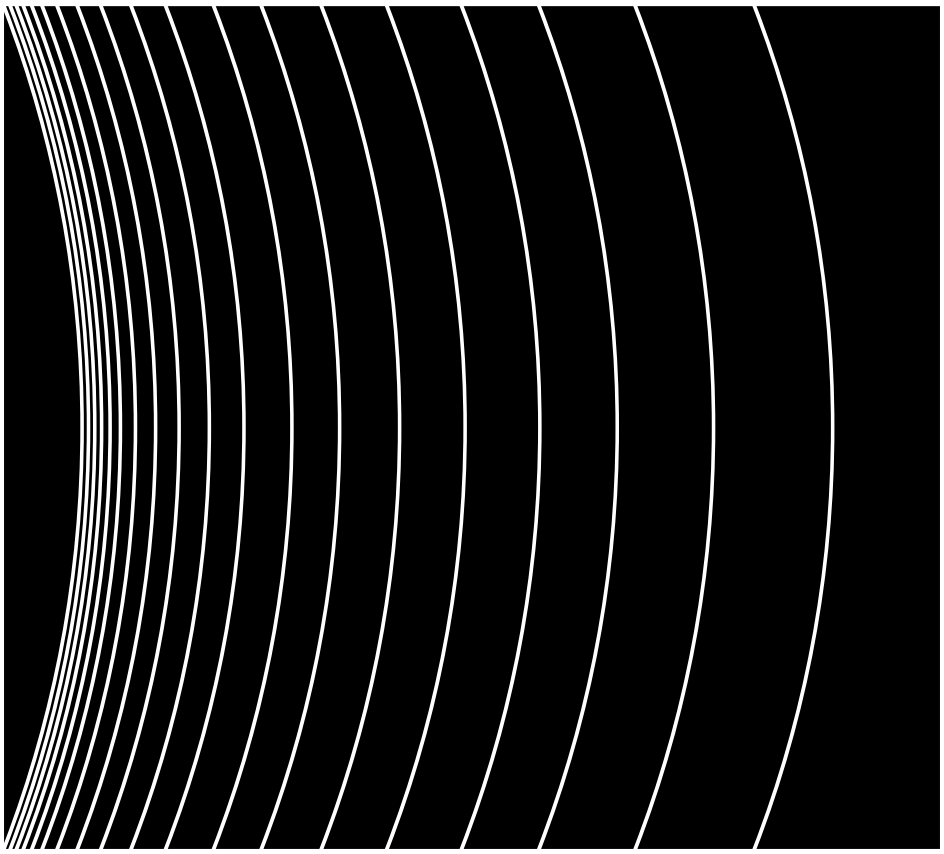
USNC-URSI National Radio Science Meeting

The National Academies of SCIENCES ENGINEERING MEDICINE

U.S. National Committee for the International Union of Radio Science

IEEE AP-S Antennas and Propagation Society



7–10 January 2025

Boulder, Colorado, USA

Sponsored by the US National Committee for the

International Union of Radio Science

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University of Colorado Boulder

www.nrsmboulder.org

UNITED STATES NATIONAL COMMITTEE
INTERNATIONAL UNION OF RADIO SCIENCE

National Radio Science Meeting
7–10 January 2025
University of Colorado Boulder

Meetings and Events Overview

TUESDAY, 7 January

08:30 – 11:30	NRSM Short Courses and Workshop – Morning Session
	"Modeling Phased Arrays and Custom Antennas for Wireless Communications, Sensing, and Coexistence in MATLAB"
13:00 – 16:00	NRSM Short Courses and Workshop – Afternoon Session
	"Emerging Technologies for Long-Range Microwave-Based Power Beaming"
	"Spectrum Management and Innovation for Radio Scientists"
17:00 – 20:30	USNC-URSI Business Meeting - Invitation Only

WEDNESDAY, 8 January

08:20 – 11:30	Plenary Session and Student Paper Competition
	08:20 – 08:30 Introductions
	08:30 – 09:20 Dr. Daniel Eleuterio, ONR
	09:20 – 10:05 Dr. Jelena Notaros, MIT
	10:05 – 10:25 Break (with coffee, hot tea, water)
	10:25 – 11:30 Student Paper Competition
11:45 – 13:15	Student Mentoring Luncheon (Lunch provided for all students, commission chairs, and USNC-URSI Officers)
13:30 – 15:10	Technical Sessions
15:10 – 15:30	Break (with coffee, hot tea, water)
15:30 – 17:10	Technical Sessions
17:15 – 18:15	Commission Business Meetings (A, B, D, G)
18:30 – 20:30	Reception & SPC Awards

THURSDAY, 9 January

08:20 – 10:00	Technical Sessions
10:00 – 10:20	Break (with coffee, hot tea, water)
10:20 – 12:00	Technical Sessions
12:10 – 13:10	Women in Radio Science (WIRS) Business Meeting
13:30 – 15:10	Technical Sessions
15:10 – 15:30	Break (with coffee, hot tea, sparkling water, sodas, water)
15:30 – 17:10	Technical Sessions
17:15 – 18:15	Commission Business Meetings (C/E, F, H, J, K)
19:00 – 20:30	WIRS Reception (Ticket Required, Contact WIRS Leadership)

FRIDAY, 10 January

06:00 – 07:50	USNC–URSI Executive Council Meeting – Invitation Only
08:20 – 10:00	Technical Sessions
10:00 – 10:20	Break (with coffee, hot tea, water)
10:20 – 12:00	Technical Sessions
12:10 – 13:00	Twelfth Hans Liebe Lecture
13:30 – 15:10	Technical Sessions
15:10 – 15:30	Break (with coffee, hot tea, sparkling water, sodas, water)
15:30 – 17:30	Technical Sessions

2025 USNC-URSI National Radio Science Meeting

Tuesday, 7 January	08:30–11:30	Workshop "Modeling Phased Arrays and Custom Antennas for Wireless Communications, Sensing, and Coexistence" (Room 150)							
	13:00–16:00	Workshops "Emerging Technologies for Long-Range Microrwave-Based Power Beaming" (Room 150) "Spectrum Management and Innovation for Radio Scientists" (Room 105)							
	17:00–20:30	USNC–URSI Business Meeting – Invitation Only (Ebassy Suites)							
Time [MST] \ Room			150	151	155	200	245	265	1B40
Wednesday, 8 January	08:20–11:30		Plenary Session and Student Paper Competition (Math 100)						
	11:45-13:15		Student Mentoring Luncheon (KOBL 100)						
	13:30–15:10		D1: RF Amplifiers	BF5*: Quantum Technology Applications in Electromagnetics, Metrology, and Remote Sensing	A1: Antennas	GH4*: Meteors Orbital Debris and Dusty Plasmas	F1: Signals of Opportunity Bistatic Radar Remote Sensing of the Earth	J7*: Radio Science from the Moon	B1: Propagation, Scattering, and Sensing
	15:30–17:10		D2: Antennas and Sensing		A2: Microwave to Submillimeter Techniques	G11*: Total Eclipse	F8*: Troposcatter		B6*: Antenna and RF Self-Interference Suppression Techniques for In-Band Full-Duplex Communication Systems
	17:15–18:15		Commission D		Commission A	Commission G			Commission B
	18:30–21:30	Reception and SPC Awards (Embassy Suites)							

Time [MST] \ Room		105	150	151	155	200	245	265	1B40
Thursday, 9 January	08:20–10:00		G1: Radar and Radio Techniques I	E1: Current Issues in Spectrum Sharing and Interference I	H6*: Quantum Inspired Methods in Plasma Wave Dynamics I	B9*: Multifunctional Antennas and Arrays for Satellite and Wireless Communications	F2: Atmospheric Propagation and Remote Sensing	J1: New Telescopes, Techniques, and Technologies I	B2: Numerical Methods and EM in Complex Media
	10:20–12:00	K1: Wearable Antennas and Sensors	G2: Radar and Radio Techniques II	E2: Current Issues in Spectrum Sharing and Interference II	H7*: Quantum Inspired Methods in Plasma Wave Dynamics II	B8*: High Power Electromagnetic Environment Effects			B7*: Advanced Modeling Techniques and Algorithms in Computational Electromagnetics
	12:10–13:10	**Women in Radio Science (WIRS) Business Meeting (Math 100)**							
	13:30–15:10	K2: Interaction of the Human Body and Electromagnetic Waves	G3: Radar and Radio Techniques III	C1: Radio-Communication Systems and Signal Processing I	H1: Waves in Space and Laboratory Plasmas	G7*: Space Weather I	F6*: RF Propagation in Stable Atmospheric Conditions: Results from REDSAW Project	J4*: Millimeter-Wave Technologies, Techniques, and Challenges for CMB-S4	B13*: WPT for Novel and Challenging Applications
	15:30–17:10	K3*: Brain Stimulation Modeling and Design	F3: Radar and Radiometer Remote Sensing Technology and Applications	C2: Radio-Communication Systems and Signal Processing II	H2: Space Environment Modeling and Forecasting	G8*: Space Weather II			
	17:15–18:15	Commission K		Commission C/E	Commission H		Commission F	Commission J	
	19:00–20:30	**WIRS Reception (Embassy Suites)**							
Time [MST] \ Room		105	150	151	155	200	245	265	1B40
Friday, 10 January	06:00–07:50	**USNC–URSI Executive Council Meeting – Invitation Only (Embassy Suites)**							
	08:20–10:00	C3*: Overcoming Physically Constrained Environments	J5*: Calibration & Imaging of Nextgen Radio Telescopes	B4: Devices, Systems, and Applications	H3*: Active Experiments in Laboratory and Space Plasmas I	G9*: Studies of the Gannon Storm I	F5*: Microwave Remote Sensing of Vegetation and Ocean Salinity in Honor of Roger H Lang	J2: New Telescopes, Techniques, and Technologies II	B3: Antenna Theory and Design
	10:20–12:00				H4*: Active Experiments in Laboratory and Space Plasmas II	G10*: Studies of the Gannon Storm II			
	12:10–13:00	**Twelfth Hans Liebe Lecture (Math 100)**							
	13:10–15:10		F7*: Remote Sensing and Spectrum Allocation for Small Satellites	B10*: Reconfigurable Intelligent Surfaces for Sensing and Imaging	H5*: Active Experiments in Laboratory and Space Plasmas III	GH5*: Ionospheric Modification I	F4: Models for Remote Sensing in Random Complex Media	J6*: DSA-2000	B12*: Spectrum Management and Secure Communications
	15:30–17:30		F9*: NASA Investigation of Convective Updrafts (INCUS) Earth Venture Mission-3			GH6*: Ionospheric Modification II		J3: New Telescopes, Techniques, and Technologies III	B11*: Reflectarrays and Reconfigurable Apertures

* Denotes 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. Individuals may become members of one or more USNC-URSI Commissions through nominations by an existing Commission member and vote by the Commission members. For more information about USNC-URSI membership, including requirements for Full, Associate and Early Career membership levels, please visit https://usncursi.org/membership.php or contact the appropriate Commission Chair(s) listed below.

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 next NARSM is planned for August 2025 in Ottawa, Canada.

The international URSI General Assembly and Scientific Symposium (GASS) is held every three years in locations around the world. The 35th URSI GASS was held in Sapporo, Hokkaido, Japan, on 19 – 26 August 2023. There were over 1400 attendees from 49 countries, and over 1400 papers were presented in technical sessions covering the areas of all ten URSI Commissions. The 36th URSI GASS will be held in Krakow, Poland, on 15–22 August 2026.

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). Please visit www.ursi.org for more information on these URSI conferences.

