:30**
Stochastic FDTD Modeling of Propagation Loss due to Random Surface Roughness in Sidewalls of Optical Interconnects
Brian Guiana, Ata Zadehgol, University of Idaho, United States

Break **14:50**

B12.6 **15:10**
Cyclostationarity in EMI Assessment of PCBs
Johannes A. Russer, Technical University of Munich, Germany

Friday, January 8 13:10 - 14:50
F6 Special Session Room 7

Weather Impacts on Electromagnetic Sensors and Operations

Session Co-Chairs: Andrew Kammerer, NRL; Kyle Franklin, Fleet Numerical Meteorology and Oceanography Center

F6.1 **13:10**
Insights into Evaporation Duct Modelling for RF System Analysis
Jonathan Gehman, Thomas Hanley, Johns Hopkins University Applied Physics Laboratory, United States

F6.2 **13:30**
Challenges in Producing Electromagnetic Propagation-Related Climatology Products
Paul Frederickson, Naval Postgraduate School, United States

F6.3 **13:50**
The influence of Water Vapor Vertical Profiles on Multi-wavelength Radar Propagation Factor in the Nocturnal Boundary Layer
Robert Marshall, Mount Pleasant Meteorology, United States

F6.4 **14:10**
RF Propagation Characterization in the Arctic: Measurements from JHU/APL participation in 2018 and 2019 SODA campaigns
Zachary Burchfield, Thomas Hanley, Ross Rottier, Marshall Jose, David Drzewiecki, Andrew Riel, Johns Hopkins University Applied Physics Laboratory, United States

F6.5 **14:30**
EMSPPA: Electromagnetic Spectrum Performance Products Ashore
Biswanath Chowdhury, Eric Wishnie, Fleet Numerical Meteorology and Oceanography Center, United States

Friday, January 8 13:10 - 14:30
ACEJ Special Session Room 1

Spectrum Harmonization in Contentious Electromagnetic Environments

Session Co-Chairs: Eric Mokole, MITRE; Lawrence Cohen, Naval Research Laboratory; Jeanne Quimby, NIST

ACEJ.1 **13:10**
Radar Spectrum Engineering Criteria (RSEC), Measurements and Implementation, Present and Future
Frank Sanders, US Department of Commerce, United States

ACEJ.2 **13:30**
Understanding Dynamic Spectrum Sharing: Field to Lab Methodology and Case Study
Darren McCarthy, Rohde & Schwarz America, United States; David Erisman, ERISYS LLC, United States

ACEJ.3 **13:50**
Multi-Level Adaptive and Reconfigurable Wireless Systems for Spectrum Sharing
Charles Baylis, Baylor University, United States; Douglas Sicker, University of Colorado Denver, United States; Shannon Blunt, University of Kansas, United States; Zhu Han, David Jackson, University of Houston, United States; Ram Narayanan, Pennsylvania State University, United States; Dimitrios Peroulis, Mohammad Abu Khater, Aly El Gamal, Purdue University, United States; Erik Perrins, University of Kansas, United States; Robert Marks, Baylor University, United States

ACEJ.4 **14:10**
Continuous Real-Time Circuit Reconfiguration to Optimize Average Performance for Spectrum-Sharing Radar Transmitters
Austin Egbert, Adam Goad, Baylor University, United States; Benjamin Kirk, Pennsylvania State University, United States; Charles Baylis, Baylor University, United States; Anthony Martone, CCDC Army Research Laboratory, United States; Robert Marks, Baylor University, United States

Friday, January 8 13:10 - 14:50
F5 Room 4

Microwave Remote Sensing of the Earth: II

Session Co-Chairs: David Kunkee, Aerospace Corporation; Thomas Hanley, Johns Hopkins University Applied Physics Laboratory

F5.1 **13:10**
Millimeter-wave Sounder/Imager on a CubeSat Providing Global Observations for Atmospheric Science for More than Two Years on Orbit: Temporal Experiment for Storms and Tropical Systems - Demonstration (TEMPEST-D) Mission
Steven C. Reising, Colorado State University, United States; Todd C. Gaier, Shannon T. Brown, NASA/Caltech Jet Propulsion Laboratory, United States; Christian D. Kummerow, Wesley Berg, Chandra.V Chandrasekar, Colorado State University, United States; Sharmila Padmanabhan, Boon H. Lim, Cate Heneghan, NASA/Caltech Jet Propulsion Laboratory, United States; Richard Schulte, C. Radhakrishnan, Yuriy Goncharenko, Colorado State University, United States; Matthew Pallas, Doug Laczkowski, Nancy Gaytan, Austin Bullard, Blue Canyon Technologies, United States

F5.2 **13:30**
Simulations to Establish Design Requirements for Forward-Looking Millimeter-Wave Radiometers on Airborne Platforms for Detection of Super-Cooled Liquid Water in Clouds
Renish Thomas, Yuriy Goncharenko, Steven C. Reising, Colorado State University, United States; James L. McDonald, Eric D. Pahlke, Richard E. Bateman, FIRST RF Corporation, United States

F5.3 **13:50**
High Spectral Resolution V-band Digital Correlating Spectrometer for Climate Monitoring - RF Front End Characterization and Brightness Temperature Spectra Estimation
Aravind Venkitasubramony, Albin Gasiewski, University of Colorado Boulder, United States

F5.4 **14:10**
A Two-Scale Ocean Surface Emissivity Model Tuned to WindSat Polarimetric Emissivity Observations
Sang-Moo Lee, Albin Gasiewski, University of Colorado Boulder, United States

F5.5 **14:30**
Detection of Radio Frequency Interference in Microwave Radiometry using a Supervised Classification Method
Imara Mohamed Nazar, Mustafa Aksoy, University at Albany, State University of New York, United States

Friday, January 8 15:10 - 17:00
Event Main Room

Vendor Booths & Small Group Discussions with Invited Speakers

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