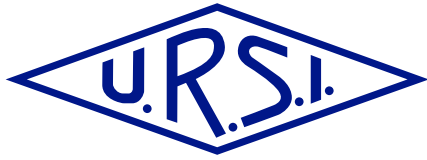
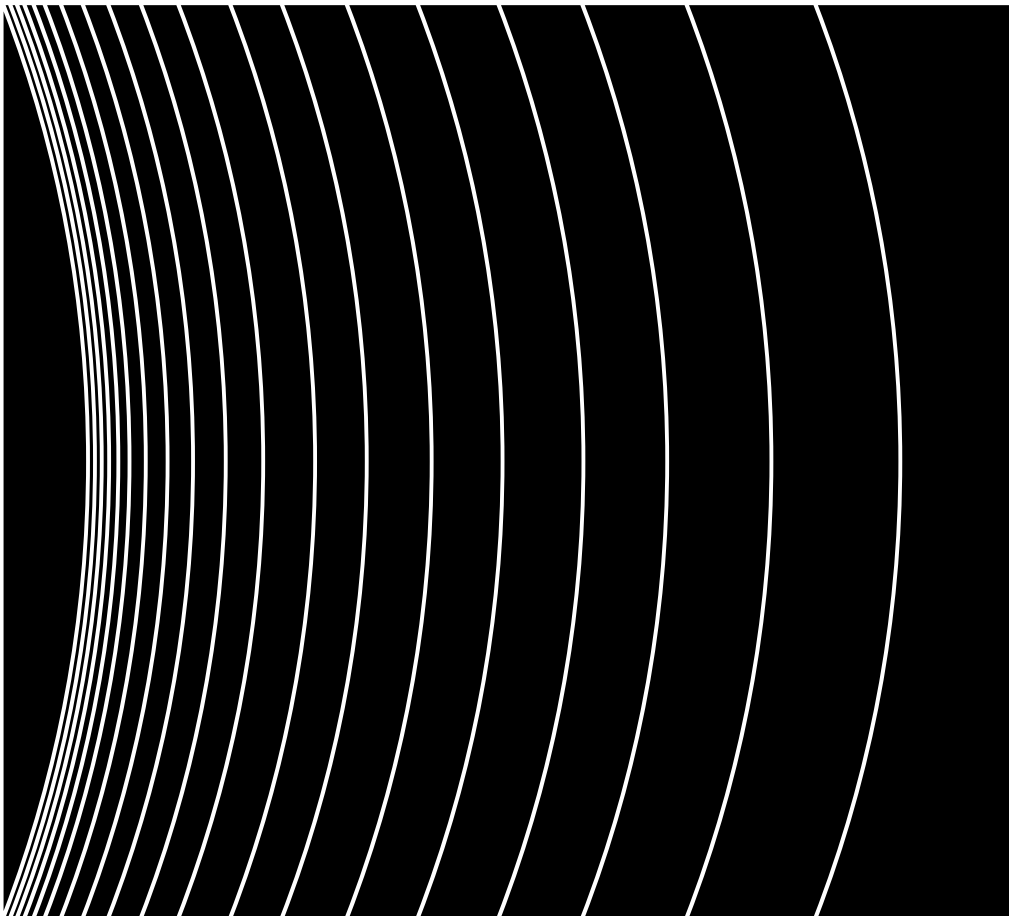
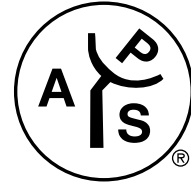


USNC-URSI National Radio Science Meeting



*The National
Academies of*

SCIENCES
ENGINEERING
MEDICINE



4–8 January 2022

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 4–8 January 2022 University of Colorado Boulder

Meetings and Events Overview

[All times are in MST.]

TUESDAY, 4 January 2022

- 08:30 – 11:30 NRSM Short Course: “Joint MIMO-Radar-MIMO-Communications for Autonomous Vehicles”
- 12:30 – 14:20 NRSM Tutorial I: “HFSS Demo”
- 14:40 – 16:30 NRSM Tutorial II: “Near-Field Measurements - Principles & Demo” (In Person Only)
- 17:00 – 21:00 USNC-URSI Business Meeting

WEDNESDAY, 5 January 2022

- 08:00 – 08:10 NRSM Welcome & Opening Remarks
- 08:15 – 17:00 Vendor Booths
- 08:20 – 12:00 Technical Sessions
- 12:10 – 13:00 Women in Radio Science (WIRS) Invited Speaker
- 13:10 – 14:50 Technical Sessions
- 15:10 – 16:50 Student Paper Competition (SPC)
- 17:00 – 18:00 Commission Business Meetings (A, F)
- 18:00 – 19:00 Commission Business Meetings (C, E, J)
- 19:00 – 20:00 Meet & Greet with WIRS Speaker (Virtual Attendees)
- 19:00 – 21:00 Reception for On-Site Attendees

THURSDAY, 6 January 2022

- 08:00 – 11:30 Plenary Session
- 11:30 – 13:00 Student Mentoring Lunch
- 12:00 – 17:00 Vendor Booths
- 13:10 – 16:50 Technical Sessions
- 17:00 – 18:00 Commission Business Meetings (B, G)
- 18:00 – 19:00 Commission Business Meetings (D, H, K)
- 19:00 – 20:00 Women in Radio Science (WIRS) Business Meeting
- 20:00 – 21:00 WIRS Reception

FRIDAY, 7 January 2022

- 08:00 - 08:10 Closing Day Remarks
- 08:15 - 17:00 Vendor Booths
- 08:20 - 12:00 Technical Sessions
- 12:10 - 13:00 Ninth Hans Liebe Lecture
- 13:10 - 17:50 Technical Sessions

SATURDAY MORNING, 8 January 2022

- 08:00 - 11:00 USNC-URSI Executive Council Meeting

2022 National Radio Science Meeting Overview: Technical Program

Time [MST] \ Room		105	150	151	155	200	245	265	1B40	1B51
Tuesday, 4 January	08:30-11:30	Short Course Joint MIMO-Radar-MIMO-Communications for Autonomous Vehicles (Hybrid - Room 105)								
	12:30-14:20	Tutorial I HFSS Demo (Hybrid - Room 150)								
	14:40-16:30	Tutorial II Near-Field Measurements: Principles & Demo (In-Person Only - Room ECEE 1B95)								
Wednesday, 5 January	08:00-08:10	Opening Welcome (Streamed from Math 100 to all of the rooms)								
	08:20-12:00	B1 - Antenna Theory, Design, and Measurements	F1* - Advances in GNSS-R and SoOp Systems: Techniques and Applications I	G1* - New Applications of SmallSat Sensors	A1 - Antennas	B2 - Numerical Methods		J1 - New Telescopes, Techniques, and Technologies and Observatory Reports I	B3* - Complex EM and Meta Structures	D1 - Electronics and Photonics
	Lunch Break 12:10-13:00	Women in Radio Science (WIRS) Invited Speaker (Math 100)								
	13:10-14:50	B5* - Low-Profile Millimeter-Wave/ Terahertz Antennas for Mobile and Space Applications	F2* - Advances in GNSS-R and SoOp Systems: Techniques and Applications II		A3* - Multiband Antenna Array Challenges and Solutions	B6 - Electromagnetic Theory and Techniques	H2* - Active Experiments in Laboratory and Space Plasmas	J2 - New Telescopes, Techniques, and Technologies, and Observatory Reports II	B7* - Multiscale and Stochastic Modeling in Computational Electromagnetics	D2* - Millimeter-Wave and Terahertz Systems for Space Applications
	15:10-16:50	Student Paper Competiton (Math 100)								
	17:00		Commission F		Commission A					
	18:00	Commission C&E						Commission J		
	19:00-20:00	WIRS Speaker Meet & Greet for all Virtual Attendees								
	19:00-21:00	Reception for all In-Person Attendees at the Byron R. White Stadium Club								

Thursday, 6 January	08:20-11:30	Plenary Session (Math 100) Meeting Highlight Plenary Talks Student Paper Competition Awards Ceremony								
	Lunch Break 11:30-13:00	Student Mentoring Luncheon (Math 100 – Lunch provided for all students, UNSC-URSI Officers, and Commission Chairs)								
	Time \ Room	105	150	151	155	200	245	265	1B40	1B51
	13:50-16:50	A4* - Inventive Approaches in Advanced Communications	F3 - Refractivity Characterization and Numerical Weather Prediction		C1 - Radar	B8 - Analysis and Design of Antennas and RF Components	H3* - Lightning and Plasma Phenomena of the Thermosphere	J3 - New Telescopes, Techniques, and Technologies, and Observatory Reports III	B9* - Novel Electrically Small Antennas and Matching Networks	
		K1* - Dosimetry and Exposure Assessment		G3 - Radar and Radio Techniques	C2 - RF Spectrum					D3* - Broadband and Multiband Amplifiers
	17:00			Commission G					Commission B	
	18:00	Commission K					Commission H			Commission D
	19:00	WIRS Business Meeting (Room 105)								
	20:00	WIRS In-Person Reception (KOBL S100)								
Friday, 7 January	08:00-08:10	Closing Day Remarks (Streamed from Math 100)								
	08:20-12:00	K2 - Human Body Interactions with Antennas and Other Electromagnetic Devices	F4 - Microwave Remote Sensing of the Earth	G4 - Ionospheric Imaging	C3 - RF Antenna Design and Systems	B10 - Antenna Arrays: Approaches, Realizations, and Applications	J4* - New SETI Technologies and Instrumentation	J5* - Imaging Black Holes: The EHT and Beyond I	B11* - Antennas and Systems for Specialized Platforms and Extreme/ Harsh Environments	
				G5 - Ionospheric Modeling and Data Assimilation	E1 - RF Spectrum and RF Systems in Noise					
	Lunch Break 12:10-13:00	Ninth Hans Liebe Lecture (Math 100)								
13:10-17:50	K3 - Electromagnetic Imaging and Sensing	F5 - Propagation and Remote Sensing in Complex and Random Media			J6* - New Frontiers in Solar Radiophysics†	H4* - Physics of the Radiation Belts	J7* - Imaging Black Holes: The EHT and Beyond II	B12 - Structures and Circuits for RF Sensing, Radar and STAR Applications		
* 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.

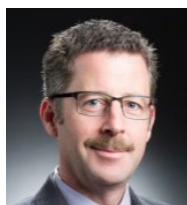
The USNC-URSI hosts the National Radio Science Meeting (NRSM) each January in Boulder, Colorado. This meeting is technically co-sponsored by the Antennas and Propagation Society of the Institute of Electrical and Electronics Engineers (IEEE/AP-S). The IEEE International Symposium on Antennas and Propagation 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 4-11 July 2020.

The international URSI General Assembly and Scientific Symposium (GASS) is held every three years in locations around the world. The 33rd URSI GASS was held in Rome, Italy, on 28 August-4 September 2021. Over 1000 papers were presented in technical sessions covering the areas of all ten URSI Commissions. The 34th URSI GASS will be held in Sapporo, Japan, on 19-23 August 2023.

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 combined with the AP-RASC meeting and will be held on 29 May-3 June 2022 in Gran Canaria, Spain. 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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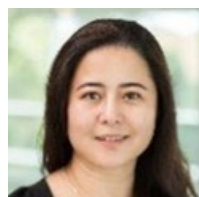
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Ata Zadehgo
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New for 2022

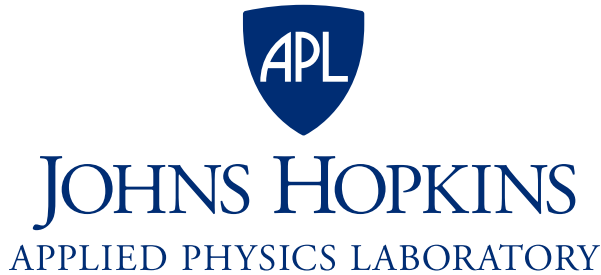
The 2022 NRSM is being held in a hybrid environment due to the ongoing COVID-19 pandemic and related restrictions on travel and large gatherings. USNC-URSI and CU Boulder will again be using the award-winning [Whova Mobile Event App](#) to provide a seamless, interactive agenda of meeting events for both in-person and online attendees, including the NRSM short course and tutorials, 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 Sponsors for their support of the 2022 NRSM

Platinum Level (\$3000)



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Tuesday, January 4	Event	08:30 - 11:30 Room 105
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Short Course

Joint MIMO-Radar-MIMO-Communications for Autonomous Vehicles
Kumar Vijay Mishra, United States CCDC Army Research Laboratory

Tuesday, January 4	Event	12:30 - 14:20 Room 150
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Tutorial

HFSS Demo
Mark Commens, Principal Product Manager, Ansys HFSS

Tuesday, January 4	Event	14:40 - 16:30 ECEE 1B95
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Tutorial

Near-Field Measurements: Principles & Demo
Jonathan Chisum, Notre Dame

Wednesday, January 5 08:20 - 11:40
B1 105

Antenna Theory, Design, and Measurements

Session Co-Chairs: Danilo Erricolo, University of Illinois Chicago; Dejan Filipovic, University of Colorado Boulder