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

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Authors have the option to have both abstracts and 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 and Exhibitors for their support of the 2025 NRSM

Student Luncheon ($5000)

WIRS Reception (€500)

Invited Speakers

Plenary Session

Current ONR Research Priorities and Specific Topics of Interest in Maritime RF Propagation

Dr. Daniel Eleuterio
Office of Naval Research

Abstract: Founded in 1946, the Office of Naval Research (ONR) was the first permanent U.S. Federal agency devoted to the support of basic scientific research. Its mission is to "plan, foster, and encourage" science and engineering research in recognition of its paramount importance to the maintenance of future naval power, and the preservation of national security. ONR is tasked with discovering, developing and delivering new knowledge and technologies to provide a decisive technological edge for the Navy and Marine Corps. The discussion will include a brief historical background and overview of the organization as well as a focus in particular on topics related to meteorology and aeronomy in the context of Electro-Magnetic Spectrum Operations (EMSO) in a maritime environment and specifically how that environment uniquely affects the channel propagation characteristics for EM systems.

Biographical Sketch: Dr. Daniel Eleuterio is currently the Team Lead for Marine Meteorology and Space Weather in the Ocean, Atmosphere, and Space Research Division at the Office of Naval Research. He holds a Ph.D. in Meteorology from the Naval Postgraduate School, a M.A. in National Security and Strategic Studies from the Naval War College, a M.S. in Physical Oceanography, and a M.A. and B.A. from Boston University in Science Education and Marine Biology. His research interests include air-sea interaction, signal propagation in the maritime environment, tropical and aerosol meteorology, and Earth system numerical prediction. Commander (ret.) Eleuterio has previously served as Division Director for Ocean Battlespace Sensing and Systems Applications at the Office of Naval Research, Deputy to the Associate Director of Research for Ocean, Atmospheric, and Space S&T at the U.S. Naval Research Laboratory, Staff Weather Officer at U.S. Special Operations Command, South, and as Staff Oceanographer and Battle Watch Captain for Commander, Carrier Strike Group Eleven, embarked on USS Nimitz (CVN-68). He is a member of the Department of Defense Space Experiments Review Board (DoD SERB), the Interagency Council for Advancing Meteorological Services (ICAMS), as well as several other boards, panels, and professional societies to include the American Geophysical Union (AGU) and the American Meteorological Society (AMS).

Plenary Session

Silicon Photonics for LiDAR Sensors, Augmented Reality, Biophotonics, Quantum Engineering, and Beyond

Prof. Jelena Notaros
Massachusetts Institute of Technology

Abstract: By not enabling the integration of millions of micro-scale optical components on compact millimeter-scale computer chips, silicon photonics is positioned to enable next-generation optical technologies that facilitate revolutionary advances for numerous fields spanning science and engineering. An emerging class of silicon-photonics systems is integrated optical phased arrays (OPAs), which enable manipulation and dynamic control of free-space light in a compact form factor, at low costs, and in a non-mechanical way. This talk will highlight our work on developing novel OPA-based platforms, devices, and systems that enable innovative chip-based solutions to high-impact problems in areas including LiDAR sensing for autonomous vehicles, augmented-reality displays, free-space optical communications, optical trapping for biophotonics, 3D printing, and trapped-ion quantum engineering.

Biographical Sketch: Jelena Notaros is the Robert J. Shillman Career Development Assistant Professor of Electrical Engineering and Computer Science at the Massachusetts Institute of Technology. She received her Ph.D. and M.S. degrees from MIT in 2020 and 2017, respectively, and B.S. degree from the University of Colorado Boulder in 2015. Jelena was one of three Top DARPA Risers, a 2018 DARPA D60 Plenary Speaker, a 2023 NSF CAREER Award recipient, a 2021 Forbes 30 Under 30 Listee, a 2021 MIT Robert J. Shillman Career Development Chair recipient, a 2020 MIT RLE Early Career Development Award recipient, a 2015 MIT Herbert E. and Dorothy J. Grier Presidential Fellow, a 2015-2020 NSF Graduate Research Fellow, a 2024 OSA CLEO Highlighted

Talk Award recipient, a 2019 OSA CLEO Chair's Pick Award recipient, a 2022 OSA APC Best Paper Award recipient, a 2022 OSA FiO Emil Wolf Best Paper Award Finalist, a 2014 IEEE Region 5 Paper Competition First Place recipient, a 2023 MIT Louis D. Smullin Award for Teaching Excellence recipient, a 2018 EECS Rising Star, a 2014 Sigma Xi Undergraduate Research Award recipient, and a 2015 CU Boulder Chancellor's Recognition Award recipient, among other honors.

Twelfth Liebe Lecture

Rydberg Atom-Based Sensors: "Transforming Measurements and Detection of Radio-Frequency Fields and Time-Varying Signals"

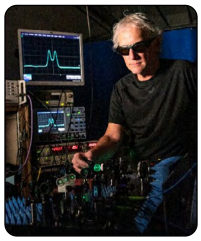
Dr. Christopher L. Holloway
National Institute of Standards and Technology
Boulder, CO

Abstract: The unique properties of Rydberg atoms allow for radio-frequency (RF) spectroscopy, which has resulted in intriguing applications. For example, Rydberg atom receivers allow for the detection and receiving of time-varying fields and communication signals without an antenna and front-end electronics. The idea in these Rydberg atom-based sensors is to replace conventional antennas (which rely on conduction electrons bound by the antenna geometry) with atom-sensors (glass cells filled with atomic vapor: atomic-bound electrons).

One of the keys to developing new science and technologies is to have sound metrology tools and techniques. Atom-based measurements allow for unprecedented accuracy in measurement systems, and as a result, measurement standards have evolved towards atom-based measurements over the last few decades; most notably length (m), frequency (Hz), and time (s) standards. Recently, there has been a great interest in extending this to magnetic (H), electric (E), and other physical quantities. These Atom-based measurements allow for direct International System of Units (SI) traceable measurements. The development of Rydberg atom-based sensors has allowed for SI-traceable measurements for E-fields and RF power. With the great progress in the development of Rydberg atom-based sensors, interesting and unforeseen applications are emerging. These applications include, (1) SI-traceable measurements for electric field and power, (2) amplitude and phase detection of time-varying signals, (3) angle-of-arrival, (4) waveforms and spectrum analyzers, (5) plasma sensors, (6) near-field and sub-wavelength imaging, (7) blackbody detection and thermometry, (8) DC/AC voltage measurements, and even streaming video over the air. As well as many other applications.

One of the more intriguing applications for Rydberg atom-based sensors is in the detection of time-varying signals. These atom-based receivers allow for the detection of amplitude-, frequency-, and phase-modulated signals. In fact, in receiver applications, these Rydberg-atom sensors act like an antenna (to detect the signal) and they perform the demodulation and down conversion automatically. That is, these Rydberg receivers can eliminate a lot of the front-end devices and electronics when compared to conventional receivers. The atom-based sensors have sizes on the order of 10 mm as compared to conventional antennas with sizes on the order of a wavelength of the field being detected. Atom-based sensors are in effect, truly electrically small antennas. The Rydberg atom sensors are broadband, detecting fields from a few kHz to THz (and even down to DC), with large dynamic range (a few micro V/m to kV/m fields). Furthermore, these new Rydberg atom-based sensors will be beneficial for 6G and beyond in that they will allow for the calibrations of both field strength and power for frequencies above 100 GHz.

In this talk, I will present a historical journey of the development of this technology, and in the process, I will summarize this work and discuss various applications.



Biographical Sketch: Dr. Christopher Holloway is a NIST Fellow and an IEEE Fellow and has been at NIST for over 25 years. He is also on the Graduate Faculty at the University of Colorado at Boulder. He is an expert in electromagnetic theory and metrology, quantum-optics, Rydberg-atom systems, and atom-based sensors. He has been involved with URSI for over 30 years in various capacities. He has a publication h-index of 64 with over 350 technical publications and has over 16,200 citations of his papers. He has 10 patents in various fields in engineering and physics. He is the Project Leader for the Rydberg-Atom-Sensor Project and is the Group Leader for the Electromagnetic Fields Group, both at NIST.

Workshop

Modeling Phased Arrays and Custom Antennas for Wireless Communications, Sensing, and Coexistence in MATLAB

Jonathan Chisum, University of Notre Dame
Honglei Chen, Mathworks

This workshop provides an introduction to the MATLAB tools for the design and simulation of antennas and wireless networks with an emphasis of phased array and custom antenna modeling. Specific examples will be provided for end-to-end 5G systems, DOA/TDOA analysis, integrated communications and sensing (ISAC), and coexistence (e.g., comms and radar, comms and radio astronomy). Attendees will receive code that can be used to recreate all of the plots we show in the session and a set of examples that can be used to explore the topics we cover.

Course Outline

- Introduction & motivation: 5G, 6G, radar, spectrum coexistence
- Antenna and array modeling, pattern synthesis
- Channel modeling
- Signal processing: Beamforming, DOA, TDOA
- Custom antennas: Simulating custom antennas
- End-to-end wireless examples: Integrated sensing and communications (ISAC), hybrid beamforming

Jonathan Chisum Biographical Sketch: Jonathan D. Chisum received the Ph.D. in Electrical Engineering from the University of Colorado at Boulder in Boulder, Colorado USA, in 2011. He is currently an Associate Professor of Electrical Engineering at the University of Notre Dame. From 2012 to 2015 he was a Member of Technical Staff at the Massachusetts Institute of Technology Lincoln Laboratory in the Wideband Communications and Spectrum Operations groups. His work at Lincoln Laboratory focused on millimeter-wave phased arrays, antennas, and transceiver design for electronic warfare applications. In 2015 he joined the faculty of the University of Notre Dame. His research interests include millimeter-wave communications and spectrum sensing using novel and engineered materials and devices to dramatically lower the power and cost and enable pervasive deployments. His group focuses on gradient index (GRIN) lenses for low-power millimeter-wave beam-steering antennas, nonlinear (1-bit) radio architectures for highly efficient communications and sensing up through millimeter-waves, phasechange materials for reconfigurable RF circuits for wideband distributed circuits and antennas, and microwave/spin-wave structures for low-power and chip-scale analog signal processing for spectrum sensing and protection. Dr. Chisum is a senior member of the IEEE, a member of the American Physical Society, and an elected Member of the U.S. National Committee (USNC) of the International Union or Radio Science's (URSI) Commission D (electronics and photonics). He is the current Chair for USNC URSI Commission D: Electronics and Photonics.

Honglei Chen Biographical Sketch: Honglei Chen is a principal engineer at MathWorks where he leads the development of phased-array system simulation tools and algorithms for radar, 5G, sonar, and ultrasound applications. Prior to his current role, Honglei also developed tools and algorithms focused on signal processing systems. Honglei received his Bachelor of Science from Beijing Institute of Technology and his MS and PhD, both in electrical engineering, from University of Massachusetts Dartmouth.

Workshop

Emerging technologies for long-range microwave-based power beaming

Ifana Mahbub, Integrated Biomedical Radiofrequency Circuits and Systems Laboratory
Adnan Basir Patwary, The University of Texas at Dallas

Wireless power beaming (WPB) is a revolutionary direction in the development of the next generation of far-field wireless power transfer (WPT) networks since this approach yields increased range, enhanced signal gain, and increased power transfer efficiency. This short course discusses methods to increase efficiency in a WPB system that can be achieved by decreasing the loss occurring due to the propagation or the path loss, misalignment, and signal phase incoherence. A WPB system requires precise directive radiation beam which can be achieved using beamforming. This workshop discusses the transmitter (TX) and receiver (RX) antennas to achieve such directive radiation beam using beamforming while achieving a high gain and radiation efficiency. Antennas/metasurfaces with array elements are used for beamforming where the phase and amplitude along the array elements are adjusted to achieve a narrow directive beam as beam steering. The RX size and placement is determined strategically based on the TX beamforming performance and the RX distance from TX to improve the efficiency by achieving higher beam collection. The received power at the RX can be harvested using a highly efficient rectifier-based energy harvesting circuit. The workshop includes methods to improve the efficiency and range of WPB systems having singe TX-RX structure along with a distributed WPB systems.

Course Outline

- History of wireless power transfer
- Introduction to wireless power beaming (WPB)
- Path loss characterization in WPB
- WPB system architecture
- Transmitter antenna design and beamforming and beam steering
- Receiver antenna and rectifier (rectenna) design
- Preliminary work and performance demonstration
- Conclusion

Ifana Mahbub Biographical Sketch: Dr. Ifana Mahbub is the director of the Integrated Biomedical Radiofrequency Circuits and Systems Laboratory (iBioRFCASL). Dr. Mahbub works on ultrawideband and mm-wave phased-array antenna systems for long-range power beaming applications and communication systems for UAVs (Unmanned Aerial Vehicles), focusing on the RF and microwave components and antenna designs. Dr. Mahbub is the recipient of the NSF Career Award (2020), and DARPA Young Faculty Award (2021), and DARPA Director's Fellowship (2023). She received a B.Sc. degree (2012) in Electrical and Electronic Engineering from the Bangladesh University of Engineering and Technology, and a Ph.D. degree (2017) in Electrical Engineering from the University of Tennessee, Knoxville. She is an Associate Editor for the IEEE Transactions on Antenna and Propagation. She is a senior member of IEEE MTTS, APS and CAS societies and also serves as the IEEE Microwave Theory and Technology Society's Region 5 coordinator of the Membership and Geographic Activities (MGA) Committee. She also serves as the vice-chair for the URSI Commission K and is a full member of Commission B.

Adnan Basir Patwary Biographical Sketch: Adnan Basir Patwary is currently working towards his Ph.D. degree in Electrical Engineering at the Department of Electrical and Computer Engineering, The University of Texas at Dallas, TX, USA. He is also a Graduate Research Assistant with the Integrated Biomedical RF Circuits and Systems Laboratory (IBioRFCASL) at The University of Texas at Dallas. His research focuses on development of ultrawideband phased array antennas with beamforming and beam steering capability, waveform engineering and path loss modeling, and CMOS RF transmitter circuit development for radiative wireless power beaming and ultrawideband communication. He received a B.Sc. degree in Electronics and Telecommunication Engineering from Chittagong University of Engineering and Technology, Chittagong, Bangladesh, in 2017. Adnan Patwary is the current chapter chair of the IEEE AP-S and MTT-S joint chapter of the University of Texas at Dallas. He is also the recipient of the 2022 Student Travel Grant presented by the IEEE Antennas and Propagation Society.

Workshop

Spectrum Management and Innovation for Radio Scientists

Charles Baylis, Baylor University
J. Nicholas Laneman, National Science Foundation Spectrum Innovation Center

This workshop overviews radio spectrum management and innovation, providing radio scientists understanding of basic issues and challenges in spectral coexistence. Topics include an overview of spectrum management practices, challenges in spectrum sharing for different types of wireless systems (communication, radar, and passive scientific systems), present movements and decisions, and areas of ongoing and needed innovation. The workshop will allow radio scientists to gain a holistic understanding of challenges and practices in spectrum management and coexistence, informing them in designing radio systems to succeed in the ever- complicated spectral environment.

Course Outline

- Introduction to the Radio Spectrum
- Introduction to Spectrum Regulation
- Scientific Uses of the Radio Spectrum
- Break
- Radar System Spectrum Coexistence Challenges
- Spectrum Innovation Frontiers
- Panel Discussion (Speakers and Participants)

Audience participation will be a vital part of this workshop, with participant questions encouraged during each presentation.

Charles Baylis Biographical Sketch: Dr. Charles Baylis serves as a Professor of Electrical and Computer Engineering at Baylor University and Director of SMART Hub, a Department of Defense Spectrum Innovation Center consisting of 29 researchers across 16 universities. Dr. Baylis has served at Baylor since 2008, where he co-founded and still directs the Wireless and Microwave Circuits and Systems Program. He received the Ph.D. in Electrical Engineering from the University of South Florida in 2007, and served on the USF faculty from 2007-2008 before joining Baylor. His research interests are reconfigurable microwave circuits and systems to enable adaptive spectrum sharing, as well as the intersection of spectrum policy and technology, and his research has been funded by defense agencies, the National Science Foundation, and industry.

J. Nicholas Laneman Biographical Sketch: Dr. Laneman is Director of SpectrumX, the National Science Foundation Spectrum Innovation Center commissioned in 2021. He is also Founding Director and currently Co-Director of the Wireless Institute in the College of Engineering; Professor of Electrical Engineering, Faculty Affiliate of iNDustry Labs; and Fellow of the Pulte Institute for Global Development as well as the Reilly Center for Science, Technology, and Values all at the University of Notre Dame. He joined the faculty in August 2002 shortly after earning a Ph.D. in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology (MIT). His research and teaching interests are in communications system engineering-blending information theory, signal processing for communications, as well as prototyping and experimental validation-with emphasis on wireless systems.

Dr. Laneman is a 2014 IEEE Fellow and received the 2018 IEEE Kiyo Tomiyasu Award. In addition to three conference best paper awards, Laneman has received a 2006 Presidential Early-Career Award for Scientists and Engineers (PECASE) and a 2006 National Science Foundation (NSF) CAREER Award. He has served as General Co-Chair of the 2017 IEEE International Symposium on Dynamic Spectrum Access Networks (DySPAN), an Associate Editor for IEEE Transactions on Communications, and a Guest Editor for Special Issues of IEEE Transactions on Information Theory and IEEE Journal on Selected Areas in Communications. He was also the first Online Editor for the IEEE Information Theory Society and served on its Board of Governors.

Laneman is author or co-author on over 145 publications, including 46 journal articles and invited book chapters, and has been recognized by Thomson Reuters as an ISI Highly Cited Researcher (2010, 2015). He is co-inventor on eight U.S. patents and has several patents pending. He currently advises two Ph.D. students; twelve Ph.D. degrees, thirteen M.S. degrees, and one B.S. honors degree have been earned under his supervision. All of these research efforts have been supported in part by over $14M in funding, with Laneman serving as principal investigator on just over $5M.

Student Luncheon

Moderator: Charles Bayliss, Baylor University

Dr. Baylis is a Professor of Electrical and Computer Engineering at Baylor University. He serves as Director of SMART Hub (Hub for Spectrum Management with Adaptive and Reconfigurable Technology), a Department of Defense Spectrum Innovation Center headquartered at Baylor, with 14 universities and 29 researchers. Since its founding in 2023, Dr. Baylis has overseen this nationwide effort to improve wireless spectrum technologies in the United States and develop a next-generation spectrum workforce. Since 2008, he has directed the Wireless and Microwave Circuits and Systems Program at Baylor, founded to provide wireless and microwave education and research in a caring, Christian environment. His research interests are reconfigurable circuit and system technologies for adaptive spectrum-use systems.is a Professor of Electrical and Computer Engineering, Director of Electromagnetics Laboratory, and University Distinguished Teaching Scholar at Colorado State University. Previously, he held assistant/associate-professor positions at the University of Massachusetts Dartmouth and University of Belgrade. His research contributions are in computational and applied electromagnetics. His publications include more than 300 journal and conference papers, and textbooks "Electromagnetics" (2010) and "MATLAB-Based Electromagnetics" (2013) with Pearson Prentice Hall and "Conceptual Electromagnetics" (2017) with CRC Press.

Panelists:

Daniel Farkas is a patent agent assisting in patent prosecution, litigation, patentability determinations, and infringement analyses in cases involving various technologies, including lasers and optics, photonics, applied electromagnetics, quantum systems, artificial intelligence, electronics, and software.

Prior to joining the firm, Daniel was a patent agent with an Am Law 200 firm. Daniel's background is in experimental physics, with laboratory experience in atomic, molecular, and optical physics. Earlier in his career, Daniel served as both manager of Contract Research and Development and lead scientist at a start-up quantum technology development and design company.

Daniel earned his undergraduate degree in physics, magna cum laude, from Yale University and his graduate degrees in physics from Harvard University. He completed postdoctoral fellowships at Yale University and JILA (University of Colorado, Boulder).

Alyson Ford is the Associate Director of Steward Observatory and an Associate Research Professor at the University of Arizona. Dr. Ford oversees the Arizona Radio Observatory and Mountain Operations. Her research focuses primarily on the gaseous content of galaxies and the processes that shape this gas, with an emphasis on faint neutral hydrogen that can only be detected using large, single-dish radio telescopes. Dr. Ford also has a strong interest in space debris, near earth asteroids, and passive, bistatic and active radar. As Lead Scientist for the RadioAstron Green Bank Earth Station, she was heavily involved in the commissioning and operation of the updated National Radio Astronomy Observatory 140ft Telescope, receiver, and monitor and control software for satellite communications and has led several proof-of-concept tests for space domain awareness activities. She is also a member of the Event Horizon Telescope Collaboration and currently serves as a Member at Large for the United States National Committee for the International Union of Radio Science (USNC-URSI).

Mehmet Ogut received his B.S. degree in electrical and electronics engineering from Bogazici University, Istanbul, Turkey (2007-2011), M.S degree in electrical engineering from the George Washington University, Washington, DC (2011-2013) and Ph.D. degree in electrical engineering from Colorado State University (CSU), Fort Collins, CO, USA (2015-2018).

He is currently working at NASA/Caltech Jet Propulsion Laboratory (JPL) in Pasadena, California, USA as a technologist in Microwave Instrument Science Group. He is the CO-I and JPL lead of Ultra-Wideband Photonic Spectrometer for Planetary Boundary Layer Sensing funded under NASA

Earth Science Technology Office (ESTO) Advanced Component Technology (ACT-20), the CO-I of Smart Ice Cloud Sensing (SMICES) high frequency radiometer (250-670 GHz), sounder (380 GHz) and radar (240 GHz) awarded under NASA ESTO IIP-19, the CO-I of Compact Fire Infrared Radiance Spectral Tracker (c-FIRST) funded by NASA ESTO IIP-21, the CO-I of the Ultra-Wide RF ACT-22 project. He is the instrument manager of the Passive Active L-Band Sensor (PALS) Airborne instrument of JPL. His expertise is design, testing, calibration and analysis of microwave and millimeter-wave radar/radiometer instruments, developing innovative concepts in radiometry, artificial intelligence and photonic applications in remote sensing. He is currently the chair of IEEE GRSS Young Professionals and the USNC URSI Commission-F Secretary. He is the recipient of the 2023 best paper award from IEEE Transactions on Terahertz Science and Technology. He has received NASA's Exceptional Bravery Medal in 2024 and NASA JPL's Voyager award in 2023.