B1.1 08:20

[Inverse-design of Advanced Short Backfire Antennas with 100% Aperture Efficiency](#)
Colin Musssman, Daniel Binion, Pingjuan Werner, Douglas Werner, Penn State, United States; Erik Lie, Thomas Hand, Lockheed Martin, United States

B1.2 08:40

[An Ultra-Wideband Parallel Plate Sinuous Antenna for Direction Finding Applications](#)
Alan Salari, Omid Manoochehi, Danilo Erricolo, University of Illinois Chicago, United States

B1.3 09:00

[A Dual-Band Patch Antenna Employing a Folded Probe Feed for Non-Linear Radar Applications](#)
Alex Bouvy, Nader Behdad, University of Wisconsin-Madison, United States

B1.4 09:20

[ALBATROS antenna and front-end electronics development](#)
Joelle-Marie Begin, McGill University, Canada

B1.5 09:40

[On the Adaptation of Combined TEM-horn Loop Antenna to HF](#)
Songyi Yen, Mohamed Elmansouri, Dejan Filipovic, University of Colorado Boulder, United States

Break

B1.6 10:00

[Radiation Pattern Reconfigurable Antenna using a Proximity-Coupled Sunflower-Shaped Patch](#)
Hareth Abdalkarim, Brad Jackson, California State University, Northridge, United States

B1.7 10:40

[Asymptotic Fields of Pure Magnetic Dipole Antenna via Spherical Azimuthal Electric Current Shell](#)
David Garren, Naval Postgraduate School, United States

B1.8 11:00

[Mechanically Configurable, Capacitively Coupled, Disk Loaded Monopole Driven Corner Reflector](#)
Jonathan Lundquist, Lauren Linkous, Erdem Topsakal, Virginia Commonwealth University, United States

B1.9 11:20

[Error Analysis of UAV-based Near-Field Antenna Measurements](#)
Fabian T. Faul, Thomas F. Eibert, Technical University of Munich, Germany

Wednesday, January 5 08:20 - 12:00
F1 Special Session 150

Advances in GNSS-R and SoOp Systems: Techniques and Applications I

Session Co-Chairs: Mohammad Al-Khaldi, University Cooperation for Atmospheric Research; Clara Chew, University Cooperation for Atmospheric Research; Scott Gleason, University Cooperation for Atmospheric Research

F1.1 08:20

[Assessment of Dual-Polarization GNSS Measurements from a Mountaintop Dish Antenna](#)
Brian Breitsch, James Brennan, Jade Morton, University of Colorado, Boulder, United States

F1.2 08:40

[Experimental Analysis of Off-Specular Bistatic Scattering Using Ship-Based S-Band Reflectometer Measurements](#)

Jeffrey Ouellette, Paul Hwang, David Dowgiallo, Jakov Toporkov, William Bounds, US Naval Research Laboratory, United States; Ethan Raines, Joel Johnson, The Ohio State University, United States

F1.3 09:00

[Design and Implementation of a P-band Signals of Opportunity Receiver Operating from An Unmanned Aircraft System \(UAS\)](#)

Preston Peranich, Johns Hopkins University, United States; Md Abdus Shahid Rafi, Mehmet Kurum, Mississippi State University, United States

F1.4 09:20

[An Approach For The Mitigation of L-band SBAS Radio Frequency Interference Effects In The Calibration of CYGNSS's Level-1 Observables](#)

Scott Gleason, Mohammad Al-Khaldi, University Cooperation for Atmospheric Research, United States; Tianlin Wang, The Ohio State University, United States; Christopher Ruf, Darren McKague, Anthony Russel, Dorina Iwigg, University of Michigan, United States

F1.5 09:40

[Forward Model Inversion Based Wind Retrieval For CYGNSS](#)

Rajeswari Balasubramaniam, Christopher Ruf, Univ of Michigan, Ann Arbor, United States

Break 10:00

F1.6 10:20

[Investigation of CYGNSS-Enhanced Parametric Wind Fields on Storm Surge Modeling](#)

Ethan Kubatko, Younghun Kang, Joel Johnson, The Ohio State University, United States; Mohammad Al-Khaldi, University Cooperation for Atmospheric Research, United States

F1.7 10:40

[River Slope Observation Using Spaceborne GNSS-R Carrier Phase Measurements](#)

Yang Wang, Jade Morton, University of Colorado Boulder, United States

F1.8 11:00

[An Intercomparison of Satellite-based Earth Observation Watermarks Derived from Global Navigation Satellite System Reflectometry \(GNSS-R\), Optical Sensors, and Synthetic Aperture Radar \(SAR\)](#)

Gertrude Pavur, Hyunglok Kim, Venkataraman Lakshmi, University of Virginia, United States

F1.9 11:20

[Intercomparisons of Spaceborne GNSS-R System Coherence Detection Methodologies Using Special and Standard CYGNSS Downlinks](#)

Eric Loria, Marco Lavallo, Cinzia Zuffada, NASA Jet Propulsion Laboratory, United States; Ilaria Russo, Carmela Galdi, Maurizio di Bisceglie, Università degli Studi del Sannio, United States; Mohammad Al-Khaldi, Scott Gleason, UCAR, United States; Brandi Downs, Andrew O'Brien, Joel Johnson, The Ohio State University, United States; Valery Zavarotny, CIRES/University of Colorado Boulder (Ret.), United States

F1.10 11:40

[Estimation of Spaceborne GNSS-R Systems' Spatial Resolutions Under Dominantly Coherent Reflection Regimes Using CYGNSS Downlinks](#)

Mohammad Al-Khaldi, Scott Gleason, University Cooperation for Atmospheric Research, United States; Joel Johnson, The Ohio State University, United States

Wednesday, January 5 08:20 - 09:20
G1 Special Session 151

New Applications of SmallSat Sensors

Session Co-Chairs: John Bradburn, University at Albany, State University of New York; Mehmet Ogut, Jet Propulsion Laboratory

G1.1 08:20

[Enabling Low-power Radiometers with Machine Learning Calibration](#)

John Bradburn, Mustafa Aksay, University at Albany, State University of New York, United States; Paul Racette, Tim McClanahan, NASA Goddard Space Flight Center, United States; Sheri Loftin, ADNET Systems, Inc., United States

G1.2 08:40

[ACCURACy: Adaptive Calibration of CubeSat Radiometer Constellations](#)

John Bradburn, Mustafa Aksay, University at Albany, State University of New York, United States

G1.3 09:00

[Smart Ice Cloud Sensing \(SMICES\) SmallSat Instrument: Radiometer Electronics and Autonomous Capabilities](#)

Mehmet Ogut, Xavier Bosch-Luis, Isaac Ramos-Perez, Joelle Cooperrider, Pekka Kangaslahti, Alan Tanner, Qing Yue, Jason Swope, Peyman Tavallali, Steve Chien, Omkar Pradhan, Jet Propulsion Laboratory, United States; William Deal, Caitlyn Cooke, Northrop Grumman Aerospace Systems, United States

Wednesday, January 5 08:20 - 10:00

A1 155

Antennas

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

A1.1 08:20

[Design of a Wideband, Dual-Polarized, High Gain and Power Quad-Ridge Horn Antenna](#)

Dong-Chan Son, Mohamed Elmansoury, Ljubodrag Boskovic, Dejan Filipovic, University of Colorado Boulder, United States

A1.2 08:40

[A Compact and Simple Prototype CPW-Fed Dual Band Antenna for ISM, Wi-Fi, and WLAN Applications](#)

Syed Muhammad Rizvi Jarchavi, Beijing Jiaotong University, China; Musa Hussain, Bahria University Islamabad Campus, Pakistan; Syed Hamza Hassan Gardezi, University of Management and Technology, Pakistan; Mohammad Alibakhshikenari, Universidad Carlos III de Madrid, Spain; Francisco Falcone, Public University of Navarre (UPNA), Spain; Ernesto Limiti, University of Rome Tor Vergata, Italy

A1.3 09:00

[Investigation of Creeping Wave Channel Variations during Hip Motion Activities](#)

Daniel Agu, Yang Li, Baylor University, United States

A1.4 09:20

[A High-Power UHF Antenna with Logarithmic Spiral Structure](#)

Omid Manoochehri, Alan Salari, University of Illinois at Chicago, United States

A1.5 09:40

[A Matched Dual-Band Waveguide to Improve Microwave Power Measurements using Rydberg Atoms](#)

Amy Robinson, Zoya Popovic, University of Colorado, United States; Matthew Simons, Christopher Holloway, National Institute of Standards and Technology, United States

Wednesday, January 5 08:20 - 10:00

B2 200

Numerical Methods

Session Co-Chairs: Branislav Notaras, Colorado State University; Donald R. Wilton, University of Houston

B2.1 08:20

[Time-Domain Field Solution for a Point Source Near a Complex Transformation Optics Flat Lens](#)

Hayrettin Odabasi, Eskisehir Osmangazi University, Turkey; Fernando Teixeira, The Ohio State University, United States

B2.2 08:40

[Exact Geometrical Optics Scattering by a DNG Prism of Triangular Equilateral Cross-Section Illuminated by Three Plane Waves](#)

Piorgiorgio L. E. Uslenghi, University of Illinois at Chicago, United States

B2.3 09:00

[On the Maxwell Eigenvalue Problem and Exponential Convergence Through Adaptive Error Control in the Presence of Singularities](#)

Jake Harmon, Jeremiah Corrado, Branislav Notaras, Colorado State University, United States

B2.4 09:20

[Solving the Full Waveform Electromagnetic Inversion Enhanced by Efficient Progressive Transfer Learning](#)

Yuchen Jin, Yuan Zi, Wenyi Hu, Yanyan Hu, Xuqing Wu, Jiefu Chen, University of Houston, United States

B2.5 09:40

[Dimensionality Reduction \(DR\) Approach for Treating Singular and Near-Singular Multidimensional Integrals of Electromagnetics](#)

Donald R. Wilton, University of Houston, United States; Francesca Vipiana, Javier Rivero, Politecnico di Torino, Italy; William A. Johnson, Consultant, United States; Michael A. Khayat, Independent Researcher, United States

Wednesday, January 5 08:20 - 12:00
J1 265

New Telescopes, Techniques, and Technologies and Observatory Reports I

Session Co-Chairs: Jeff Mangum, NRAO; Alyson Ford, University of Arizona

J1.1 08:20

[Closure Phase in the Image Plane: Image Plane Self-Calibration](#)

Chris Carilli, NRAO, United States; Nithyananda Thyagarajan, CSIRO, Australia; Bojan Nikolic, Cavendish Astrophysics, United Kingdom

J1.2 08:40

[A General Theory of Calibration-invariant Observables in Co-polar and Full Stokes Radio Interferometry](#)

Nithyanandan Thyagarajan, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia; Rajaram Nithyananda, Azim Premji University, India; Joseph Samuel, International Centre for Theoretical Sciences, India

J1.3 09:00

[A-to-Z Solver – Modeling the full Jones antenna aperture illumination pattern](#)

Srikrishna Sekhar, Andrew Russ Taylor, Institute for Data Intensive Astronomy, South Africa; Preshanth Jagannathan, Sanjay Bhatnagar, National Radio Astronomy Observatory, United States

J1.4 09:20

[Design Considerations for CHORD: the Canadian Hydrogen Observatory and Radio-transient Detector](#)

Vincent MacKay, University of Toronto, Canada

J1.5 09:40

[Recent Developments in the Array of Long Baseline Antennas for Taking Radio Observations from the Seventy-ninth parallel](#)

Lawrence Herman, McGill University, Canada

Break 10:00

J1.6 10:20

[Hat Creek Radio Observatory \(HCRO\): A Prototype National Radio Dynamic Zone](#)

David DeBoer, Steve Croft, Andrew Siemion, University of California, United States; Kevin Gifford, Arvind Aradhya, Mark Lofquist, Georgiana Weihe, University of Colorado, United States; Andrew Clegg, Google, United States; Wael Farah, Alexander Pollak, SETI Institute, United States; Tim O'Shea, Nathan West, DeepSig, United States

J1.7 10:40

[An Advanced Low-band VHF Radar for Geospace, Cislunar, Planetary, Solar, and Astronomical Research](#)

Brett Isham, Interamerican University of Puerto Rico, United States; Jason Kooi, Namir Kassim, Joseph Helmbolt, Juha Vierinen, Naval Research Laboratory, United States; Marco Milla, Instituto Geofísico del Perú, Peru; Michael Nolan, University of Arizona, United States; Michel Blanc, Observatoire Midi-Pyrénées, France; Wlodek Kotman, Université Grenoble Alpes, France

J1.8 11:00

[The MeerKAT Absorption Line Survey \(MALS\): An Overview](#)

Preshanth Jagannathan, National Radio Astronomy Observatory, United States; Neeraj Gupta, Inter University Center for Astronomy and Astrophysics, India

J1.9 11:20

[Prototyping for large scale interferometric radio telescope arrays with the Deep Dish Development Array](#)

Elizabeth Pieters, McGill University, Canada

J1.10 11:40

[First Upper limits on the Cosmic Dawn from the HERA Phase II System](#)