Tuesday, January 7 08:30 - 11:30
Event Room 150

Modeling Phased Arrays and Custom Antennas for Wireless Communications, Sensing, and Coexistence

Tuesday, January 7 10:00 - 10:20
Event Engineering Lobby

Break

Tuesday, January 7 13:00 - 16:00
Event Room 150

Emerging Technologies for Long-Range Microrwave-Based Power Beaming

Tuesday, January 7 13:00 - 16:00
Event Room 105

Spectrum Management and Innovation for Radio Scientists

Tuesday, January 7 14:30 - 14:50
Event Engineering Lobby

Break

Tuesday, January 7 17:00 - 20:30
Event Embassy Suites

USNC–URSI Business Meeting – Invitation Only

Wednesday, January 8 08:20 - 10:05
Event Math 100

Plenary Session

Current ONR Research Priorities and Specific Topics of Interest in Maritime RF Propagation
Dr. Daniel Eleuterio
Office of Naval Research

Silicon Photonics for LiDAR Sensors, Augmented Reality, Biophotonics, Quantum Engineering, and Beyond
Prof. Jelena Notaros
Massachusetts Institute of Technology

Wednesday, January 8 10:05 - 10:25
Event Math 100

Break

Wednesday, January 8 10:25 - 11:30
Event Math 100

Student Paper Competition

Session Chairs: Asimina Kiourti and Elias Alwan

Lightweight and Battery-less Multichannel Wireless Sensor for Swine Biopotential Recording
Melany Gutierrez-Hernandez – Advisor: John L. Volakis
Florida International University

Evolving Antennas For Directional Radio Sensitivity
Dylan Wells – Advisor: Amy Connolly
Ohio State University

Electrically Small Ultrawideband Antenna for Wireless Power Transfer to Headstage Based Electrophysiological Recording System
Adnan Basir Patwary – Advisor: Ifana Mahbub
University of Texas at Dallas

Wednesday, January 8 11:45 - 13:15
Event KOBL 100

Student Mentoring Luncheon

Wednesday, January 8 13:30 - 14:50
D1 Room 150

RF Amplifiers

Session Co-Chairs: Jon Chisum, University of Notre Dame; Leonardo Ranzani, RTX

D1.1 **13:30**
Multidimensional Load-Pull Extrapolation for Accelerated Computer-Aided Design (CAD) Simulations
Jonathan Swindell, Adam Goad, Austin Egbert, Baylor University, United States; Casey Latham, Matthew Ozalas, Andy Howard, Daren McClearnon, Keysight, United States; Charles Baylis, Robert Marks, Baylor University, United States

D1.2 **13:50**
Linearization of Nonlinear Power Amplifier Effects on BPSK Waveforms
James Gaudreau, Nicholas Ellis, Joel Johnson, Patrick Roblin, Justin Kuric, Richard Ridgway, Christopher Ball, The Ohio State University, United States

D1.3 **14:10**
Multi-Watt GaN MMIC Power Amplifiers for 32 GHz Deep Space Communications and Radio Science
Jack Molles, CU Boulder, United States; Sushians Rahimizadeh, Lin Yi, NASA JPL, United States; Zoya Popović, CU Boulder, United States

D1.4 **14:30**
Design of a Decade-Bandwidth Tunable Multi-Notch Filter for RFI Mitigation in a Congested Spectral Environment
Justin Roessler, Emma Lever, Luke Mello, Austin Egbert, Charles Baylis, Robert Marks, Baylor University, United States; Alex Bouvy, Benjamin Kirk, DEVCOM Army Research Laboratory, United States

Wednesday, January 8 13:30 - 16:50
BF5 Special Session Room 151

Quantum Technology Applications in Electromagnetics, Metrology, and Remote Sensing

Session Co-Chairs: Saba Mudaliar, Air Force Research Laboratory; Thomas Roth, Purdue University; Matthew Simons, National Institute of Standards and Technology

BF5.1 **13:30**
Maxwell-Schrödinger Modeling of Multi-Qubit Effects in a Superconducting Circuit Quantum Device
Ghazi Khan, Thomas Roth, Purdue University, United States

BF5.2 **13:50**
Hybrid Quantum-Classical Algorithms for Satellite Swarm Optimization in Non-Terrestrial Networks
QI JIAN LIM, Zhen Peng, University of Illinois at Urbana-Champaign, United States

BF5.3 **14:10**
Fast and Accurate Method for Doppler Averaging of Rydberg EIT Signals
Omar Nagib, Thad G. Walker, University of Wisconsin-Madison, United States

BF5.4 **14:30**
Development of an all-dielectric quantum-based RF field sensor for electric field calibrations
William Watterson, University of Colorado Boulder, United States; Alexandra Artusio-Glimpse, Nikunjkumar Prajapati, Matthew Simons, Christopher Holloway, National Institute of Standards and Technology, United States

BF5.5 **14:50**
Michael Faraday and the Quantum Field Theory
Akira Ishimaru, University of Washington, United States

BF5.6 **15:10**
Dynamics of Quantized Signals in Random Media: A Transport Theoretic Model
Saba Mudaliar, Air Force Research Laboratory, United States

BF5.7 **15:30**
Quantum sensing of 130 GHz blackbody radiation with Rydberg states of cold Rb atoms
Noah Schlossberger, Nikunjkumar Prajapati, Alexandra B. Artusio-Glimpse, Matthew T. Simons, National Institute of Standards and Technology, United States; Dixith Manchaiah, Dangka Shylla, William J. Watterson, Charles Patrick, Adil Meraki, Rajavardhan Talashila, University of Colorado, Boulder, United States; Christopher L. Holloway, National Institute of Standards and Technology, United States

BF5.8 **15:50**
Electric Field Detection with High Angular Momentum Rydberg Receivers in the HF/VHF Bands and Beyond
David La Mantia, Baran Kayim, Michael Viray, Daniel Richardson, Ryan Westafer, Brian Sawyer, Robert Wyllie, Georgia Tech Research Institute, United States

BF5.9 **16:10**
Performance Showdown: Rydberg Sensors vs. Electrically Small Antennas
Kathryn Nicolich, Kelly Backes, Neel Malvania, Zachary Hardesty-Shaw, Bonnie Schmittberger Marlow, Charles Fancher, MITRE, United States

BF5.10 **16:30**
FDTD in Computational Electromagnetics and Quantum Transport
KAI REN, South Dakota School of Mines and Technology, United States

Wednesday, January 8 13:30 - 15:10
A1 Room 155

Antennas

Session Co-Chairs: Chris Anderson, NTIA; Matthew Simons, National Institute of Standards and Technology

A1.1 **13:30**
Towards Harsh Environment Silicon Carbide Based On-chip Antenna
Sree Adinarayana Dasari, Seung Yoon Lee, Nima Ghalichechian, Georgia Institute of Technology, United States

A1.2 **13:50**
Cylindrical Dielectric Resonator Antenna Providing Pattern Diversity Using Higher-Order Modes
Anh T. Vu, Jason Summer, Nigel Shepherd, Hung Luyen, University of North Texas, United States

A1.3 **14:10**
37 GHz Low-Profile Wideband Antenna with High-Gain Characteristics for Next-Generation Networks
Carlos Arteaga Araujo, Elias Alwan, Florida International University, United States

A1.4 **14:30**
Direct Antenna Binary Phase-Shift Keying through Ferrimagnetic Loading
Shantu Ghose, Binbin Yang, North Carolina A&T State University, United States

A1.5 **14:50**
Evolving Antennas For Directional Radio Sensitivity
Dylan Wells, Ohio State University, United States; Julie Rolla, NASA, United States; Bryan Reynolds, Remcom, United States; Amy Connolly, Ohio State University, United States

Wednesday, January 8 13:30 - 15:10
GH4 Special Session Room 200

Meteors Orbital Debris and Dusty Plasmas

Session Co-Chairs: Alex Fletcher, NASA; Paul Bernhardt, University of Alaska Fairbanks

GH4.1 **13:30**
Track After Detection of Inert Space Objects in Conjunction with Satellite-Based Plasma Wave Sensors
Paul Bernhardt, University of Alaska Fairbanks, United States; Bengt Eliasson, University of Strathclyde, United Kingdom; Wayne Scales, Andrew Howarth, Virginia Tech, United States; Lauchie scott, DRDC Ottawa Research Centre, Canada; Andrew Foss, univeristy of cal, Canada

GH4.2 **13:50**
Simultaneous Observation of a Daytime Arietids Meteor Head Echo at VHF and UHF Frequencies
Trevor Hedges, Stanford University, United States; Alex Green, Boston University, United States; Nicolas Lee, Sigrid Elschot, Stanford University, United States; Meers Oppenheim, Boston University, United States

GH4.3 **14:10**
Using Plasma Clouds Produced by Dust Impacts on Parker Solar Probe to Search for Anomalous Dust Populations in the Inner Heliosphere
David Malaspina, Avery Mazurkiewicz, University of Colorado, Boulder, United States; Jamey Szalay, Princeton University, United States; Delaney Lee-Bellows, University of Colorado, Boulder, United States

GH4.4 **14:30**
Towards resolving the wake structure of a dust grain in plasma with wave kinetic models
Michael Kwara, Sigrid Elschot, Stanford University, United States

GH4.5 **14:50**
Anomalous diffusion of a strongly magnetized plasma in a simulated spacecraft wake: experimental observations and modeling
Edward Thomas, Saikat Chakraborty Thakur, Auburn University, United States

Wednesday, January 8 13:30 - 15:10
F1 Room 245

Signals of Opportunity Bistatic Radar Remote Sensing of the Earth

Session Co-Chairs: Ming Li, University Corporation for Atmospheric Research; Christopher Ruf, University of Michigan

F1.1 **13:30**
A Study on RFI Detection and Mitigation for UAS-based P-band SoOp System
Tanvir Anjum, Mehmet Kurum, University of Georgia, United States

F1.2 **13:50**
The Sea State Sensitivity of GNSS-R Ocean Wind Speed Measurements
Christopher Ruf, University of Michigan, United States; April Warnock, SRI, United States

F1.3 **14:10**
Inverting Soil Moisture from GNSS-R Reflectivity Using a Semi-empirical Model
Jiahua Zhang, Ming Li, John Braun, Jan-Peter Weiss, University Corporation for Atmospheric Research (UCAR), United States

F1.4 **14:30**
Grid Size Optimization for Soil Moisture Estimation Using UAS-based GNSS Reflectometry
Sriman Bidhan Baray, Md Mehedi Farhad, University of Georgia, United States; Volkan Senyurek, Ali Gurbuz, Mississippi State University, United States; Mehmet Kurum, University of Georgia, United States

F1.5 **14:50**
Sensing of Directional Ice Surface Roughness Features with GNSS-Reflectometry
Sophie Anderson, Jade Morton, University of Colorado Boulder, United States; Lauren Andrews, NASA Goddard Spaceflight Center, United States

Wednesday, January 8 13:30 - 17:10
J7 Special Session Room 265

Radio Science from the Moon

Session Chair: David DeBoer, University of California, Berkeley

J7.1 **13:30**
The Dawning of Radio Astronomy from the Moon
Jack Burns, University of Colorado Boulder, United States

J7.2 **13:50**
~~Preserving the Shielded Zone of the Moon for Radio Astronomy~~
~~*Sarah Marie Bruno, Johns Hopkins University, United States*~~

J7.3 **14:10**
RAE-exploring the past: Lunar Science and the Legacy of RAE-2
Adam Fahs, Zack Li, Stuart Bale, UC Berkeley, United States

J7.4 **14:30**
Commission J: Radio Science from the Moon Lunar Odyssey: ROLSES-1 Data Analysis
Joshua Hibbard, Jack Burns, Center for Astrophysics and Space Astronomy, United States