Aaron Ewall-Wice, UC Berkeley, United States

Wednesday, January 5 08:20 - 11:20
B3 Special Session 1B40

Complex EM and Meta Structures

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

B3.1 08:20
[Taylor-like Super-directive Patterns Enable Advanced Super-oscillatory Imaging](#)
Haitang Yang, George Eleftheriades, University of Toronto, Canada

B3.2 08:40
[Asymmetric Metamaterial-Lined Apertures for Plasmonic Phase-Gradient Optical Metasurfaces](#)
Mitchell Semple, Ashwin K. Iyer, University of Alberta, Canada

B3.3 09:00
[Highly Sensitive Exceptional Degeneracy in Coupled Transmission Lines With Balanced Gain and Loss](#)
Alireza Nikzami, Hamidreza Kazemi, Tarek Mealy, Filippo Capolino, University of California, Irvine, United States

B3.4 09:20
[Circuit Models for Electrically-Small Time-Varying Spherical Scatterers](#)
Zachary Fritts, Anthony Grbic, University of Michigan, United States

B3.5 09:40
[Tailoring Wireless Intra-Chip Communication Links Using a Programmable Metasurface](#)
Mohammadreza F. Imani, Arizona State University, United States; Sergi Abadal, Univ. Politècnica de Catalunya, Spain; Philipp del Hougne, Université de Rennes 1, France

Break 10:00

B3.6 10:20
[Anomalies in Light Scattering for Advanced Wireless Power Transfer](#)
Alex Krasnok, Florida International University, United States

B3.7 10:40
[A Multifunctional Integrated-Circuit Enabled Programmable Metasurface](#)
Kypros M. Kossifos, Julius Georgiou, University of Cyprus, Cyprus; Marco A. Antoniadis, Ryerson University, Canada

B3.8 11:00
[A Hybrid Intelligent Surface with Simultaneous Sensing and Reconfigurable Reflection Capability](#)
Idban Alamzadeh, Mohammadreza F. Imani, Arizona State University, United States; George C. Alexandropoulos, National and Kapodistrian University of Athens, Greece; Nir Shlezinger, Ben-Gurion University of the Negev, Israel

Wednesday, January 5 08:20 - 11:00
D1 1B51

Electronics and Photonics

Session Co-Chairs: Jonathan Chisum, University of Notre Dame; Leonardo Ranzani, Raytheon

D1.1 08:20
[Integrated Random Projections with Disordered Photonic Lattices](#)
Mohammad Ali Miri, City University of New York / Queens College, United States

D1.2 08:40
[Photonic Integrated Circuits for Transmit and Receive RF Phased Arrays in the Millimeter Wave Region of the Spectrum](#)
Dennis Prather, University of Delaware, United States; Timothy Creazzo, Etris Mohamed, Phase Sensitive Innovations, Inc, United States

D1.3 09:00
[A Complete Antenna-coupled Nonlinear Receiver for Low-power Gigabit Millimeter-wave Wireless Communications](#)
Nicholas Estes, Jonathan Chisum, University of Notre Dame, United States

D1.4 09:20
[Enhanced Sensitivity of Gyration-based Circuit at Exceptional Point Composed of Unstable Resonators](#)
Kasra Rouhi, Alireza Nikzami, Alexander Figotin, Filippo Capolino, University of California, Irvine, United States

D1.5 09:40
[High-Power, Plasma-Switched, Lumped-Element Reconfigurable Impedance Tuner for Radar Transmitter Applications](#)
Justin Roessler, Austin Egbert, Charles Baylis, Robert J Marks II, Connor Laktasic, Baylor University, United States; Zach Vander Missen, Alden Fisher, Mohammad Abu Khater, Dimitrios Peroulis, Purdue University, United States

Break 10:00

D1.6 10:20
[Optimization Approach for a High Power Array Based System with Elementwise Power Amplifier Impedance Tuning using a Combination of Digital and Continuous Search Algorithms for 5G Systems](#)
Adam Goad, Charles Baylis, Sarah Seguin, Robert J. Marks II, Baylor University, United States

D1.7 10:40
[Tri-Band RF Switching with PIN Diodes](#)
Javier Reyes, Marisol Roman, Anthony Nuñez, Elias Alwan, Florida International University, United States

Wednesday, January 5 10:20 - 11:20
G2 151

Meteoroids and Orbital Debris

Session Co-Chairs: Julio Urbina, The Pennsylvania State University; Alex Fletcher, NRL

G2.1 10:20
[An AI-based Approach to Study Non-specular Meteor Trail Echoes](#)
Freddy Galindo, Yanlin Li, Julio Urbina, The Pennsylvania State University, United States

G2.2 10:40
[Do meteors radiate very-low-frequency radio emissions?](#)
Paraksh Vankawala, Robert Marshall, University of Colorado Boulder, United States; Denis Vida, Peter Brown, Western University, United States

G2.3 11:00
[Development of the Colorado Zephyr Meteor Radar Network](#)
Nicholas Rainville, John Marino, Scott Palo, University of Colorado Boulder, United States

Wednesday, January 5 10:20 - 12:00
A2 155

Materials

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

A2.1 10:20
[An investigation on using lightweighted Carbon-Epoxy Composites as Microstrip Patch Antenna substrate](#)
Zahra Nazarijoubi, University of Maryland, College Park, United States

A2.2 10:40
[On the Far-Field Characteristics of a 3D-printed Antenna Using Wood-Based PLA and Conductive Silver Nanoparticle Ink](#)
Milad Mirzaee, Yanghyo Kim, Stevens Institute of Technology, United States

A2.3 11:00
[Toward Fully Biodegradable and Renewable Antennas Using 3D Printing Technology](#)
Milad Mirzaee, Yanghyo Kim, Stevens Institute of Technology, United States

A2.4 11:20
[Microwave Characterization of NinjaFlex Filament Using Performance Probe for Developing 3D-Printed Wearable Antennas](#)
Milad Mirzaee, Yanghyo Kim, Stevens Institute of Technology, United States

A2.5 11:40
[A 3D-Printed Microwave Passive Sensor Using Fully Biodegradable and Renewable Materials](#)
Milad Mirzaee, Yanghyo Kim, Stevens Institute of Technology, United States

Wednesday, January 5 10:20 - 12:00
B4 Special Session 200

5G and Millimeter Wave Antennas and Applications

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

B4.1 10:20
[A Compact Unit-cell Design for mmWave Reconfigurable Intelligent Surfaces](#)
Aditya Shekhawat, Bharath G. Kashyap, Panagiotis C. Theofanopoulos, Anand Sengar, Georgios C. Trichopoulos, Arizona State University, United States

B4.2 10:40
[Towards E-band Wavelength: 3D Printed Gaussian Corrugated Horn for Cassegrain Antenna Application](#)
Javad Pourahmadazar, Concordia University, Canada; Reza Karimian, The George Washington University, United States; Mansoor Dashti Ardakani, INRS University, Canada

B4.3 11:00
[Sub-mmW Travelling Wave Semiconductor Amplifier](#)
Michail Anastasiadis, Shubhendu Bhardwaj, John L. Volakis, Florida International University, United States

B4.4 11:20
[3D Non-Line-of-Sight Terahertz Imaging Using Mirror Folding](#)
Yiran Cui, Georgios C. Trichopoulos, Arizona State University, United States

B4.5 11:40
[Using Portable mmWave for See Through Wall Applications](#)
Marvin Joshi, Abdel-Kareem Moadi, Aly Fathy, University of Tennessee, Knoxville, United States

Wednesday, January 5 10:20 - 11:40
H1 Special Session 245

Heliospheric Observations of Waves in Plasmas

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

H1.1 10:20

[Electron-Resonant Plasma Waves Driven by Pickup of Newly Formed Plasma in the Near Sun Solar Wind](#)
David M. Malaspina, Adel Al-Ghazwi, Hsiang-Wen Hsu, University of Colorado, Boulder, United States; Guillermo Stenborg, Douglas Mehoke, Johns Hopkins University, Applied Physics Laboratory, United States; Mitchell Shen, Department of Astrophysical Sciences, Princeton University, United States; Stuart Bale, University of California, Berkeley, United States; Thierry Dudok de Wit, LPC2E, CNRS, CNES, and University of Orleans, Orleans, France, United States

H1.2 10:40

[Flux rope merging and the structure of switchbacks in the solar wind](#)
Oleksiy Agapitov, UC BERKELEY, United States; James F. Drake, Michael Swisdak, University of Maryland, United States; Tai Phan, Forrest Mozer, SSL, UC Berkeley, United States

H1.3 11:00

[Study on the connection between the emission of near-fce harmonics and geometrical properties of the ambient magnetic field in the near-Sun environment](#)
Sabrina F. Tigik, Andris Vaivads, KTH Royal Institute of Technology, Sweden; David M. Malaspina, University of Colorado, United States

H1.4 11:20

[Recent Advances in Understanding Radiation Belt Electron Acceleration at Earth and Jupiter](#)
Wen Li, Qianli Ma, Xiaochen Shen, Boston University, United States

Wednesday, January 5 12:10 - 13:00
Event Math 100

Women in Radio Science (WIRS) Invited Speaker

Launch Vehicle and Spacecraft Transmitter Electromagnetic Compatibility

Dawn H. Trout, Kennedy Space Center

Wednesday, January 5 13:10 - 14:50
B5 Special Session 105

Low-Profile Millimeter-Wave/Terahertz Antennas for Mobile and Space Applications

Session Co-Chairs: Satish Sharma, San Diego State University; Goutam Chattopadhyay, NASA-Jet Propulsion Laboratory

B5.1 13:10

[Millimeter-Wave Tightly Coupled Dipole Arrays on a Ball Grid Array Package](#)
Vignesh Monahar, Matthew Nichols, Satheesh Bojja Venkatakrishnan, John L. Volakis, Florida International University, United States

B5.2 13:30

[Low Sidelobe Level Randomized Reconfigurable Reflective Surfaces under Oblique Incidence](#)
Bharath G. Kashyap, Panagiotis C. Theofanopoulos, Georgios C. Trichopoulos, Arizona State University, United States

B5.3 13:50

[Low-cost Ultra Wideband Millimeter Wave Arrays](#)
Matthew Nichols, Satheesh Bojja Venkatakrishnan, John L. Volakis, Florida International University, United States

B5.4 14:10

[6-12 GHz Transmit Phased Array Efficiency with Stepped Static Supply Modulation for Beam Shaping](#)
Laila Marzall, Zoya Popovic, University of Colorado Boulder, United States

B5.5 14:30

[Low-Probability-of-Intercept/Detect \(LPI/LPD\) Secure Communications Using Phased-Arrays Employing Side-Lobe Time Modulation](#)
Jiahao Zhao, John H. Booske, Nader Behdad, University of Wisconsin-Madison, United States

Wednesday, January 5 13:10 - 14:50
F2 Special Session 150

Advances in GNSS-R and SoOp Systems: Techniques and Applications II

Session Co-Chairs: Mohammad Al-Khaldi, University Cooperation for Atmospheric Research; Clara Chew, University Corporation for Atmospheric Research; Scott Gleason, University Cooperation for Atmospheric Research

F2.1 13:10

[Using Lidar Airborne data sets to understand the relationship between surface roughness and GNSS-R coherent returns over land](#)
Alexandra Bringer, Tianlin Wang, Joel Johnson, The Ohio State University, United States

F2.2 13:30

[Rough Surface Roughness Effect Retrieved from CYGNSS](#)
Rashmi Shah, Xiaolan Xu, Simon Yueh, Jet Propulsion Laboratory, California Institute of Technology, United States

F2.3 13:50

[Merging SMAP and CYGNSS Observations to Create Downscaled Brightness Temperature and Soil Moisture Products](#)
Liza Wernicke, Eric Small, University of Colorado Boulder, United States; Clara Chew, University Corporation for Atmospheric Research, United States

F2.4 14:10

[Soil Moisture Retrieval from CYGNSS Observations: Comparison of Results from a Physics-based Method and a Machine-learning-based Method](#)
Amer Melebari, Erik Hodges, James D. Campbell, Mahta Moghaddam, University of Southern California, United States; Grigoris Tsagkarakis, Foundation for Research and Technology - Hellas, Greece; Ruzbeh Akbar, Massachusetts Institute of Technology, United States; Jeffrey P. Walker, Monash University, Australia

F2.5 14:30

[Soil Moisture Retrievals Using Drone-Based Reflections of Electromagnetic Signals](#)
Alexander Voronovich, Richard Latatis, NOAA, United States

Wednesday, January 5 13:10 - 14:50
A3 Special Session 155

Multiband Antenna Array Challenges and Solutions

Session Co-Chairs: Chris Anderson, USNA; Amy Robinson, University of Colorado

A3.1 13:10

[A Tri-Band Frequency Reconfigurable Patch Antenna Array for Sub-6GHz 5G Applications](#)
Marisol Roman Guerra, Elias Alwan, Florida International University College of Engineering and Computing, United States

A3.2 13:30

[Ultra-Wideband MIMO Antenna Realization for Indoor Ka-band Applications](#)
Musa Hussain, Bahria university Islamabad Campus, Pakistan; Qaisar Abbas, University of Engineering and Technology, Pakistan; Syed Hamza Hassan Gardzi, University of Management and Technology, Pakistan; Mohammad Alibakhshikenari, Universidad Carlos III de Madrid, Spain; Francisco Falcone, Public University of Navarre (UPNA), Spain; Ernesto Limiti, University of Rome Tor Vergata, Italy