J7.5 **14:50**
Pioneering Ultra-Long-Wavelength Radio Science with LuSEE-Night
Stuart Bale, John Bonnell, University of California, Berkeley, United States; Jack Burns, University of Colorado, United States; Thierry Dudok de Wit, Laboratoire de Physique et de Chimie de l'Environnement et de l'Espace, France; Adam Fahs, University of California, Berkeley, United States; Keith Goetz, University of Minnesota, United States; Christian Bye, University of California, Berkeley, United States; Sven Herrmann, Brookhaven National Laboratory, United States; Joshua Hibbard, University of Colorado, United States; Zack Li, University of California, Berkeley, United States; Milan Maksimovic, Observatoire de Paris, France; David Malaspina, University of Colorado, United States; Ryan McLean, Raul Monsalve, University of California, Berkeley, United States; Paul O'Connor, Brookhaven National Laboratory, United States; Brent Page, Aaron Parsons, Marc Pulupa, University of California, Berkeley, United States; Rugved Pund, Stony Brook University, United States; David Rapetti, NASA Ames Research Center, United States; Kaja Rotermund, Lawrence Berkeley National Laboratory, United States; Ben Saliwanchik, Brookhaven National Laboratory, United States; Dave Sheppard, NASA Goddard Space Flight Center, United States; Anže Slosar, Brookhaven National Laboratory, United States; David Sundkvist, University of California, Berkeley, United States; Aritoki Suzuki, Lawrence Berkeley National Laboratory, United States; Fatima Yousuf, University of California, Berkeley, United States

J7.6 **15:10**
Design, modeling, and characterization of the antenna module for the LuSEE-Night project
Kaja M. Rotermund, Aritoki Suzuki, Joseph Silber, LBNL, United States; Jeremy McCauley, SSL at UC Berkeley, United States; Fatima Yousuf, Adam Fahs, Stuart Bale, UC Berkeley, United States; on behalf of the LuSEE-Night Team, BNL, United States

J7.7 **15:30**
Lunar Farside Radio Arrays for Investigations of Dark Ages and Exoplanet Magnetospheres
Nivedita Mahesh, Caltech, United States; Judd Bowman, ASU, United States; Jack Burns, CU Boulder, United States; Gregg Hallinan, Caltech, United States

J7.8 **15:50**
300-900 MHz Midband Array Design for the Lunar Farside Technosignatures and Transients Telescope
Daniel Kemp, Sierra King, Nathaniel Horne, Ryan Larsen, Isaac Garfield, Joshua Santos, Karl Warnick, Brigham Young University, United States

J7.9 **16:10**
Solar system radiophysics from the farside of the Moon
Stuart Bale, UC Berkeley, United States

J7.10 **16:30**
Ground-Penetrating Radar for Lunar Exploration
Robert Grimm, David Stillman, Bryan Pyke, Southwest Research Institute, United States

J7.11 **16:50**
The Lunar Farside Technosignature and Transient Telescope (LFT3)
David DeBoer, University of Oxford, United Kingdom; Karl Warnick, Brigham Young University, United States; Chenoa Tremblay, SETI Institute, United States; Owen Johnson, Evan Keane, Trinity College Dublin, Ireland; Kaia Reenock, Haverford College, United States

Wednesday, January 8 13:30 - 15:10
B1 Room 1B40

Propagation, Scattering, and Sensing

Session Co-Chairs: David Jackson, University of Houston; Edward Kuester, University of Colorado

B1.1 **13:30**
REFLECTION BY A COATED PARABOLIC-CYLINDER MIRROR
Piergiorgio L. E. Uslenghi, University of Illinois Chicago, United States

B1.2 **13:50**
Tomographic 3D Imaging for UAV Lunar Penetrating Radar Using Geometric Optics
Tatiana Valera, Stavros Koulouridis, John Volakis, Florida International University, United States

B1.3 **14:10**
Quasi Static TEM Analysis of a uStrip above a Perforated Plane
Edward Kuester, University of Colorado, United States; Nick Krull, Electronic Expertise Ltd, United States

B1.4 **14:30**
Stopband Investigation of Leaky-Wave Antenna Based on Microstrip Line with Circular Apertures
Nanik Ram, David Jackson, University of Houston, United States

B1.5 **14:50**
Design and Simulation of a 94 GHz Resonant Horn Antenna that Detects Hidden Microscopic Defects on a PCB Board
Anthony Giordano, Peeyush Awasthi, Markondeyaraj Pulugurtha, Satheesh Venkatakrishnan, Florida International University, United States

Wednesday, January 8 15:10 - 15:30
Event Engineering Lobby

Break

Wednesday, January 8 15:30 - 17:10
D2 Room 150

Antennas and Sensing

Session Co-Chairs: Jon Chisum, University of Notre Dame; Leonardo Ranzani, RTX

D2.1 **15:30**
Optimization Metrics for Minimizing Error in Array Transmission Pattern
David Cox, Adam Goad, Austin Egbert, Charles Baylis, Robert Marks, Baylor University, United States

D2.2 **15:50**
Software-defined Radio (SDR) Configuration Pitfalls and Reference Signal Coherence Experiments
James Conroy, JHUAPL, United States; Natalie Venginickal, University of Maryland, United States; Courtney Pasternack, Embry-Riddle Aeronautical University, United States; Matteo Cerasoli, Sarah Willenbrink, Minhtri Ho, Sean Ellison, Robert Schmid, JHUAPL, United States

D2.3 **16:10**
Reinforcement Learning Controlled Mechanically Reconfigurable Antennas
Lauren Linkous, Erwin Karincic, Michael Suche, Erdem Topsakal, Virginia Commonwealth University, United States

D2.4 **16:30**
A Prototype Millimeter-Wave Reflectionless Diplexer based on Silicon Micromachining
Robert Weikle, Noah Sauber, University of Virginia, United States; Matthew Bauwens, Dominion Microprobes, Inc., United States; Michael Cyberey, Scott Barker, Arthur Lichtenberger, University of Virginia, United States

D2.5 **16:50**
NRL SPADE-2 plasma diagnostic electronics
George Gatling, Bill Amatucci, Erik Tejero, US Naval Research Laboratory, United States

Wednesday, January 8 15:30 - 16:50
A2 Room 155

Microwave to Submillimeter Techniques

Session Co-Chairs: John L. Volakis, Florida International University; Dan Kuester, National Institute of Standards and Technology; Matthew Simons, National Institute of Standards and Technology

A2.1 **15:30**
In-Situ Voltage and Current Assessment for Transmission of Signals with Bandwidth
Adam Goad, Emma Lever, David Cox, Austin Egbert, Charles Baylis, Robert Marks, Baylor University, United States

A2.2 **15:50**
Grounded Coplanar Waveguides for Material Characterization
Anna Ikelheimer, Lauren Egaas, Joseph Dunbar, Zoya Popović, University of Colorado Boulder, United States

A2.3 **16:10**
Spectrum Sensing Using Dispersive Delay Line Structure in Real-Time
Sri Tarun Reddy Chilukury, Aakash Sahai, Mark Golkowski, University of Colorado Denver, United States; Dan Kuester, National Institute of Standards and Technology, United States

A2.4 **16:30**
Electromagnetic Noise and Radiation Mitigation in Power Delivery Networks
Ghaleb Saleh Ghaleb Al-Duhni, Markondeya Raj Pulugurtha, John L. Volakis, Florida International University, United States

Wednesday, January 8 15:30 - 17:10
G11 Special Session Room 200

Total Eclipse

Session Chair: Josemaria Socola, University of Texas at Dallas

G11.1 **15:30**
An Eclipse-Ballooning Study of Shadow Bands During the April 2024 Total Eclipse
Giana Deskevich, University of Pittsburgh, United States; Norris Bach, Carnegie Mellon University, United States; Jakob Bindas, Kristian Borysiak, Russell Clark, Louis Coban, Istvan Danko, Luke Docherty, Michael Hatridge, Howard Malc, Boris Mestis, Emma Moran, Mathilda Nilsson, University of Pittsburgh, United States; Jeffery Peterson, Carnegie Mellon University, United States; Edward Michael Potosky, Sandhya Rao, Peri Schindelheim, David Turnshek, Ryan Young, Ameya Velankar, University of Pittsburgh, United States

G11.2 **15:50**
Comparative Analysis of the Great American Solar Eclipses Data Obtained with the Transportable Dynasonde System
Nikolay Zabotin, Liudmila Zabotina, NorthWest Research Associates, United States

G11.3 **16:10**
VLF and ELF Remote Sensing of the Lower Ionosphere during Total Solar Eclipse Conditions
Mark Golkowski, University of Colorado Denver, United States; Oleksiy Agapitov, University of California Berkeley, United States; Ryan Eskola, Gabriel Da Silva, Favour Ogbinaka, Srivani Inturi, University of Colorado Denver, United States

G11.4 **16:30**
~~Signatures of ionospheric G-condition observed during 2017 and 2021 Total Solar Eclipses~~
~~*Shibaji Chakraborty, Virginia Tech, United States; Sebastijan Mrak, JHU/APL, United States; Naomi Maruyama, LASP, United States; Gareth Chisham, BAS, United Kingdom; Xueling Shi, Virginia Tech, United States; Evan Thomas, Dartmouth College, United States; Kevin Sterne, Virginia Tech, United States*~~

G11.5 **16:50**
Forecasting Global VTEC Data from VISTA with High Spatial and Temporal Resolution Using a Transformer-Based Deep Learning Model
Srivani Inturi, Mark Golkowski, Ashis Biswas, University of Colorado Denver, United States; Venkata Ratnam Devanaboyina, Koneru Lakshmaiah University, India; Anmol Singhal, University of Colorado Denver, United States

Wednesday, January 8 15:30 - 17:10
F8 Special Session Room 245

Troposcatter

Session Chair: Abby Anderson, US Naval Research Laboratory

F8.1 **15:30**
Fading Measurements from a Maritime Mobile Troposcatter Link
Sunil Ramlall, Jia-Chi Chieh, Naval Information Warfare Center Pacific, United States

F8.2 **15:50**
Characterizing clutter via a time-varying troposcatter signal
Adam Hicks, Institute for Telecommunication Sciences, United States

F8.3 **16:10**
Evaluation of a Turbulence Characterization Technique Using Fixed-Distanced Commercial Radiosondes: Insights from a 2024 Measurement Campaign
Ariel Roos, Zachary Burchfield, Johns Hopkins University Applied Physics Laboratory, United States; Jordan McCammon, Naval Surface Warfare Center Dahlgren Division, United States; Abby Anderson, Naval Research Laboratory, United States; Amit Itagi, Johns Hopkins University Applied Physics Laboratory, United States; Chance McQuaid, Naval Surface Warfare Center Dahlgren Division, United States; Thomas Hanley, Johns Hopkins University Applied Physics Laboratory, United States; Matt Wilbanks, Naval Surface Warfare Center Dahlgren Division, United States

F8.4 **16:30**
Correlating NEXRAD Data with Electromagnetic Propagation Data
AJ Cuddeback, CU Boulder, United States; Christopher Anderson, NTIA-ITS, United States; Scott Palo, CU Boulder, United States

F8.5 **16:50**
Troposcatter: Illuminating the Black Box
Abby Anderson, NRLDC, United States

Wednesday, January 8 15:30 - 17:10
B6 Special Session Room 1B40

Antenna and RF Self-Interference Suppression Techniques for In-Band Full-Duplex Communication Systems

Session Co-Chairs: Nader Behdad, University of Wisconsin-Madison; Hung Luyen, University of North Texas

B6.1 **15:30**
Circular Retrodirective Arrays Making Use of Self-interference Cancellation Properties of Butler Matrices
Songyi Yen, Dejan Filipovic, University of Colorado Boulder, United States

B6.2 **15:50**
Co-Site Interference Mitigation in Full-Duplex HF Antenna Arrays Employing Electronically Reconfigurable Impedance Matching and Decoupling Networks
Arman Afsari, Barry Van Veen, Nader Behdad, University of Wisconsin-Madison, United States