A3.3 13:50

[Antenna Array for 5G Mobil Communication](#)
Alberto Munoz, Abas Sabouni, Wilkes University, United States

A3.4 14:10

[Alternative Ways to Feed the Arecibo Observatory Spherical Reflector](#)
Mohamed Alkhatib, James Breakall, The Pennsylvania State University, United States; Omar Alzaabi, Khalifa University, United Arab Emirates

A3.5 14:30

[Far Field EVM Estimation for Large Phased Arrays using Embedded Elements and Beam Squint Model](#)
Dustin Brown, Yahya Rahmat-Samii, UCLA, United States

Wednesday, January 5 13:10 - 14:50
B6 200

Electromagnetic Theory and Techniques

Session Co-Chairs: David Jackson, University of Houston; Steven Weiss, The Army Research Lab

B6.1 13:10

[Supercavity Modes in High-Index Resonators with Diverse Rotational Symmetry](#)
Zahra Manzoor, Omer Yesilyurt, Alexander V. Kildishev, Dimitrios Peroulis, Purdue University, United States

B6.2 13:30

[Extremely-Low Frequency \(ELF\) Radio Sensing of Unmanned Aerial Systems](#)
Ajuna Madanayake, Hiruni Silva, FIU, United States; Soumyajit Mandal, Jarred Glickstein, Case Western Reserve University, United States

B6.3 13:50

[Design and Manufacturing Analysis of Sub-Millimeter Wave Narrow-Band Filters for Direct-Detection Atmospheric Sounding Radiometers](#)
Samantha Williams, Steven C. Reising, Yuriy Goncharenko, Colorado State University, United States

B6.4 14:10

[RCS Reduction for a Monostatic Signal with Arbitrary Polarization Using Microstrip Antennas](#)
Vani Vellanki, David Jackson, Daniel Onofrei, University of Houston, United States; Sohini Sengupta, Sonos, United States

B6.5 14:30

[Matching Techniques for Microstrip Antennas in Classes Teaching Electromagnetics](#)
Steven Weiss, The Army Research Lab, United States

Wednesday, January 5 13:10 - 14:30
H2 Special Session 245

Active Experiments in Laboratory and Space Plasmas

Session Co-Chairs: Chris Crabtree, US Naval Research Laboratory; Poorya Hosseini, Applied Physics Laboratory

H2.1 13:10

[Understanding the VLF Bear Claw Captured by the DSX Spacecraft](#)
Michael Starks, Jay Albert, Wm. Robert Johnston, Air Force Research Laboratory, United States; David Lauben, Ivan Linscott, Stanford University, United States; Umran Inan, Koc University, Turkey; Steve Stelmash, University of Massachusetts - Lowell, United States; James McCollough, US Department of Energy, United States

H2.2 13:30

[Modeling the Formation, Evolution, and Measurement of a Rocket-Released Barium Cloud](#)
Alex Fletcher, Gurudas Ganguli, Chris Crabtree, Carl Siefing, Rinaldo Soto, Andrew Stephen Richardson, US Naval Research Laboratory, United States; Joseph Huba, Syntek Technologies, United States

H2.3 13:50

[High Altitude Echoes in the Equatorial Topside Ionosphere](#)
Sevag Derghazarian, Enrique Rojas, David Hysell, Charles Seyler, Cornell University, United States

H2.4 14:10

[High Resolution ELF/VLF Time-of-Arrival Analysis at HAARP](#)
Harrison Burch, Robert Moore, University of Florida, United States

Wednesday, January 5 13:10 - 14:50
J2 265

New Telescopes, Techniques, and Technologies and Observatory Reports II

Session Co-Chairs: Jeff Mangum, NRAO; Alyson Ford, University of Arizona

J2.1 13:10

[Low Noise L-band RF-over-fiber Signal Transport for ALPACA on theGBT](#)
Mitchell Burnett, Nathaniel Ashcraft, Spencer Ammermon, Brian Jeffs, Karl Warnick, Brigham Young University, United States

J2.2 13:30

[RFI Mitigation with Neural Networks for the BMX Telescope](#)
Benjamin Salwanchik, Brookhaven National Laboratory, United States

J2.3 13:50

[Array Element Coupling in Radio Interferometry: A Semi-Analytic Approach](#)
Alec Jossaitis, Eloy de Lera Acedo, University of Cambridge, United Kingdom; Aaron Ewall-Wice, University of California - Berkeley, United States

J2.4 14:10

[SWRDS: SMT Wideband Radio Digital Spectrometer](#)
Arash Roshanimeshat, Dan Marrone, David Forbes, University of Arizona, United States

J2.5 14:30

[Towards a New Arecibo Telescope for All Radar Science](#)
Brett Isham, Interamerican University of Puerto Rico, United States; Christiano Brum, Francisco Cordova, Arecibo Observatory, United States; Juha Viininen, University of Tromsø, Norway; Michael Nolan, University of Arizona, United States; Anne Virkki, University of Helsinki, Finland; Marco Milla, Instituto Geofísico del Perú, Peru

Wednesday, January 5 13:10 - 14:50
B7 Special Session 1B40

Multiscale and Stochastic Modeling in Computational Electromagnetics

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

B7.1 13:10

[FDTD Simulation of Stochastic Scattering Loss Due to Surface Roughness in Optical Interconnects](#)
Brian Guiana, Ata Zadehgal, University of Idaho, United States

B7.2 13:30

[RFID Tag Antenna Design based on the Theory of Characteristic Modes](#)
Pallavi Sharma, Jennifer T. Bernhard, University of Illinois Urbana-Champaign, United States

B7.3 13:50

[A Grid-Aligned TE/SF Plane Wave Source Condition for the Constraint-Preserving FVTD Method](#)
Kaiser Niknam, Jamesina Simpson, University of Utah, United States

B7.4 14:10

[Efficiency Benefits of Anisotropic hp-Refinement for CEM](#)
Jeremiah Corrado, Jake Hamon, Branislav Notaros, Colorado State University, United States

B7.5 14:30

[On the Parallel Performance of SPAI-FETD Solvers for Time-Domain Maxwell's Equations](#)
Joonsik Kim, Fernando Teixeira, The Ohio State University, United States

Wednesday, January 5 13:10 - 14:50
D2 Special Session 1B51

Millimeter-Wave and Terahertz Systems for Space Applications

Session Co-Chairs: Negar Ehsan, NASA Goddard Space Flight Center; Berhanu T. Bulcha, NASA Goddard Space Flight Center

D2.1 13:10

[μ-Spec On-Chip Spectrometers for the EXCLAIM Instrument](#)
Emily M. Barrentine, Berhanu T. Bulcha, Giuseppe Cataldo, Negar Ehsan, Thomas Essinger-Hileman, James P. Hays-Wehle, Larry A. Hess, Mona Mirzaei, Omid Noroozian, Maryam Rahmani, Thomas R. Stevenson, Eric R. Switzer, Carolyn G. Volpert, Edward J. Wollack, NASA Goddard Space Flight Center, United States; Jake A. Connors, National Institute of Standards and Technology, United States; Trevor M. Oxholm, University of Wisconsin, United States

D2.2 13:30

[Technology Maturation for Cloud Ice Radiometers](#)
Pekka Kangaslahti, Erich Schlecht, Isaac Ramos, Javier Bosch, Mary Soria, Erika Hernandez, Jonathan Jiang, Jet Propulsion Laboratory, California Institute of Technology, United States; William Deal, Alex Zamora, Kevin Leong, Ben Gorospe, Alfonso Escorcía, Khanh Nguyen, Gerry Mei, Caitlyn Cooke, Maxwell Duffy, Northrop Grumman Corporation, United States

D2.3 13:50

[Venus Wideband Submillimeter Heterodyne Spectrometer \(V-WiSheS\): a Remote-Sensing Flight Instrument Targeting Venus' Middle Atmosphere](#)
Carrie Anderson, Paul Racette, Negar Ehsan, Gordon Chin, Melissa Ugelow, Tilak Hewagama, NASA Goddard Space Flight Center, United States; Timothy Livengood, University of Maryland, United States

D2.4 14:10

[Submillimeter Solar Observation Lunar Volatiles Experiment \(SSOLVE\)](#)
Timothy Livengood, NASA GSFC/CRESST, United States; Carrie Anderson, Berhanu T. Bulcha, Gordon Chin, Negar Ehsan, Tilak Hewagama, Paul Racette, Geronimo Villanueva, NASA GSFC, United States

D2.5 14:30

[Schottky Diodes based on Heterogeneous Integration for Submillimeter-Wave Metrology and Calibration](#)
Robert M. Weikle II, Linli Xie, Michael Cyberey, University of Virginia, United States; Matthew Bauwens, Dominion MicroProbes, Inc., United States; Arthur Lichtenberger, Scott Barker, University of Virginia, United States

Wednesday, January 5	Event	15:10 - 16:50 Math 100
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Student Paper Competition

Wideband, Electronically Reconfigurable Phased-Array Element with 1-Bit Phase Quantization and High Power Handling Capability

Zongtang Zhang, Advisor: Nader Behdad

Seeing Around Obstacles with Terahertz Waves

Yiran Cui, Advisor: Georgios Trichopoulos

Direction Finding Bandwidth Enhancement of a Machine Learning Retrofit Ultrawideband Array

Gaeron Friedrichs, Advisor: Dejan Filipovic

Non-Contact Heart Rate Estimation in Low SNR Environments Using mmWave Radar

C.J. Bauder, Advisor: A.E. Fathy

RFSOC-Based Digital Beamformer for Millimeter-Wave MIMO Applications

Kefayet Ullah, Advisor: John Volakis

Wednesday, January 5	Event	17:00 - 18:00
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Business Meetings

Commission A (Room 155)

Commission F (Room 150)

Wednesday, January 5	Event	18:00 - 19:00
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Business Meetings

Commissions C and E (Room 105)

Commission J (Room 265)

Wednesday, January 5	Event	19:00 - 21:00
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Receptions

WIRS Speaker Meet & Greet for all Virtual Attendees (online)

Reception for all In-Person Attendees (Byron R. White Stadium Club)

Thursday, January 6 08:00 - 11:30
Event Math 100

Plenary Session

RF Spectrum Use, Management, and Interference Mitigation

Plenary Introduction

Eric Mokole

Musings on Practical Radar Spectrum Sharing

Shannon Blunt, University of Kansas

Making Spectrum Better: Collaboration Opportunities between Radio Scientists and other Spectrum Users

Andy Clegg, Google and Baylor University

Maintaining Access to Spectrum for Astronomy and Passive Radio Science

Harvey Liszt, National Radio Astronomy Observatory

Student Paper Competition Awards

Thursday, January 6 13:10 - 14:50
A4 Special Session 105

Inventive Approaches in Advanced Communications

Session Co-Chairs: Chris Anderson, USNA; Amy Robinson, University of Colorado

A4.1 13:10

[Reconfigurable Satellite Radios Using Machine Learning Algorithms](#)

Michael Ortiz, Elias Alwan, Florida International University, United States

A4.2 13:30

[A Robotic Antenna Alignment and Tracking System for Millimeter Wave Propagation Modeling](#)

Bharath Keshavamurthy, Nicola Michelusi, Arizona State University, United States; Yaguang Zhang, James Krogmeier, David Love, Purdue University, United States; Christopher Anderson, United States Naval Academy, United States

A4.3 13:50

[RFSoc-Based Digital Beamformer for Millimeter-Wave MIMO Applications](#)

Kefayet Ullah, Sathesh Bajja Venkatakrishnan, John L. Volakis, Florida International University, United States

A4.4 14:10

[Doppler Frequency Shift Compensation in Millimeter-Wave Multi-Port Receiver Front-Ends](#)

Mansoor Dashti Ardakani, INRS University, Canada; Marzie Tabatabaefar, Serioja Ovidiu Tatu, Institut National de la Recherche Scientifique (INRS), Canada

A4.5 14:30

[Development of Quantum Field Probes for Reliable Channel Sounding Measurements](#)

Alexandra Artusio-Glimpse, Matthew Simons, Vladimir Aksyuk, Christopher Holloway, NIST, United States; Amy Robinson, University of Colorado, United States; Daniel Lopez, Penn State, United States

Thursday, January 6 13:10 - 16:50
F3 150

Refractivity Characterization and Numerical Weather Prediction

Session Co-Chairs: Jonathan Z. Gehman, Johns Hopkins University Applied Physics Laboratory; Abby Anderson, NRLDC

F3.1 13:10

[Improving Parametric Refractivity Models for Evaporation Ducts](#)

Sarah Wessinger, Erin E. Hackett, Coastal Carolina University, United States; Tracy Haack, Naval Research Laboratory, United States

F3.2 13:30

[A Fully Coherent Vertical Array for Evaporation Duct Height Estimation at Coastal Boundaries](#)

Joe Vinci, Caglar Yardim, The Ohio State University, United States

F3.3 13:50

[Global Sensitivity of X-band Propagation to Environmental Parameters in Evaporative Ducting Conditions](#)

Douglas M. Pastore, Erin E. Hackett, Coastal Carolina University, United States

F3.4 14:10

[Assessment of NWP/SLM Blend Algorithm Performance](#)

Andrew Mahre, Jonathan Z. Gehman, Jonathan M. Pozderac, Thomas R. Hanley, Johns Hopkins University Applied Physics Laboratory, United States

F3.5 14:30

[LATPROP Radar Data Collection for CLAS1 Experiment](#)

DeGrafth Palmore, Caglar Yardim, Joshua Compalea, The Ohio State University, United States

Break 14:50

F3.6 15:10

[Evaluating the Effects of Digital Elevation Models and Land Use Land Cover Models on Radio Frequency Electromagnetic Propagation Modeling for Over Land Applications](#)

Abby Anderson, NRLDC, United States

F3.7 15:30

[An Assessment of Theoretical Models of Sea Surface Roughness at Coastal Boundaries with the Aid of the Parabolic Equation](#)

Elizabeth Shi, Caglar Yardim, Mark Andrews, Joe Vinci, Joel Johnson, Ohio State University, United States

F3.8 15:50

[Exploring the Sensitivity of Simulated Radio Propagation Loss to NWP-Derived Modified Refractivity](#)

Jacob Yung, Bay Systems Consulting, United States; David Flagg, Andrew Kammerer, James Doyle, U.S. Naval Research Laboratory, United States; Qing Wang, Naval Postgraduate School, United States; Denny Alappattu, NorthWest Research Associates, United States; Robert Burkholder, Caglar Yardim, Ohio State University, United States; Peter Rogowski, Tony de Paola, Scripps Institution of Oceanography, United States; Katherine Mulreany, Office of Naval Research, United States

F3.9 16:10

[Characterizing Heterogeneous Refractivity Conditions Along a Propagation Path from Gridded NWP Data](#)

Paul Frederickson, Naval Postgraduate School, United States

F3.10 16:30

[Effects of Climate Change on Radio-Wave Propagation](#)

Jonathan Z. Gehman, Benjamin Sheppard, Ben Weaver, Jake Kovalic, Thomas R. Hanley, Johns Hopkins University Applied Physics Laboratory, United States

Thursday, January 6 13:10 - 14:50
C1 155

Radar

Session Co-Chairs: James Gowan; Robert Gardner, Georgia Tech Research Institute

C1.1 13:10

[DISTRIBUTED SDR ARRAY FOR FORWARD-BASED OVER-THE-HORIZON-RADAR \(OTHR\)](#)

Sean Ellison, Yan Li, Priscilla Tang, Minhtri Ho, Joseph McIlvenny, James Conroy, Johns Hopkins Applied Physics Lab, United States

C1.2 13:30

[A Mobile, High Temporal and Spatial Resolution FMCW Channel Sounder](#)

Carl L. Wolsieffer, Daniel J. Breton, Army Corps of Engineers, United States

C1.3 13:50

[Limits on Available Monostatic RCS Observation Angles for Satellites](#)

Robert Gardner, Georgia Tech Research Institute, United States

C1.4 14:10

[FPGA Implementation of an Efficient Neural Network Model for Maximum Power Point Tracking](#)

Dilruba Parvin, Omiya Hassan, Twisha Titirsha, Syed Kamrul Islam, University of Missouri, United States

C1.5 14:30

[Non-Contact Heart Rate Estimation in Low SNR Environments Using mmWave Radar](#)

Chandler Bauder, Aly Fathy, University of Tennessee Knoxville, United States

Thursday, January 6 13:10 - 16:10
B8 200

Analysis and Design of Antennas and RF Components

Session Co-Chairs: Satish Sharma, San Diego State University; Zoya Popovic, University of Colorado Boulder

B8.1 13:10
[Magnetically Reconfigurable Band-Reject Metasurface Filter](#)
Jack Eichenberger, Jize Dai, The Ohio State University, United States; Shuai Wu, Renee Zhao, Stanford University, United States; Nima Ghahchehian, Georgia Institute of Technology, United States

B8.2 13:30
[Understanding the Far-Field Properties of Orbital Angular Momentum Beams through the Antenna Aperture Field Method](#)
Anastasios Papatathanopoulos, Junbo Wang, Yahya Rahmat-Samii, UCLA, United States

B8.3 13:50
[Exceptional Point of Degeneracy as a Desirable Point of Operation for Oscillator With Discrete Nonlinear Gain and Radiating Elements](#)
Tarek Mealy, Alireza Nikzami, Ahmed Abdelshafy, Filippo Capolino, University of California, Irvine, United States

B8.4 14:10
[Front-End Isolation Circuit for Aperture-Level STAR Arrays](#)
Seth Johannes, Zoya Popovic, University of Colorado Boulder, United States

B8.5 14:30
[Tri-Band Quasi-FIR Microwave Filter with Parallel Switched Resonators for 5G New Radio Mission Critical Band Selectivity](#)
Anthony Nuñez, Stavros Georgakopoulos, Elias Alwan, Florida International University, United States

Break 14:50

B8.6 15:10
[Modular 3D printed Antennas](#)
Lauren Linkous, Jonathan Lundquist, Erdem Topsakal, Virginia Commonwealth University, United States

B8.7 15:30
[Object-Oriented RF Effects Simulation](#)
Robert Gardner, Georgia Tech Research Institute, United States

B8.8 15:50
[GTRI Precision Effects Testbed](#)
George Che, Robert Gardner, Gabriel Saffold, Georgia Tech Research Institute, United States

Thursday, January 6 13:10 - 14:10
H3 Special Session 245

Lightning and Plasma Phenomena of the Thermosphere

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

H3.1 13:10
[Excitation of the Schumann Band by Q-bursts, N-bursts, and V-bursts](#)
Quincy Flint, Robb Moore, University of Florida, United States

H3.2 13:30
[Mesospheric Photochemistry Optimized for Lightning-Ionosphere Interactions and VLF Scattering Calculations](#)
Joshua Santos, Robert Moore, University of Florida, United States

H3.3 13:50
[Simulating Meteoroid Ablation on Picosecond Timescales](#)
Gabrielle Guttormsen, UCLA, United States; Alex Fletcher, Naval Research Laboratory, United States; Meers Oppenheim, Boston University, United States

Thursday, January 6 13:10 - 16:30
J3 265

New Telescopes, Techniques, and Technologies and Observatory Reports III

Session Co-Chairs: Jeff Mangum, NRAO; Alyson Ford, University of Arizona

J3.1 13:10
[First HERA Phase I Results: Improved Limits on the 21 cm Reionization Power Spectrum at z=8](#)
Nicholas Kern, Massachusetts Institute of Technology, United States

J3.2 13:30
[A Map of Diffuse Radio Emission at 182 MHz to Enhance Epoch of Reionization Observations in the Southern Hemisphere](#)
Ruby Byrne, California Institute of Technology, United States; Miguel Morales, Bryna Hazelton, Ian Sullivan, University of Washington, United States; Nichole Barry, University of Melbourne, Australia; Christene Lynch, Jack Line, Curtin University, Australia; Daniel Jacobs, Arizona State University, United States

J3.3 13:50
[Preliminary Field Results from the MIST Global 21cm Experiment](#)
Ian Hendricksen, McGill University, Canada

J3.4 14:10
[Lost Horizon: Quantifying the Effect of Local Topography on Global 21-cm Cosmology Data Analysis](#)
Neil Bassett, Jack Burns, University of Colorado Boulder, United States; David Rapetti, NASA Ames Research Center, United States

J3.5 14:30
[Electrical Characterization of the Soil for Sky Radio Measurements with the MIST Global 21-cm Experiment](#)
Matheus Azevedo Silva Pessôa, McGill University, Brazil

Break 14:50

J3.6 15:10
[A Progress Report on PRIZM Data Analysis and Calibration](#)
Kelly Foran, McGill University, Canada

J3.7 15:30
[Drone Calibration for HIRAX and Other 21cm Experiments](#)
Emily Kuhn, Yale University, United States

J3.8 15:50
[RFI Measurement of a Drone Calibration System for 21cm Experiments](#)
Anna R. Polish, Yale University, United States

J3.9 16:10
[Evaluation of Antenna Beam Chromaticity for the MIST Global 21-cm Experiment](#)
Christian Hellum Bye, University of California, Berkeley, United States

Thursday, January 6 13:10 - 15:30
B9 Special Session 1B40

Novel Electrically Small Antennas and Matching Networks

Session Co-Chairs: Ashwin K. Iyer, University of Alberta; Ting-Yen Shih, University of Idaho

B9.1 13:10
[Approaching the Q Lower Bounds with an Inherently Matched and Highly Miniaturized Spherical Folded Dipole](#)
Ashwin K. Iyer, University of Alberta, Canada; Sanghamitra Das, San Diego State University, United States

B9.2 13:30
[Design of an Electrically Small Printed Square Loop Antenna](#)
Nhat Truong, Sanghamitra Das, Satish Sharma, San Diego State University, United States

B9.3 13:50
[Investigation of Overcoming the Chu Lower Bound on Quality Factor for Antennas Tuned with Highly Dispersive Lossy Material](#)
Younes Ra'di, Ahmed Mekkawy, Andrea Alu, Advanced Science Research Center, City University of New York, United States

B9.4 14:10
[Mutual Coupling Reduction of Miniaturized MM-wave ME-dipole Antennas using SRR Superstrate](#)
Mehdi Borhani Kakhki, Tayeb A. Denidni, University of Quebec, Canada; Abdolmehdi Dadgarpour, Abdel-Razik Sebok, Concordia University, Canada; Marco A. Antoniadis, Ryerson University, Canada

B9.5 14:30
[A Machine Learning Approach to Varactor Diode Modeling](#)
Phillip Hagen, Qianyi Li, Ting-Yen Shih, University of Idaho, United States

Break 14:50

B9.6 15:10
[API Design for Machine-Learning-Based Automatic Synthesis of Practical Impedance Matching Circuits](#)
Qianyi Li, Ting-Yen Shih, University of Idaho, United States

Thursday, January 6 15:10 - 16:30
K1 Special Session 105

Dosimetry and Exposure Assessment

Session Co-Chairs: Asimina Kiourt, ELECTROSCIENCE LABORATORY; Ifana Mahbub, University of North Texas

K1.1 15:10

[Implementation of Polynomial Chaos Expansion Surrogate Model in SAR Statistical Studies](#)

Botian Zhang, Yahya Rahmat-Samii, University of California, Los Angeles, United States

K1.2 15:30

[Human vs. Rat Head Models for Wireless and Fully-Passive Brain Implant Design: A Comparative Study](#)

Mihir N. Patil, Asimina Kiourt, ELECTROSCIENCE LABORATORY, United States

K1.3 15:50

[The Design and SAR Analysis of a UWB Bow-tie Antenna for Wireless Wearable Sensors](#)

Karthik Kakaraparty, Ifana Mahbub, University of North Texas, United States

K1.4 16:10

[Extending Range of Wireless Power Transfer Using a Novel Intermediate Passive Loop with Coils](#)

Bashir Morshed, Mahfuzur Rahman, Texas Tech University, United States

Thursday, January 6 15:10 - 16:50
G3 151

Radar and Radio Techniques

Session Co-Chairs: Thomas Gaussiran, UT Austin; Stan Briczinski, NRL

G3.1 15:10

[SuperDARN Observations of STEVE](#)

Gareth Perry, New Jersey Institute of Technology, United States; Bea Gallardo-Lacourt, NASA Goddard Space Flight Center, United States; William Archer, Canadian Space Agency, Canada; Simon Shepherd, Dartmouth College, United States; Ashton Reimer, SRI, United States; Megan Gillies, University of Calgary, United States

G3.2 15:30

[On the Use of HAARP and the Kiwi Software-defined Receiver Network for HF Studies](#)

Jordan Wiker, Brian Minch, Jonathan Z. Gehman, David Aylaian, Glenn Sugar, Aram Vartanyan, James Conroy, Johns Hopkins University Applied Physics Laboratory, United States

G3.3 15:50

[DLITE: A Low-cost Radio Telescope Array for Ionospheric Remote Sensing](#)

Joseph Helmboldt, Blerita Markowski, David Bonanno, Tracy Clarke, Brian Hicks, Namir Kassim, U.S. Naval Research Laboratory, United States; Jayce Dowell, University of New Mexico, United States; Gregory Taylor, University of New Mexico, United States

G3.4 16:10

[Modulated pump power effects on VHF PMSE and associated dust charging process in space](#)

Alireza Mahmoudian, University of Tehran, Iran; M J Kosch, SANSA, South Africa; Juha Vierinen, University of Tromso, Norway

G3.5 16:30

[Characterization of the D-Region Ionosphere using Polarization Parameters](#)

Hunter Burch, Robert Moore, University of Florida, United States

Thursday, January 6 15:10 - 16:50
C2 155

RF Spectrum

Session Co-Chairs: Lawrence Cohen, Naval Research Laboratory; Greg Huff, Pennsylvania State University

C2.1 15:10

[Circuit Optimization of Non-Linear Transmit Amplifiers using Partial Load-Pull Extrapolation via Deep Image Completion](#)