B6.3 **16:10**
Mutual Coupling Study of Full-Duplex Arrays
Kenneth Kolodziej, MIT Lincoln Laboratory, United States; Dejan Filipovic, Zoya Popovic, University of Colorado Boulder, United States

B6.4 **16:30**
Dual-Band Matching and Decoupling Network Design for Asymmetric Two-Element Antenna Arrays
Son Vu, Hung Luyen, The University of North Texas, United States

B6.5 **16:50**
An Analytical Method for Designing Matching and Decoupling Networks for Three-Element Antenna Arrays with Radiation Pattern Control
Son Vu, Hung Luyen, The University of North Texas, United States

Wednesday, January 8 17:15 - 18:15
Event Room 155

Commission A Business Meeting

Wednesday, January 8 17:15 - 18:15
Event Room 1B40

Commission B Business Meeting

Wednesday, January 8	17:15 - 18:15
Event	Room 150

Commission D Business Meeting

Wednesday, January 8	17:15 - 18:15
Event	Room 200

Commission G Business Meeting

Wednesday, January 8	18:30 - 20:30
Event	Embassy Suites

Reception and SPC Awards

Thursday, January 9 08:20 - 09:20
G1 Room 150

Radar and Radio Techniques I

Session Co-Chairs: Thomas Gaussiran, University of Texas at Austin; Ted Beach, Boston College

G1.1 **08:20**
Statistical Analysis and Detection of Spread-F and foF2 values using Digisonde and VIPIR instruments
Preeti Bhaneja, USRA/NASA-GSFC, United States; Terry Bullett, NCEI/NOAA, United States; Jeff Klenzing, NASA-GSFC, United States

G1.2 **08:40**
Two-dimensional radar studies of post-midnight equatorial F-region irregularity development
Alexander Massoud, Fabiano Rodrigues, Jonas Sousasantos, The University of Texas at Dallas, United States

G1.3 **09:00**
Climatology of Large-Scale Traveling Ionospheric Disturbances Observed with 14 MHz Amateur Radio Using a Novel Automated Detection Technique
Diego Sanchez, Nathaniel Frissell, The University of Scranton, United States; Mary Lou West, Montclair State University, United States; V. Lynn Harvey, University of Colorado Boulder, United States; Sharon Vadas, Erich Becker, Northwest Research Associate, United States; Gareth Perry, The New Jersey Institute of Technology, United States; William Engelke, Nicholas Callahan, The University of Alabama, United States; Philip Erickson, Massachusetts Institute of Technology, United States

Thursday, January 9 08:20 - 09:40
E1 Room 151

Current Issues in Spectrum Sharing and Interference I

Session Co-Chairs: Charles Dietlein, Institute for Telecommunication Sciences; Robert Gardner

E1.1 **08:20**
Growing a Spectrum Paradigm: Toward Adaptive and Reconfigurable Spectrum Sharing
Charles Baylis, Baylor University, United States; Douglas Sicker, University of Colorado at Denver, United States; Austin Egbert, Andrew Clegg, Tom Brooks, Baylor University, United States; Casey Latham, Keysight Technologies, United States; Robert Marks, Baylor University, United States

E1.2 **08:40**
Interference Monitoring with NRDZ-as-a-Service at Spectrum Experimentation Events
Curtis Watson, William Young, Venki Ramaswamy, The MITRE Corporation, United States

E1.3 **09:00**
An Analysis Framework of Supplemental Coverage from Space (SCS) and Radio Astronomy System (RAS) Interference
Ryan McCullough, NTIA, United States

E1.4 **09:20**
Aggregate Interference Analysis of a LEO Satellite Constellation into the Radio Astronomy Observatory
Mustafa Yilmaz, National Telecommunications and Information Administration, United States

Thursday, January 9 08:20 - 09:40
H6 Special Session Room 155

Quantum Inspired Methods in Plasma Wave Dynamics I

Session Chair: Ashanthi Maxworth, University of Maine

H6.1 **08:20**
Application of Weyl symbol calculus for quasilinear modeling of waves in plasmas
Ilya Dodin, Princeton Plasma Physics Laboratory, Princeton University, United States

H6.2 **08:40**
Quantum Geometry and Transport in Cold Magnetized Plasmas
Enrico Rossi, William and Mary, United States; Chris Crabtree, US Naval Research Laboratory, United States

H6.3 **09:00**
Topological Mode Analysis of PT-Symmetric Electrostatic Shear Driven Instabilities
Chris Crabtree, Guru Ganguli, US Naval Research Laboratory, United States; Enrico Rossi, William and Mary, United States

H6.4 **09:20**
Switching between Whistler-Mode Waves inside Density and Magnetic Ducts
Anatoly Streltsov, Salman Nejad, Embry-Riddle Aeronautical University, United States

Thursday, January 9 08:20 - 10:00
B9 Special Session Room 200

Multifunctional Antennas and Arrays for Satellite and Wireless Communications

Session Co-Chairs: Satish Kumar Sharma, San Diego State University; Jia-Chi Chieh, NIWC-Pacific

B9.1 **08:20**
Miniaturized, Tri-Band (2.4 GHz, 5.2 GHz, and 5.8 GHz), and Self-Matched Antenna Design for Future Earbud Applications
Pranav Yogesh Mahajan, San Diego State University, United States; Balamurugan Shanmugam, Google LLC, United States; Sanghamitro Das, Satish Kumar Sharma, San Diego State University, United States

B9.2 **08:40**
A Compact CPW-Fed Circularly Polarized Planar Monopole Antenna for IoT Applications
Abu Horaira Hridhon, Tutku Karacolak, Washington State University Vancouver, United States

B9.3 **09:00**
Toward Binary Reconfigurable Holographic Surfaces
Feiyu Shan, Arizona State University, United States; Quang Nguyen, DEVCOM - Army Research Laboratory, Adelphi, United States; Georgios Trichopoulos, Arizona State University, United States

B9.4 **09:20**
Mitigating Mutual Coupling in an Antenna Array in the Digital Domain
Majid Manteghi, Virginia Tech, United States

B9.5 **09:40**
Adaptive Beamforming with a Double-Cross Array of Dipole Antennas on a Drone
Neil Egarguin, University of the Phillipines, Philippines; David Jackson, Daniel Onofrei, University of Houston, United States

Thursday, January 9 08:20 - 10:40
F2 Room 245

Atmospheric Propagation and Remote Sensing

Session Co-Chairs: Daniel P. Greenway, Coastal Carolina University; Douglas M. Pastore, Coastal Carolina University

F2.1 **08:20**
Remote Sensing of Humidity and Temperature from X-band Radar Measurements in the Marine Atmospheric Surface Layer
Erin E. Hackett, Douglas M. Pastore, Daniel P. Greenway, Alexis E. Vaughan, Caleb R. Sease, Coastal Carolina University, United States

F2.2 **08:40**
Identifying Regions of Large Propagation Variability via Principal Component Analysis
Douglas Pastore, Naval Surface Warfare Center Dahlgren Division, United States; Zach Beever, Johns Hopkins University Applied Physics Laboratory, United States

F2.3 **09:00**
A Quantitative Method for Comparing RF Propagation Model Output
Zach Beever, Johns Hopkins University Applied Physics Laboratory, United States; Abby Anderson, Naval Research Laboratory DC, United States; Jonathan Gehman, Johns Hopkins University Applied Physics Laboratory, United States; Douglas Pastore, Naval Surface Warfare Center Dahlgren Division, United States

F2.4 **09:20**
Viability of a Ground-Based Wind Profiling Radar Remote Sensing Methodology for Application in the Marine Atmospheric Surface Layer
Caleb R. Sease, Daniel P. Greenway, Erin E. Hackett, Coastal Carolina University, United States

F2.5 **09:40**
Statistical Distributions of Evaporation Duct Height and Strength Over Range and the Diurnal Cycle
Sarah Wessinger, Naval Research Lab, United States; Andrew Kammerer, Devine Consulting, United States; David Flagg, Qingfang Jiang, Naval Research Lab, United States

F2.6 **10:00**
Assessment of a Humidity and Temperature Retrieval Technique Using Refractivity Measurements
Daniel P. Greenway, Caleb R. Sease, Coastal Carolina University, United States; Qing Wang, Ryan Yamaguchi, Naval Postgraduate School, United States; Erin E. Hackett, Coastal Carolina University, United States

F2.7 **10:20**
Impact of surface temperature representation in a mesoscale numerical weather prediction model on electromagnetic propagation modeling over an inland water body
Andrew Kammerer, DeVine Consulting Inc, United States; Sarah Wessinger, Naval Research Laboratory, United States; Jacob Yung, Bay Systems Consulting, Inc, United States; David Flagg, Naval Research Laboratory, United States

Thursday, January 9 08:20 - 11:40
J1 Room 265

New Telescopes, Techniques, and Technologies I

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

J1.1 08:20
Re-channelizing Quantized Polyphase Filter Banks
Stephen Fay, McGill University, Canada

J1.2 08:40
Evidence for uncorrected gain factors in Galactic synchrotron template maps
Michael Wilensky, McGill University, Canada; Melis Irfan, University of Cambridge, United Kingdom; Philip Bull, University of Manchester, United Kingdom

J1.3 09:00
Cyclic Spectroscopy in Present and Upcoming Radio Telescope Data
Timothy Dolch, Hillsdale College, United States

J1.4 09:20
A 400Gbit Ethernet core enabling High Data Rate Streaming from FPGAs to Servers and GPUs in Radio Astronomy
Wei Liu, University of California Berkeley, United States; Mitchell C. Burnett, Brigham Young University, United States; Dan Werthimer, Jonathon Kocz, University of California Berkeley, United States

J1.5 09:40
Pulsar Detection Performance using Oversampled Spectrometer: Preliminary Indications
Rebecca Haymore, Mitchell Burnett, Brian Jeffs, Karl Warnick, Brigham Young University, United States

J1.6 10:00
High-dynamic Range Radio Astronomy Systems, Interference Mitigation strategies, and a Test Setup for Experimenting Dynamic Spectrum Sharing
Emilio Armas, Connor Westcott, William Dellinger, Nehal Patel, D. Anish Roshi, University of Central Florida, United States; Mitch Burnett, Brigham Young University, United States; Wei Liu, University of California Berkely, United States; Dan Werthimer, University of California Berkeley, United States; Rafael A. Rodríguez-Solís, University of Puerto Rico, United States

J1.7 10:20
An Experimental Test-bed for Investigating Spectrum Sharing Strategies Between Passive and Active Users at a Prototype National Radio Dynamic Zone (NRDZ)
Arvind Aradhya, University of Colorado, Boulder, United States; David DeBoer, University of California, Berkeley, United States; Oren Collaco, University of Colorado, Boulder, United States; Wael Farah, SETI Institute, United States; Cole Forrester, University of California, Berkeley, United States; Kevin Gifford, University of Colorado, Boulder, United States; David Johnson, University of Utah, United States; Sylvia Llosa, University of Colorado, Boulder, United States; Alexander Pollak, SETI Institute, United States; Bo Pearce, University of Colorado, Boulder, United States; Mark Ruzindana, University of California, Berkeley, United States; Aarushi Sarbhai, University of Utah, United States; Brockton Stover, University of California, Berkeley, United States; Stefan Tschimben, University of Colorado, Boulder, United States; Jacobus Van der Merwe, Kirk Webb, University of Utah, United States; Georgiana Weihe, University of Colorado, Boulder, United States

J1.8 10:40
Detecting VHF satellite emissions using the Orville Wideband Imager
Nicholas Rainville, Scott Palo, University of Colorado Boulder, United States; Gergory Taylor, Jayce Dowell, University of New Mexico, United States