Austin Egbert, Charles Baylis, Robert J. Marks II, Baylor University, United States

C2.2 15:30

[Directional Modulation and Array Impedance Tuning for Secure Radar and Communications](#)

Adam Goad, Julian Alonzo, Austin Egbert, Sarah Seguin, Charles Baylis, Robert J. Marks II, Baylor University, United States; Moeness Amin, Villanova University, United States; Anthony Martone, Benjamin Kirk, DEVCOM Army Research Laboratory (ARL), United States

C2.3 15:50

[Changepoint Detection for Real-Time Spectrum Sharing Radar](#)

Samuel Haug, Austin Egbert, Robert J. Marks II, Charles Baylis, Baylor University, United States; Anthony Martone, Army Research Laboratory, United States

C2.4 16:10

[Spectrum Sharing Broker for Active and Passive Devices Considering In-Band and Out-of-Band Emissions](#)

Sarah Seguin, Kayla Sanders, Trevor Van Hoosier, Adam Goad, Charles Baylis, Robert J. Marks II, Baylor University, United States; Albin Gasiewski, Aravind Venkatasubramony, University of Colorado at Boulder, United States

C2.5 16:30

[Adaptive Radio Frequency Interference Cancellation for Radio Science Observatories](#)

Sharanya Srinivas, Frank D. Lind, John Swoboda, Philip J. Erickson, Kazunori Akiyama, Massachusetts Institute of Technology, United States

Thursday, January 6 15:10 - 16:30
D3 Special Session 1B51

Broadband and Multiband Amplifiers

Session Co-Chairs: Zoya Popovic, University of Colorado Boulder; Philip Zurek, University of Colorado Boulder

D3.1 15:10

[State of the Art Transformer Enabled 2-20 GHz GaN MMIC Overview](#)

Michael Roberg, Qorvo, United States

D3.2 15:30

[Broadband RF Power Amplifier Architectures for Linear Concurrent Signal Transmission](#)

Philip Zurek, Zoya Popovic, University of Colorado Boulder, United States

D3.3 15:50

[GaAs MMIC Interferometer for Interference Cancellation](#)

Paige Danielson, Megan Robinson, Zoya Popovic, University of Colorado Boulder, United States

D3.4 16:10

[A 90-125 GHz Stacked PA in 130 nm InP HBT with 18.3 % peak PAE at 15.3 dBm Output Power](#)

Vinay Iyer, Jay Sheth, Linsheng Zhang, Robert M. Weikle II, Steven Bowers, University of Virginia, United States

Thursday, January 6 17:00 - 18:00
Event

Business Meetings

Commission B (Room 1B40)

Commission G (Room 151)

Thursday, January 6 18:00 - 19:00
Event

Business Meetings

Commission D (Room 1B51)

Commission H (Room 245)

Commission K (Room 105)

Thursday, January 6 19:00 - 20:00
Event

Business Meetings

WIRS Business Meeting (Room 105)

Thursday, January 6 20:00 - 21:00
Event

Reception

WIRS In-Person Reception (KOBLS100)

Friday, January 7 08:20 - 12:00
K2 105

Human Body Interactions with Antennas and Other Electromagnetic Devices

Session Co-Chairs: Ryan Green, Mississippi State University; Erdem Topsakal, Virginia Commonwealth University

K2.1 08:20

[Skin Acetone Sensing Based on PANI-CA Composites](#)

Balaji Dontha, Asimina Kiourti, The Ohio State University, United States

K2.2 08:40

[Analysis of a Wearable Joint Flexion Sensor Using Anatomical Tissue Models](#)

Keren Zhu, Asimina Kiourti, The Ohio State University, United States; Michael Johnson, C.J. Reddy, Altair Engineering, Inc., United States

K2.3 09:00

[Screen-Printed Frequency Selective Surfaces for Health and Communication Applications](#)

McKenzie Piper, Joshua Piper, Erdem Topsakal, Virginia Commonwealth University, United States

K2.4 09:20

[Using Anatomical Body Models to Simulate Antenna-Impregnated Fabrics that Monitor Child Height](#)

Keren Zhu, Asimina Kiourti, The Ohio State University, United States; Michael Johnson, C.J. Reddy, Altair Engineering, Inc., United States

K2.5 09:40

[Silver Ink-Based Thin Film Antennas for Wearable Stretch Sensor Applications](#)

Ryan Green, Benjamin Wilkinson, Mississippi State University, United States; Jonathan Lundquist, Erdem Topsakal, Virginia Commonwealth University, United States

Break 10:00

K2.6 10:20

[Study of Electrical Properties of PEDOT:PSS Material and its Feasibility for Wireless Implantable Devices](#)

Mohammad Moulad, Sharolyn Ballbaugh, David Hoelzle, Asimina Kiourti, Jinghua Li, Félix Miranda, Ohio State University, United States

K2.7 10:40

[On-Demand Current Pulse Activation of RF Monopole Antenna Biosensor Arrays with Nitrocellulose Membranes](#)

Sindu Shanmugas, Jonathan Lundsquitt, Erdem Topsakal, Vitaliy Avrutin, Dr. Umit Olgur, Virginia Commonwealth University, United States

K2.8 11:00

[Combined Static Magnetic Fields and RF Fields effects on HT-1080 fibro sarcoma cells and role of Iron Sulphur Complexes on ROS production](#)

Hakki Gurhan, Frank Barnes, University Colorado, United States

K2.9 11:20

[Emission of Electric and Magnetic Fields from HD1080 Fibrosarcoma Cell And E-coli](#)

Frank Barnes, Hakki Gurhan, Sahithi Kandala, Mark Hernandez, University of Colorado Boulder, United States

K2.10 11:40

[Assessment of the Point Electrode Configuration in Electrical Impedance Myography Measurement for Early Stage Breast Cancer Detection](#)

Md Al Amin Bhuiyan, Dhaka Community Medical College, Bangladesh; Md Nurul Anwar Tarek, Florida International University, United States; Mohammad A. Ahad, GEORGIA SOUTHERN UNIVERSITY, United States

Friday, January 7 08:20 - 11:40
F4 150

Microwave Remote Sensing of the Earth

Session Co-Chairs: David Kunke, The Aerospace Corporation; Chris Ruf, University of Michigan

F4.1 08:20

[Impacts of WSR-88D Supplemental Lower Elevation Angles on Quantitative Precipitation Estimating](#)

Haonan Chen, Liangwei Wang, Zhe Li, Colorado State University, United States

F4.2 08:40

[Examination of Transfer Learning Based Nowcasting in Different Geographical Regions](#)

EunYeol Kim, Venkatachalam Chandrasekar, Colorado State University, United States

F4.3 09:00

[Impainting Polarimetric Radar Observations in Complex Environments](#)

Songjian Tan, Haonan Chen, Shun Yao, Colorado State University, United States

F4.4 09:20

[NowSRGAN: A Super-Resolution Generative Adversarial Network for Machine Learning Weather Radar Nowcasting](#)

Jacob Garcia, Venkatachalam Chandrasekar, Colorado State University, United States

F4.5 09:40

[Impact of Precipitation Regimes on Deep Learning-based Radar Nowcasting Performance](#)

Shun Yao, Haonan Chen, Colorado State University, United States

Break 10:00

F4.6 10:20

[Enabling Temporal Observations of Cloud and Precipitation Processes from Constellations of Small Satellites: The Temporal Experiment for Storms and Tropical Systems – Demonstration \(TEMPEST-D\) Mission](#)

Steven C. Reising, Venkatachalam Chandrasekar, Christian D. Kummerow, Wesley Berg, Chandrasekar Radhakrishnan, Colorado State University, United States; Shannon T. Brown, Todd C. Gaier, NASA/Caltech Jet Propulsion Laboratory, United States

F4.7 10:40

[Antarctic Firn Characterization through Wideband Microwave Radiometry](#)

Rahul Kar, Mustafa Aksoy, Dua Kaurejo, University at Albany, SUNY, United States

F4.8 11:00

[Forward-Looking Millimeter-Wave Radiometers to Provide Advance Warning of Aircraft Icing Potential in Clouds](#)

Renish Thomas, Yuriy Goncharenko, Steven C. Reising, Jonah Smith, Chaehyeon C. Nam, Samantha Williams, Laurel O'Brien, Michael M. Bell, Colorado State University, United States; James McDonald, Eric Pahlke, Richard Bateman, FIRST RF Corporation, United States

F4.9 11:20

[Radio Frequency Interference Detection in Microwave Radiometry Using Bayesian Detection](#)

Imara Mohamed Nazar, Mustafa Aksoy, University at Albany, United States

Friday, January 7 08:20 - 10:00
G4 151

Ionospheric Imaging

Session Co-Chairs: Thomas Gaussiran, UT Austin; Roy Calfas, Univ of Texas at Austin

G4.1 08:20

[An MF/HF Radio Array for Radar and Radio Imaging of the Ionosphere](#)

Brett Isham, Interamerican University of Puerto Rico, United States; Terence Bullett, University of Colorado, United States; Bjorn Gustavsson, University of Tromsø, Norway; Emil Polisenksy, Naval Research Laboratory, United States; Gebrah Zewdie, Arecibo Observatory, United States; Vasyil Belyey, Leiza Norouzi, private researcher, Norway; Jan Bergman, Swedish Institute of Space Physics, Sweden

G4.2 08:40

[Resolving High-Latitude Plasma Density Structures using Advanced Modular Incoherent Scatter Radars and Novel Mapping Techniques](#)

Lindsay Goodwin, Gareth Perry, New Jersey Institute of Technology, United States

G4.3 09:00

[Ionospheric Imaging with the North American VLF Array](#)

Joshua Covey, Robert Moore, University of Florida, United States

G4.4 09:20

[Gaussian process model specification for 4-D wind field estimation using meteor radar network observations](#)

Ryan Volz, Philip J. Erickson, Massachusetts Institute of Technology, United States; Oana Mirestean, Cornell University, United States; Jorge Chau, University of Rostock, Germany

G4.5 09:40

[Morphological and spectral features of ionospheric structures at E- and F-region altitudes over Poker Flat analyzed using modeling and observations.](#)

Pralay Raj Vaggu, Kshitija Deshpande, Embry Riddle Aeronautical University, United States; Seebany Datta-Barua, Aurora Lopez, Illinois Institute of Technology, United States; Gary Bust, James Conroy, JHUAPL, United States; Donald Hampton, Geophysical Institute, University of Alaska, United States

Friday, January 7 08:20 - 10:00
C3 155

RF Antenna Design and Systems

Session Co-Chairs: Dev Palmer, DARPA; Kumar Mishra, Army Research Laboratory

C3.1 08:20

[Machine Learning for Microstrip Patch Antenna Design: Observations and Recommendations](#)

Yiming Chen, Atef Elsherbeni, Colorado School of Mines, United States; Veysel Demir, Northern Illinois University, United States

C3.2 08:40

[Next Generation RF and Microwave Antenna Predictive and Optimization Models](#)

Sai Sampreeth Indharapu, Anthony N. Caruso, Kalyan C. Durbhakula, University of Missouri - Kansas City, United States

C3.3 09:00

[Prior Knowledge based Inverse Parametric Modeling of UWB Band-Notched Antennas](#)

Debanjali Sarkar, Taimoor Khan, Fazal Ahmed Talukdar, NIT Silchar, India; Sembiam R. Rengarajan, California State University, United States

C3.4 09:20

[Direction Finding Bandwidth Enhancement of a Machine Learning Retrofit Ultrawideband Array](#)

Gaeron Friedrichs, Mohamed Elmansouri, Dejan Filipovic, University of Colorado Boulder, United States

C3.5 09:40

[A Novel MIMO System with Integrated Coupling Suppression Filter at W Band](#)

Asif Hassan, Md Nurul Anwar Tarek, Sandhya R. Govindarajulu, Elias A. Alwan, Florida International University, United States

Friday, January 7 08:20 - 12:00
B10 200

Antenna Arrays: Approaches, Realizations, and Applications

Session Co-Chairs: Nader Behdad, University of Wisconsin, Madison; Randy Haupt, Colorado School of Mines

B10.1 08:20

[Application of Waveguide Simulators in the Design of Large, Wideband Phased Arrays with Asymmetric Antenna Elements](#)

Collin Wallish, Songyi Yen, Dejan Filipovic, University of Colorado Boulder, United States

B10.2 08:40

[A Particle Swarm Approach to Grating Lobe Suppression in an Aperiodic Vivaldi Array](#)

Gregory Mitchell, Quang Nguyen, Army Research Laboratory, United States

B10.3 09:00

[Sparse Circular Aperture Arrays Based on Poisson Disk Sampling](#)

Travis Torres, Payam Nayeri, Randy Haupt, Colorado School of Mines, United States; Paolo Rocca, University of Trento, Italy

B10.4 09:20

[A High-Power-Capable, Electronically-Reconfigurable, Phased-Array Unit Cell with 1-Bit Phase Quantization and 3:1 Bandwidth](#)

Jinkai Wu, Zongtang Zhang, John Booske, Nader Behdad, University of Wisconsin, Madison, United States

B10.5 09:40

[Sparse Cylindrical Arrays Based on the Low-Discrepancy Sobol Sequence Sampling](#)

Travis Torres, Payam Nayeri, Randy Haupt, Colorado School of Mines, United States

Break 10:00

B10.6 10:20

[Wideband, Electronically Reconfigurable Phased-Array Element with 1-Bit Phase Quantization and High-Power Handling Capability](#)

Zongtang Zhang, Meng Gao, Mohammad Mahdi Honari, John Booske, Nader Behdad, University of Wisconsin-Madison, United States

B10.7 10:40

[Foldable, Ultra-Wideband Tightly Coupled Dipole Array \(TCDA\) with Integrated Planar Feed and LET Joint](#)

Md Rakibul Islam, Vignesh Manohar, Sathesh B. Venkatakrishnan, John L. Volakis, Florida International University, United States

B10.8 11:00

[Orbital Angular Momentum \(OAM\) Beams: Novel Mathematical Insights, Transmitarray Generation and Measurement Validation](#)

Anastasio Papathanasopoulos, Yahya Rahmat-Samii, UCLA, United States

B10.9 11:20

[Improved GRIN Lens Ray Tracing Using Uniform Asymptotic Physical Optics](#)

Wei Wang, Jonathan Chisum, University of Notre Dame, United States

B10.10 11:40

[High-Power-Capable, Electronically-Reconfigurable Reflectarray Antennas with Wideband 1- and 2-Bit Phase Quantization](#)

Mohammad Mahdi Honari, John Booske, Nader Behdad, University of Wisconsin-Madison, United States

Friday, January 7 08:20 - 11:00
J4 Special Session 245

New SETI Technologies and Instrumentation

Session Co-Chairs: Dan Werthimer, University of California Berkeley; David DeBoer, University of California Berkeley

J4.1 08:20

[Search for Extra-terrestrial Intelligence \(SETI\) using Interferometric Radio Telescopes with an Ethernet-based, Multi-user Observing System](#)

Cherry Ng, University of Toronto, Canada

J4.2 08:40

[The PANOSETI Transient Search Instrument](#)

Dan Werthimer, University of California, Berkeley, United States

J4.3 09:00

[White Rabbit: Precision Time and Frequency Distribution for Radio Astronomy and SETI](#)

Wei Liu, Dan Werthimer, University of California, Berkeley, United States; Rick Raffanti, Techn Instruments, United States

J4.4 09:20

[A Machine-Learning-Based Direction-of-Origin Filter for the Identification of Radio Frequency Interference in the Search for Technosignatures](#)

Pavlo Pinchuk, Jean-Luc Margot, University of California, Los Angeles, United States

J4.5 09:40

[Validation of the SETI@home Candidate Pipeline Using Synthetic Extraterrestrials](#)

Eric Korpela, David Anderson, Jeff Cobb, Dan Werthimer, University of California, United States

Break 10:00

J4.6 10:20

[High Performance Pipelines for SETI Signal Processing](#)

David MacMahon, University of California at Berkeley, United States

J4.7 10:40

[Instrumentation Development for Radio Technosignature Searches at the Hat Creek Radio Observatory](#)

Alexander Pollak, Wael Farah, Sarah Schoultz, SETI Institute, United States; Andrew Siemion, David DeBoer, University of California at Berkeley, United States; Jack Hickish, REAL-TIME RADIO SYSTEMS LTD, United Kingdom; Franklin Antonio, Qualcomm, Inc., United States

Friday, January 7 08:20 - 11:20
J5 Special Session 265

Imaging Black Holes: The EHT and Beyond I

Session Co-Chairs: James Moran, Harvard University; Vincent Fish, MIT Haystack Observatory

J5.1 08:20

[The Event Horizon Telescope](#)

Geoffrey Bower, ASIAA, United States

J5.2 08:40

[Testing the Kerr nature of black holes with the Event Horizon Telescope](#)

Lia Medeiros, Institute for Advanced Study, United States; Dimitrios Psaltis, Feryal Ozel, University of Arizona, United States; Pierre Christian, Fairfield University, United States

J5.3 09:00

[Black hole images and movies from general relativistic MHD simulations](#)

Jason Dexter, University of Colorado Boulder, United States

J5.4 09:20

[Interferometric Imaging Techniques for the Event Horizon Telescope](#)

Kazunori Akiyama, Massachusetts Institute of Technology, United States

J5.5 09:40

[Calibration of the Event Horizon Telescope](#)

Lindy Blackburn, Center for Astrophysics | Harvard & Smithsonian, United States

Break 10:00

J5.6 10:20

[Inference techniques for the Event Horizon Telescope](#)

Dominic Pesce, Center for Astrophysics | Harvard & Smithsonian, United States

J5.7 10:40

[Polarimetric Observations with the Event Horizon Telescope](#)

Daniel Marrone, University of Arizona, United States

J5.8 11:00

[Observations of Active Galactic Nuclei with the Event Horizon Telescope](#)

Alan Marscher, Svetlana Jorstad, Boston University, United States

Friday, January 7 **08:20 - 11:40**
B11 **Special Session** **1B40**

Antennas and Systems for Specialized Platforms and Extreme/Harsh Environments

Session Co-Chairs: Reyhan Baktur, Utah State University; David Jackson, University of Houston; Sima Noghianian, Phoenix Analysis and Design Technologies; Sayan Roy, South Dakota School of Mines

B11.1 **08:20**
[Origami-Based Tightly Coupled Dipole Array for Small Satellites](#)
Maxence Carvalho, John L. Volakis, FIU, United States

B11.2 **08:40**
[Antenna Designs for CubeSat-Borne Continuous Wave Radar](#)
Logan Voigt, Reyhan Baktur, Utah State University, United States

B11.3 **09:00**
[Ultra-Lightweight Transmitarray Antenna Enabled by Charge-Programmed Three-Dimensional Multi-Material Printing](#)
Junbo Wang, Ryan Hensleigh, Zhenpeng Xu, Anastasios Papathanasopoulos, Xiaoyu Zheng, Yahya Rahmat-Samii, University of California, Los Angeles, United States

B11.4 **09:20**
[An Equivalent Circuit Analysis of Permanent Magnet Based VLF Transmitter](#)
Ali Hosseini-Fahrjaji, Majid Manteghi, Virginia Polytechnic Institute and State University, United States

B11.5 **09:40**
[Optically Transparent Frequency Selective Surfaces of Smart City Applications](#)
Benjamin Wilkinson, Ryan Green, Mississippi State University, United States; Jonathan Lundquist, Erdem Topsakal, Virginia Commonwealth University, United States

Break **10:00**

B11.6 **10:20**
[Optically Transparent Reflectarray Antenna \(RAA\) for Future Self-Powered Communication Systems](#)
Asim Alkhaibari, Trung Dung Ha, Pai-yan Chen, University of Illinois at Chicago, United States

B11.7 **10:40**
[A Comparative Study of Two Styles of Transparent Antennas under Vibration Seen in Automotive Environments](#)
Benjamin Wilkinson, Ryan Green, Mississippi State University, United States; Jonathan Lundquist, Erdem Topsakal, Virginia Commonwealth University, United States

B11.8 **11:00**
[Design of Low-Cost and Volume Environmental Test Bench for Evaluating RF Performance of Antennas Operating in Harsh Conditions](#)
Ljubodrag Boskovic, Mohamed Elmansouri, Dejan Filipovic, University of Colorado Boulder, United States

B11.9 **11:20**
[Bench Testing a System on Chip Adaptive Beamformer For GPS](#)
Jakob Kunzler, Karl Warnick, Jacob Bartschi, Spencer Ammerman, Mitchell Burnett, Brigham Young University, United States

Friday, January 7 **10:20 - 11:40**
G5 **151**

Ionospheric Modeling and Data Assimilation

Session Co-Chairs: Justin Mabie, Colorado; James Conroy, Virginia Tech

G5.1 **10:20**
[Inversion of Scintillation Events in the Auroral and Polar Cap Regions Using Analytical and Numerical Models](#)
James Conroy, Bharat Kunduri, Amir Zaghloul, Virginia Tech, United States; Kshitija Deshpande, Embry-Riddle, United States; Roger Varney, SRI International, United States

G5.2 **10:40**
[Constraining VLF Trans-Ionospheric Propagation Experiment Rocket \(VIPER\) Ionospheric Conditions with Ground-based VLF Transmitter Observations](#)
James Cannon, Wei Xu, Robert Marshall, University of Colorado Boulder, United States; John Bonnell, University of California Berkeley, United States

G5.3 **11:00**
[A Multi-scale Dynamic Mode Decomposition of Ionospheric Profiles](#)
Daniel Alford-Lago, Naval Information Warfare Center Pacific, United States; Christopher Curtis, San Diego State University, United States; Alexander Ihler, University of California Irvine, United States

G5.4 **11:20**
[A New Routine to Simulate Plasma Density Measurements from Satellites: Application to the SPORT Project](#)
Ana Paula Schuch, João Pedro Borher, Marco Ridenti, Willer Gomes, Aeronautics Institute of Technology, Brazil

Friday, January 7 **10:20 - 11:40**
E1 **155**

RF Spectrum and RF Systems in Noise

Session Co-Chairs: Greg Huff, Pennsylvania State University; Lawrence Cohen, Naval Research Laboratory

E1.1 **10:20**
[Enabling Crucial Scientific and Military Systems for Coexistence with 5G](#)
Charles Baylis, Sarah Seguin, Andrew Clegg, Robert J. Marks II, Baylor University, United States; Albin Gasiewski, Aravind Venkatasubramony, University of Colorado at Boulder, United States; Dimitrios Peroulis, Mohammad Abu Khater, Purdue University, United States

E1.2 **10:40**
[Creation of a Spatial-Spectral Mask in a Spectrally Brokered System](#)
Trevor Van Hoosier, Kayla Sanders, Charles Baylis, Sarah Seguin, Adam Goad, Robert J. Marks II, Baylor University, United States

E1.3 **11:00**
[Preliminary study of Radio Frequency waves in hypervelocity impact plasma](#)
Kimia Fereydooni, Nicolas Lee, Sigrid Close, Stanford University, United States

E1.4 **11:20**
[Analysis and Mitigation of Self-Scattering for VLF Navigation Applications](#)
Clint Snider, Robert Moore, University of Florida, United States

Friday, January 7 **12:10 - 13:00**
Event **Math 100**

Ninth Hans Liebe Lecture

Laboratory Spectroscopy of Atmospheric Gases in the Millimeter and Submillimeter Wave Range

Mikhail Tretyakov, Institute of Applied Physics, Russian Academy of Sciences, Moscow, Russia

Friday, January 7 13:10 - 16:30
K3 105

Electromagnetic Imaging and Sensing

Session Co-Chairs: Asimina Kiourti, ELECTROSCIENCE LABORATORY; Zoya Popovic, University of Colorado - Boulder

K3.1 13:10

[A Coherent Model for Radiometric Core Body Temperature Sensing](#)

Katrina Tisdale, Alexandra Bringer, Asimina Kiourti, The Ohio State University, United States

K3.2 13:30

[New Approach on Transcranial Magnetic Stimulation Using Permanent Magnet Based Generator](#)

Ali Hosseini-Fahrari, Majid Manteghi, Virginia Polytechnic Institute and State University, United States

K3.3 13:50

[Broadband Probe for Subcutaneous, Noninvasive Thermometry](#)

Kaitlin Hall, Megan Robinson, Robert Streeter, Gabriel Santamaria-Botello, Zoya Popovic, University of Colorado - Boulder, United States

K3.4 14:10

[Denoising E-Textile Sensors for Real-World Kinematics Monitoring](#)

Yuxuan Han, Vigyanshu Mishra, Asimina Kiourti, The Ohio State University, United States

K3.5 14:30

[Recording Evoked Somatosensory Activity with a Multichannel Passive Wireless Neurosensing System](#)

Carolina Moncion, Lakshmi Balachandrar, Melany Gutierrez-Hernandez, Satheesh Bojja Venkatakrishnan, John L. Volakis, Jorge Riera, Florida International University, United States

Break 14:50

K3.6 15:10

[Passive Wireless Neurosensing Recorder Evaluation using Machine Learning for Somatosensory Evoked Potentials Recognition](#)

Melany Gutierrez-Hernandez, Carolina Moncion, Satheesh Bojja Venkatakrishnan, John L. Volakis, Florida International University, United States

K3.7 15:30

[Experimental Demonstration of Geometric Parameter Estimation of Hidden Objects in Layered Media](#)

Kai Ren, Wentworth Institute of Technology, United States

K3.8 15:50

[Ceramic and Plastic Antenna Design for Into-Body Radiation](#)

Allyanna Rice, Asimina Kiourti, Ohio State University, United States

K3.9 16:10

[Investigation of Intra-body Transmission Channel around the Human Body](#)

Jose Alcalá-Medel, Yang Li, Baylor University, United States

Friday, January 7 13:10 - 16:30
F5 150

Propagation and Remote Sensing in Complex and Random Media

Session Co-Chairs: Saba Mudaliar, Air Force Research Laboratory, Wright-Patterson AFB; Gary S. Brown, Virginia Polytechnic Institute and State University