J1.9 11:00
Using Meter-Wavelength Lunar Polarimetry to Determine the Accuracy of Estimates of the Ionospheric Faraday Rotation Measure
Richard Perley, Bryan Butler, Lilia Tremou, Eric Greisen, National Radio Astronomy Observatory, United States; Tony Willis, Dominion Radio Astrophysical Observatory, Canada

J1.10 11:20
Precision Data Analysis for 21 cm Cosmology with the OVRO-LWA Stage III
Ruby Byrne, Gregg Hallinan, Caltech, United States

Thursday, January 9 08:20 - 10:00
B2 Room 1B40

Numerical Methods and EM in Complex Media

Session Co-Chairs: Thomas Roth, Purdue University; Reyhan Baktur, Utah State University

B2.1 08:20
A New and Efficient Solution to Matrix Equation Generated by the Method of Moments
Salim Karimov, The Ohio State University, United States; Sadasiva Rao, Naval Research Lab, United States

B2.2 08:40
A Study of the Fields Excited in a Cylindrical Cavity by Multiple Longitudinal Apertures
Secil E Dogan, Joel T Johnson, Robert J Burkholder, The Ohio State University, United States

B2.3 09:00
Unconditionally Stable Time-Marching for Numerical Modeling of Josephson Traveling-Wave Parametric Amplifiers
Samuel Elkin, Thomas Roth, Purdue University, United States

B2.4 09:20
Pixelated Metamaterial Design with Binary Genetic Algorithm
Ryan Banks, Virginia Tech, United States; Quang Nguyen, Amir Zaghloul, CCDC Army Research Laboratory, United States

B2.5 09:40
Theoretical and Practical Aspects of Frequency Up-Conversion in Linear Time Varying Plasmas
Hossein Mehrpour Bernety, Mark Cappelli, Stanford University, United States

Thursday, January 9 10:00 - 10:20
Event Engineering Lobby

Break

Thursday, January 9 10:20 - 12:00
K1 Room 105

Wearable Antennas and Sensors

Session Co-Chairs: Ifana Mahbub, University of Texas at Dallas; Connor Jenkins, The Ohio State University

K1.1 10:20
Design and Implementation of an E-textile Vivaldi Antenna for Wearable Applications
Riley Hollman, Yang Li, Baylor University, United States

K1.2 10:40
Textile-Based Incognito RFID for Patient Tracking
Amber Nunnally, Erdem Topsakal, Virginia Commonwealth University, United States

K1.3 11:00
Screen-Printed Wearable Textile Antennas Using Ag/Cu Inks
Sarah Johnson, Erdem Topsakal, Virginia Commonwealth University, United States

K1.4 11:20
Broadband Impedance Matching for Wearable Magnetoinductive Waveguides
Connor Jenkins, Asimina Kiourti, The Ohio State University, United States

K1.5 11:40
Lightweight and Battery-less Multichannel Wireless Sensor for Swine Biopotential Recording
Melany Gutierrez-Hernandez, Sally P. Duarte, Jorge Riera Diaz, John L. Volakis, Florida International University, United States

Thursday, January 9 10:20 - 11:40
G2 Room 150

Radar and Radio Techniques II

Session Co-Chairs: Thomas Gaussiran, University of Texas at Austin; Ted Beach, Boston College

G2.1 **10:20**
Development and Validation of a Limb-to-disk Algorithm for Mapping Radio Occultation Measurements of Scintillation to the Vertical Propagation Geometry
Charles Carrano, Keith Groves, William McNeil, Boston College, United States; Endawoke Yizengaw, Paul Straus, Aerospace Corporation, United States

G2.2 **10:40**
Utilizing Low-Elevation Wideband GNSS Signals for Ionospheric TEC Estimations
Madeline C. Evans, Brian Breitsch, Y. Jade Morton, University of Colorado Boulder, United States

G2.3 **11:00**
TRIDENT: A Novel HF Radar System for Measuring Traveling Ionospheric Disturbances
Ian Collett, Adam Reynolds, Erich Hoover, Scott Thaller, Anastasia Newheart, Camella Nasr, Joe Hughes, Rachel Stutz, Keith Boyer, Malcolm McKellips, Dan Knight, Junk Wilson, Orion Space Solutions, An Arcfield Company, United States; Geoff Crowley, Arcfield, United States

G2.4 **11:20**
On the Use of Ionosonde Return Pulse Amplitudes
Matthew Strong, Morris Cohen, Georgia Institute of Technology, United States

Thursday, January 9 10:20 - 11:20
E2 Room 151

Current Issues in Spectrum Sharing and Interference II

Session Co-Chairs: Charles Dietlein, Institute for Telecommunication Sciences; Robert Gardner

E2.1 **10:20**
A Preliminary Comparison of Fast Techniques to Monte Carlo Techniques for Aggregate Modelling
Joel Dumke, Institute for Telecommunication Sciences, United States

E2.2 **10:40**
Latency Budget for Spectrum Sharing with Airborne Radars
Mustafa Yilmaz, Robert Achatz, Rajpreet Grewal, John Dumke, National Telecommunications and Information Administration, United States

E2.3 **11:00**
Examination of Radar Interference Protection Criteria Power Threshold Measurement Methods
Robert Achatz, United States Department of Commerce, United States

Thursday, January 9 10:20 - 11:40
H7 Special Session Room 155

Quantum Inspired Methods in Plasma Wave Dynamics II

H7.1 **10:20**
Quantized Tensor Trains for Simulations of Plasma Waves
Erika Ye, Lawrence Berkeley National Lab, United States

H7.2 **10:40**
Simulating linear plasma waves on quantum computers
Bhuvanesh Sundar, Bram Evert, Rigetti Computing, United States; Vasily Geyko, Ilon Joseph, Lawrence Livermore National Laboratory, United States; Yuan Shi, University of Colorado, Boulder, United States

H7.3 **11:00**
Efficiency in Measurement-Based Nonlinear Dynamics
Joseph Andress, University of Colorado, Boulder, United States

H7.4 **11:20**
Propagation of Whistler Mode Waves in Earth's Inner Magnetosphere in the Presence of Field Aligned Irregularities and Geomagnetic Curvature
Raahima Khatun-E-Zannat, Vijay Harid, Mark Golkowski, University of Colorado Denver, United States; Oleksiy Agapitov, Space Sciences Laboratory, University of California, Berkeley, United States; Poorya Hosseini, West Virginia University, United States

Thursday, January 9 10:20 - 11:40
B8 Special Session Room 200

High Power Electromagnetic Environment Effects

Session Co-Chairs: Avinash Sharma, Johns Hopkins University Applied Physics Laboratory; Zachary Epstein, Johns Hopkins Applied Physics Laboratory

B8.1 **10:20**
Qualification of the IMAP X-band GaN Solid State Power Amplifiers for Near Earth and Deep Space
Justin Dennison, John Lehtonen, Justin Likar, Johns Hopkins Applied Physics Laboratory, United States

B8.2 **10:40**
Theoretical Estimation of Passive HF signal from a Meteorite Plasma Trail
Zachary Epstein, Yan Li, Dalibor Todorovski, Johns Hopkins Applied Physics Laboratory, United States; Bahman Hafizi, Naval Research Laboratory, United States

B8.3 **11:00**
High Power Breakdown Effects in Microwave Components in the Titan Atmosphere
Avinash Sharma, Matthew Shannon, The Johns Hopkins University Applied Physics Laboratory, United States

B8.4 **11:20**
Substituting Lattices to Improve Mass Fraction of an Antenna for Stress Testing (SLIMFAST)
Karol Grabczewski, Avinash Sharma, The Johns Hopkins University Applied Physics Laboratory, United States

Thursday, January 9 10:20 - 12:00
B7 Special Session Room 1B40

Advanced Modeling Techniques and Algorithms in Computational Electromagnetics

Session Chair: Branislav Notaroš, Colorado State University

B7.1 **10:20**
An Algorithm for Converting PCB Via Structure to a Voxelized Mesh for Artificial Intelligence Models
Stephen Newberry, Ata Zadehgol, University of Idaho, United States

B7.2 **10:40**
Neural Network Prediction of Scattering Parameters Based on Voxel Mesh Representation
Stephen Newberry, Ata Zadehgol, University of Idaho, United States

B7.3 **11:00**
Investigation of Guided Power Expressions for Symmetric Dielectric Slab Waveguides
Rasul Choupanzadeh, Ata Zadehgol, University of Idaho, United States

B7.4 **11:20**
An Approach for Obtaining Hours of GIC Predictions from a Single, Short FDTD Simulation having a Time-Step Increment on the Order of ~1 μs
Prashanna Sharma Paneru, Jamesina Simpson, University of Utah, United States; Mark Moldwin, University of Michigan, United States

B7.5 **11:40**
Utilization of Dynamic Basis Functions in Kriging Methodology for Uncertainty Quantification in Finite Element Computation of Electromagnetic Scattering
Christopher Erickson, Stephen Kasdorf, Branislav Notaroš, Colorado State University, United States

Thursday, January 9 12:10 - 13:10
Event Math 100

Women in Radio Science (WIRS) Business Meeting

Thursday, January 9 13:30 - 15:10
K2 Room 105

Interaction of the Human Body and Electromagnetic Waves

Session Co-Chairs: Hakki Gurhan, University of Colorado Boulder; Ananya Nandikanti, University of Houston

K2.1 **13:30**
Weak and Extremely Low Frequency Magnetic Fields Alter the Growth Rates of HT-1080 Fibrosarcoma
Nhat Dang, Jason Keller, University of Colorado Boulder, United States; Marek Bajtos, University of Zilina, Slovakia; Hakki Gurhan, Frank Barnes, University of Colorado Boulder, United States

K2.2 **13:50**
Electromagnetic Field-Induced Modulation of Antioxidant Responses in Cancer Cells: Frequency-Specific Investigations and Bioengineering Implications
Hakki Gurhan, Frank Barnes, University of Colorado at Boulder, United States

K2.3 **14:10**
Assessing MR Safety of Cerebral Stents: Insights into RF-Induced Heating and Stent Orientation at 1.5 T and 3 T
Ananya Nandikanti, University of Houston, United States; Guanfa Shen, William P. Clements High School, United States; Jianfeng Zheng, Ji Chen, University of Houston, United States

K2.4 **14:30**
Repeatability of Internal Body Temperature Measurements via Microwave Radiometry
Lauren Egaas, Anna Ikelheimer, Jooeun Lee, Devin Wong, Zoya Popović, University of Colorado, United States

K2.5 **14:50**
A Conformal Microwave Measurement System for Imaging Buried Anomalies
M Shifatul Islam, ESL, The Ohio State University, United States; M Asiful Islam, Bangladesh University of Engineering and Technology, Bangladesh; Asimina Kiourti, ESL, The Ohio State University, United States

Thursday, January 9 13:30 - 14:50
G3 Room 150

Radar and Radio Techniques III

Session Co-Chairs: Thomas Gaussiran, University of Texas at Austin; Ted Beach, Boston College

G3.1 **13:30**
Electromagnetic Emissions Associated with the 2024 Perseid Meteor Shower
Mickey Batson, Laboratory for Telecommunication Sciences, United States; Nick Donnangelo, MITRE, United States; Alex Mamishev, University of Washington, United States; Robert Moore, University of Florida, United States

G3.2 **13:50**
Using automatic differentiation to simplify ionospheric specification with signals from a network of HF beacons
Jhassmin Aricoche, David Hysell, Cornell University, United States

G3.3 **14:10**
Spatiotemporal Dynamics of Sporadic E Formations and their Irregular Structure based on Dynasonde Analysis
Nikolay Zabotin, Liudmila Zabotina, LJ Nickisch, NorthWest Research Associates, United States