F5.1 13:10

[The effects of surface roughness in the surface spectral range of \$k\(\text{sub } s\) > 2k\(\text{sub } o\)\$](#)

Gary S. Brown, Thaddeus Black, Virginia Polytechnic Institute and State University, United States

F5.2 13:30

[Two-ray Propagation Model with Random Volumetric Scattering](#)

Vladimir Ostashev, Daniel J. Breton, D. Keith Wilson, Carl L. Wolsieffer, U.S. Army Engineer Research and Development Center, United States

F5.3 13:50

[L Band Non-Line of Sight Wave Propagation Reflected from a Tree Covered Mountainside](#)

Carl Suer, the George Washington University, United States; Roger H. Lang, George Washington University, United States; Carl L. Wolsieffer, Daniel J. Breton, U.S. Army Corps of Engineers - Engineer Research & Development Center, United States

F5.4 14:10

[A Space-angle Discontinuous Galerkin Method for Two-Dimensional Radiative Transfer Equation with Reflective Boundary Conditions](#)

Hang Wang, Reza Abedi, University of Tennessee Space Institute, United States; Saba Mudaliar, Air Force Research Laboratory, Wright-Patterson AFB, United States

F5.5 14:30

[DNN Enabled Real-Time Modeling of EM LWD Tool Responses in Complex Subsurface Formations](#)

Chaoxian Qi, Li Yan, Yuchen Jin, Xuqing Wu, Jiefu Chen, University of Houston, United States; Yueqin Huang, Cyentech Consulting LLC, United States

Break 14:50

F5.6 15:10

[Two-Potential Formulation for Scattering from an Inhomogeneous Layer](#)

Saba Mudaliar, Air Force Research Laboratory, United States; Dilip Ghosh Roy, Utah Center for Advanced Imaging Research, United States

F5.7 15:30

[Space Correlations Functions and Propagation Loss in a 2D-Trunk Dominated Forest](#)

Saul Torrico, Comsearch, United States; Roger H. Lang, George Washington University, United States

F5.8 15:50

[Design and Implementation of a Ground Penetrating Radar \(GPR\) from an Unmanned Aircraft System \(UAS\)](#)

Matthew Duck, Ali Gurbuz, Mehmet Kurum, Mississippi State University, United States

F5.9 16:10

[Transitional Reversible-Jump MCMC for Subsurface Characterization](#)

Han Lu, Jiefu Chen, Xuqing Wu, Xin Fu, University of Houston, United States; Mohammad Khalil, Cosmin Safta, Sandia National Laboratories, United States; Yueqin Huang, Cyentech Consulting LLC, United States

Friday, January 7	13:10 - 17:50
J6	Special Session 200
New Frontiers in Solar Radiophysics	
Session Co-Chairs: Tim Bastian, National Radio Astronomy Observatory; Marc Pulupa, UC Berkeley Space Sciences Laboratory	
J6.1	13:10
Advances in Ground-Based Solar Radio Science Dale E. Gary, New Jersey Institute of Technology, United States	
J6.3	13:50
Science Highlights from the Expanded Owens Valley Solar Array Bin Chen, New Jersey Institute of Technology, United States	
J6.4	14:10
Large Microwave Flare Sources with Multi-loop Magnetic Reconnection observed by EOVS A Imaging Spectroscopy Shaheda Begum Shaik, Dale E. Gary, NJIT, United States; Stephen White, Air Force Research Laboratory, Space Vehicles Directorate, United States	
J6.5	14:30
A New Era of Solar Physics with Owens Valley Radio Observatory – Long Wavelength Array (OVRO-LWA) Sherry Chhabra, George Mason University, United States; Dale E. Gary, Bin Chen, Center for Solar-Terrestrial Research, New Jersey Institute of Technology, United States; Brian O'Donnell, New Jersey Institute of Technology, United States; Gregg Hallinan, California Institute of Technology, United States; Marin Anderson, NASA Jet Propulsion Laboratory, United States	
Break	14:50
J6.6	15:10
Adding ALMA: Combining Millimeter Observations with Optical and UV Diagnostics to Probe the Solar Chromosphere Kevin Reardon, Mornchil Molnar, Ryan Hofmann, National Solar Observatory, United States; Yi Chai, Dale E. Gary, New Jersey Institute of Technology, United States	
J6.7	15:30
The Sun Radio Interferometer Space Experiment (SunRISE) Mission Joseph Lazio, Andrew Romero-Wolf, James Lux, Jet Propulsion Laboratory, California Institute of Technology, United States; Justin Kasper, University of Michigan, United States; Tim Neilsen, Space Dynamics Laboratory, Utah State University, United States	
J6.9	16:10
Parker Solar Probe and Solar Orbiter Observations of Solar Radio Bursts Vratislav Krupar, University of Maryland, Baltimore County and NASA Goddard Space Flight Center, United States	
J6.10	16:30
Frontiers in Faraday Rotation: Probing the Solar Wind Magnetic Field with the Very Large Array Jason Kooi, Naval Research Laboratory, United States	
J6.11	16:50
SunRISE Mission Overview: A Distributed Eye in the Sky for Radio Burst & SEP Sourcing Alexander Hegedus, Justin Kasper, University of Michigan, United States; Joseph Lazio, Andrew Romero-Wolf, Jet Propulsion Laboratory, California Institute of Technology, United States	
J6.12	17:10
Investigating Quiescent and Transient Magnetic Structures in the Inner Heliosphere using Faraday Rotation, the FETCH instrument on the MOST "awesome" mission Concept Elizabeth Jensen, Planetary Science Institute, United States; Natchimuthuk Gopalswamy, Shing Fung, Lan Jian, Lihua Li, Teresa Nieves-Chinchilla, Lynn Wilson, NASA Goddard Space Flight Center, United States; Joseph Lazio, Jet Propulsion Laboratory, United States; Jason Kooi, Brian Wood, Naval Research Laboratory, United States; Megan Kenny, University of Colorado, Boulder, United States; Ward Manchester, University of Michigan, United States; Alexei Pevtsov, National Solar Observatory, United States; David Wexler, University of Massachusetts, Lowell, United States; Stuart Bale, University of California, Berkeley, United States; Tim Bastian, National Radio Astronomy Observatory, United States	
J6.13	17:30
The Cubesat Radio Interferometry Experiment (CURIE) David Sundkvist, University of California at Berkeley, United States	

Friday, January 7	13:10 - 17:10
H4	Special Session 245
Physics of the Radiation Belts	
Session Co-Chairs: Oleksiy Agapitov, University of California Berkeley; Maria Usanova, LASP	
H4.1	13:10
Whistlers in the Large Magnetospheric Ducts Anatoly V. Streltsov, Embry-Riddle Aeronautical University, United States	
H4.2	13:30
FDTD Modeling of Whistler Mode Propagation in Field-Aligned Ducts in the Magnetosphere Vijay Harid, Mark Golkowski, Aleksandr Anikevich, Raahima Khatun-E-Zannat, University of Colorado Denver, United States; Oleksiy Agapitov, University of California Berkeley, United States; Ashanthi Maxworth, University of Southern Maine, United States; Poorya Hosseini, Johns Hopkins University Applied Physics Laboratory, United States	
H4.3	13:50
Statistical Analysis of Whistler Wave Ducting Events Daniel Williams, Anatoly V. Streltsov, Embry-Riddle Aeronautical University, United States	
H4.4	14:10
Chorus and Hiss Spatial Scales in the Inner Magnetosphere: Statistics From Van Allen Proves Multi-Point Measurements Oleksiy Agapitov, John Bannell, UC BERKELEY, United States; Didier Mourenas, CEA, France; Anton Artemyev, UCLA, United States; Aaron Breneman, NASA Goddard Space Flight Center, United States; John Wygant, University of Minnesota, United States; George Hospodarsky, University of Iowa, United States	
H4.5	14:30
Whistler Mode Chirped-Solitons as the Building Blocks of Chorus Chris Crabtree, Gurudas Ganguli, Rualdo Soto, Luke Johnson, United States Naval Research Laboratory, United States; Sagada Penana, Syntek Technologies, United States	
Break	14:50
H4.6	15:10
On a transitional regime of electron resonant interaction with whistler-mode waves in inhomogeneous space plasma Anton Artemyev, UCLA, United States	
H4.7	15:30
2-Dimensional PIC simulations of Generation of Whistler waves by Nonlinear induced scattering Rualdo SotoChavez, Chris Crabtree, Guru Ganguli, Alex Fletcher, US Naval Research Laboratory, United States	
H4.8	15:50
Origin of Ultra-Low Frequency Waves Observed at Middle Latitudes During Substorms Mergen Alimaganbetov, Anatoly V. Streltsov, Embry-Riddle Aeronautical University, United States	
H4.9	16:10
ULF Waves and Currents in the Feedback Interactions between the Magnetosphere and Ionosphere near the Plasmapause Anatoly V. Streltsov, Mergen Alimaganbetov, Embry-Riddle Aeronautical University, United States; Evgeny Mishin, USSF AFMC AFRL, United States	
H4.10	16:30
Statistics of LF-MF auroral radio emissions observed at South Pole Station in 2020 James LaBelle, Dartmouth College, United States	
H4.11	16:50
Simulations of energetic electron acceleration in the low-latitude boundary layer of Earth's magnetosphere Allison Jaynes, Sanjay Chepuri, University of Iowa, United States; Vijay Harid, Mark Golkowski, University of Colorado Denver, United States; Poorya Hosseini, Drew Turner, Ian Cohen, Barry Mauk, JHU/APL, United States; Daniel Baker, University of Colorado Boulder, United States; Joseph Fennell, Aerospace Corp., United States; Trevor Leonard, NOAA/University of Colorado Boulder, United States	

Friday, January 7 13:10 - 16:10
J7 Special Session 265

Imaging Black Holes: The EHT and Beyond II

Session Co-Chairs: Vincent Fish, MIT Haystack Observatory; James Moran, Harvard University

J7.1 13:10

[The next-generation Event Horizon Telescope Project](#)

Sheperd Doeleman, Center for Astrophysics | Harvard & Smithsonian, United States

J7.2 13:30

[MultiFrequency VLBI](#)

Gopal Narayanan, Neal Erickson, Sandra Bustamante, University of Massachusetts, Amherst, United States

J7.3 13:50

[Next-Generation Simulations of \(ng\)EHT Sources](#)

Charles Gammie, University of Illinois at Urbana-Champaign, United States

J7.4 14:10

[Next-Generation Event Horizon Telescope Site Survey](#)

Alexander Raymond, Smithsonian Astrophysical Observatory, United States

J7.5 14:30

[ngEHT Instrumentation](#)

Kari Haworth, Center for Astrophysics | Harvard & Smithsonian, United States

Break 14:50

J7.6 15:10

[The Final Frontier: Exploring Space to Further Extract Science from Black Hole Images](#)

Katherine Bouman, California Institute of Technology, United States

J7.7 15:30

[Black Hole Shadows and Photon Rings: Science Opportunities for Space-VLBI](#)

Michael Johnson, Center for Astrophysics | Harvard & Smithsonian, United States

J7.8 15:50

[Beyond the One Ring: Detecting and Interpreting Photons Rings in M87](#)

Avery Broderick, Perimeter Institute for Theoretical Physics / University of Waterloo, Canada

Friday, January 7 13:10 - 15:30
B12 1B40

Structures and Circuits for RF Sensing, Radar and STAR Applications

Session Co-Chairs: Dejan Filipovic, University of Colorado at Boulder; Aly Fathy, University of Tennessee, Knoxville

B12.1 13:10

[Ultra-sensitive Radio-Frequency Sensors Enabled by Coherent Perfect Absorber-Laser](#)

Minye Yang, Zhilu Ye, Pai-yen Chen, University of Illinois at Chicago, United States

B12.2 13:30

[Design and Fabrication of High Performance, Low Profile Air-Filled Coaxial Diplexers Enabled by 3D Printing](#)

Jake Cazden, Ljubodrag Boskovic, Isaiiah Pisani, Dejan Filipovic, University of Colorado at Boulder, United States; Thomas Hand, Erik Lier, William Kefauver, Lockheed Martin Space Systems, United States

B12.3 13:50

[1 GHz Coupling Suppression Circuit for Simultaneous Transmit and Receive System](#)

Md Nurul Anwar Tarek, Anthony Nuñez, Elias Alwan, Florida International University, United States

B12.4 14:10

[Equidistant Multi-Subject Vital-Sign Detection Using FMCW MIMO Radar](#)

Abdel-Kareem Moadi, Marvin Joshi, Aly Fathy, University of Tennessee, Knoxville, United States

B12.5 14:30

[Spatial Power Combining of Two GaN FET Grid Oscillators in an Over-Moded Rectangular Cavity](#)

Jack Molles, Megan Robinson, Zoya Popovic, University of Colorado Boulder, United States

Break 14:50

B12.6 15:10

[Modeling and measurement of co-planar waveguide spin-wave transducers](#)

David Connelly, Hadrian Renaldo O. Aquino, Maxwell Robbins, Gary H. Bernstein, Alexei Orlov, Wolfgang Parod, Jonathan Chisum, University of Notre Dame, United States; Gyorgy Csaba, Pazmany Peter Catholic University, United States

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