G3.4 **14:30**
Review of a Newly Developed Modular Ionosonde Operating in the Canadian High Arctic
Torsten Reuschel, Philippe Trottier, Jayachandran P. Thayyil, Chris Watson, Anton Kashcheyev, Oleksandr Koloskov, University of New Brunswick, Canada

Thursday, January 9 13:30 - 14:50
C1 Room 151

Radio-Communication Systems and Signal Processing I

Session Co-Chairs: Eric Mokole; Jean Paul Santos, Naval Air Warfare Center Weapons Division

C1.1 **13:30**
Toward Built-in Self-Test for Large Scale Antenna Arrays: Experimental Validation
Mohammed Aladsani, Ferhat Ataman, Sule Ozev, Georgios Trichopoulos, Arizona state university, United States; Chethan Kumar Y.B, Texas Instruments, India

C1.2 **13:50**
WLAN Protocols Identification Using Machine Learning and Ensemble Models
Akimun Jannat Alvina, Yao Ma, National Institute for Standards and Technology (NIST), United States; Mark Golkowski, University of Colorado Denver, United States

C1.3 **14:10**
Impact of Notch Filtering on Radar Target Detection: Problems and Proposed Solutions
Emma Lever, Justin Roessler, Austin Egbert, Charles Baylis, Robert Marks, Baylor University, United States; Alex Bouvy, Benjamin Kirk, Army Research Laboratory, United States

C1.4 **14:30**
Novel Yagi-Uda Direction Finding Antenna Backed by Software Defined Radio
Derek Allen, Collin Wallish, Dejan Filipovic, University of Colorado Boulder, United States

Thursday, January 9 13:30 - 15:10
H1 Room 155

Waves in Space and Laboratory Plasmas

Session Co-Chairs: Ashanthi Maxworth, University of Maine; Chris Crabtree, US Naval Research Laboratory

H1.1 **13:30**
Whistler-mode Waves on Magnetic and Density Shelves
Salman A. Nejad, Anatoly V. Streltsov, Embry-Riddle Aeronautical University, United States

H1.2 **13:50**
Lightning Precursor Discharges and Terrestrial Gamma Ray Flashes
Victor Pasko, Penn State University, United States; Sebastien Celestin, University of Orleans, France; Anne Bourdon, Ecole Polytechnique, France; Reza Janalizadeh, Zaid Pervez, Penn State University, United States; Jaroslav Jansky, University of Defense, Brno, Czech Republic; Pierre Gourbin, University of Orleans, France

H1.3 **14:10**
Elves as the Optical Signature of Lightning Precursor Discharges in the Lower Ionosphere
Zaid Pervez, Reza Janalizadeh, Victor P. Pasko, Penn State University, United States

H1.4 **14:30**
Compact Intracloud Discharges and the Sources Generating Their Low and High Frequency Signatures
Zaid Pervez, Reza Janalizadeh, Victor P. Pasko, Penn State University, United States

H1.5 **14:50**
Polarization and Spectral Content of ELF/VLF Transients
Robert Moore, University of Florida, United States; Nick Donnangelo, MITRE Corp, United States; Alex Mamishev, University of Washington, United States; Mickey Batson, IARPA, United States

Thursday, January 9 13:30 - 15:10
G7 Special Session Room 200

Space Weather I

Session Chair: Sam Shidler, Applied Research Laboratories at the Unversity of Texas at Austin

G7.1 **13:30**

Detecting Phase and Amplitude Scintillation with 1 Second Scintillation Indices Using a Closely Spaced GNSS Array at Poker Flat Research Range

Gytis Blinstrubas, Seebany Datta-Barua, Illinois Institute of Technology, United States

G7.2 **13:50**

Unraveling New Indices for the Interhemispheric Asymmetry of EIA and Exploring their Connection with Global-Scale Waves

Sovit Khadka, Federico Gasperini, Orion Space Solutions, United States; Cesar Valladares, Boston College, United States

G7.3 **14:10**

Ionospheric diagnostics using AM radio and non-directional beacon signals received at Sondrestrom, Greenland

James LaBelle, Tedi Godfrey, David McGaw, John Griffin, Dartmouth College, United States

G7.4 **14:30**

Plasma irregularities at the equator (PIE) mission concept

Anastasia Newheart, John Noto, Scott Thaller, Ian Collett, Cami Nasr, Joe Hughes, Lucas Anderson, Linden Howard, Orion Space Solutions, United States; Charles Swenson, Utah State University, United States; Federico Gasperini, Orion Space Solutions, United States

G7.5 **14:50**

Phenomenology of Spatial SEE Variation Depending on Wave Type

Sam McKay, Paul Bernhardt, University of Alaska - Fairbanks, United States; Juha Vierinen, Michael Rietveld, UiT The Arctic University, Norway

Thursday, January 9 13:30 - 16:30
F6 Special Session Room 245

RF Propagation in Stable Atmospheric Conditions: Results from REDSAW Project

F6.1 **13:30**

An Overview of REDSAW and its 2024 Field Campaign

Qing Wang, Naval Postgraduate School, United States; Caglar Yardim, Ohio State University, United States; Ted Rogers, University of California San Diego, United States; Jordan Mccammon, Naval Surface Warfare Center Dahlgren Division, United States; Patrick Bidigare, Synoptic Engineering, United States; Zhien Wang, Stony Brook University, United States; Ryan Yamaguchi, Jesus Ruiz-Plancarte, Naval Postgraduate School, United States; Raymond Hoheisel, University of California San Diego, United States; Tasha Hansen, Katherine Mulreany, Naval Postgraduate School, United States; Daniel Eleuterio, Office of Naval Research, United States

F6.2 **13:50**

Overview of Naval Surface Warfare Center Dahlgren Division (NSWCDD) Execution of Radar and Electromagnetic Ducting in the Stable Atmosphere over Water (REDSAW) Experiment at the Salton Sea, California

Chance McQuaid, Jordan Mccammon, Matthew Jackson, NSWCDD, United States

F6.3 **14:10**

Dual-Polarized Multi-Emitter RF Propagation Collection with Large Vertical Array at the Salton Sea

Patrick Bidigare, Ilana Heintz, Dan Chang, Charlie Obranovich, Synoptic Engineering, United States

F6.4 **14:30**

Ducting Conditions During the 2024 REDSAW Campaign

Katherine Mulreany, Qing Wang, Naval Postgraduate School, United States

F6.5 **14:50**

REDSAW Drone-Based Electromagnetic Measurements

Elizabeth Shi, Caglar Yardim, Joe Vinci, Ohio State University, United States; Qing Wang, Ryan Yamaguchi, Jesus Ruiz-Plancarte, Naval Postgraduate School, United States

F6.6 **15:10**

REDSAW Tethered Drone-Based Meteorological Measurements

Elizabeth Shi, Caglar Yardim, Joe Vinci, Ohio State University, United States; Qing Wang, Ryan Yamaguchi, Jesus Ruiz-Plancarte, Naval Postgraduate School, United States

F6.7 **15:30**

Refractivity State Categorization Based On Phased-Array Outpu

LEE ROGERS, Scripps Institution of Oceanography / UCSD, United States; Kessen Barrett, University of California, San Diego, United States

F6.8 **15:50**

Preliminary Ultra-Wideband Measurements during the Radar and Electromagnetic Ducting in Stable Atmosphere over Water Campaign

Joe Vinci, Caglar Yardim, Elizabeth Shi, The Ohio State University, United States; Qing Wang, Ryan Yamaguchi, Jesus Ruiz-Plancarte, Naval Postgraduate School, United States

F6.9 **16:10**

Preliminary Range-dependent Measurements during the Radar and Electromagnetic Ducting in Stable Atmosphere over Water Campaign

Joe Vinci, Caglar Yardim, Elizabeth Shi, The Ohio State University, United States; Qing Wang, Ryan Yamaguchi, Jesus Ruiz-Plancarte, Naval Postgraduate School, United States

Thursday, January 9 | 13:30 - 16:50
J4 | Special Session | Room 265

Millimeter-Wave Technologies, Techniques, and Challenges for CMB-S4

Session Co-Chairs: John Carlstrom, University of Chicago; John Ruhl, Case Western Reserve University

J4.1 **13:30**
CMB-S4 Science Case and Instrument Overview
John Carlstrom, University of Chicago, United States; John Ruhl, Case Western Reserve University, United States

J4.2 **13:50**
Superconducting Bolometric Detector Technology for CMB-S4
Aritoki Suzuki for the CMB-S4 Collaboration, Lawrence Berkleey National Laboratory, United States

J4.3 **14:10**
Multiplexed Detector Readout Technology for CMB-S4
Zeeshan Ahmed, SLAC National Accelerator Laboratory, United States

J4.4 **14:30**
CMB-S4 Feedhorn and Focal Plane Assembly Design
Sara Simon, Fermi National Accelerator Laboratory, United States

J4.5 **14:50**
Large Aperture Telescope Designs for CMB-S4
Nick Emerson, University of Arizona, United States

J4.6 **15:10**
Large Aperture Telescope High Throughput Receiver design
Bradford Benson, Fermilab, University of Chicago, United States

J4.7 **15:30**
Large Aperture Telescope Sidelobe Issues and Mitigation for CMB-S4
Johanna Nagy, Case Western Reserve University, United States

J4.8 **15:50**
Small Aperture Telescope Designs for CMB-S4
John M. Kovac, Harvard University, United States

J4.9 **16:10**
Polarized Atmospheric Properties and Modeling for CMB-S4
Anna Coerver, William Holzapfel, University of California, Berkeley, United States

J4.10 **16:30**
Radiofrequency Interference Issues and Mitigation for CMB-S4
Darcy Barron, University of New Mexico, United States

Thursday, January 9 | 13:30 - 16:50
B13 | Special Session | Room 1B40

WPT for Novel and Challenging Applications

Session Co-Chairs: Ifana Mahbub, University of Texas at Dallas; David Jackson, University of Houston

B13.1 **13:30**
Preliminary Study of Inductive Power Transfer Compared to Capacitive Power Transfer
Andrew Valler, Georgian College, Canada; Felix Champagne-Lapointe, AWL Electricity, Canada; Majid OstadRahimi, Georgian College, Canada

B13.2 **13:50**
Effects of Weather Events on Wireless Power Receiver Arrays
Amelia Dundon, Ocean Reamer, Alexandra Montgomery, Jack Molles, Cody Scarborough, Zoya Popovic, University of Colorado Boulder, United States

B13.3 **14:10**
Design and Modeling of High Power Density Stacked Coil for WPT in a Lossy Seawater Environment
Kanchuka Dissanayake, Wajiha Shireen, David Jackson, University of Houston, United States

B13.4 **14:30**
Improving Robustness for Large-Scale Wireless Power Receiver Arrays
Alejandro Valenzuela, Ocean Reamer, Jack Molles, Zoya Popovic, CU Boulder, United States

B13.5 **14:50**
Get Away Special Radio and Antenna Transparency Satellite (GASRATS) Payload
Tyler Day, Ethan Wayland, Lorenzo High, Reyhan Baktur, Utah State University, United States

B13.6 **15:10**
Electrically Small Ultrawideband Antenna for Wireless Power Transfer to Headstage Based Electrophysiological Recording System
Adnan Basir Patwary, Ifana Mahbub, The University of Texas at Dallas, United States

B13.7 **15:30**
Metamaterial Antenna Design to Enhance Near Field Inductive Coupling for Biomedical Implants
Karthik kakaraparty, Marinus Henk Daling, Julian Alonzo, Baylor University, United States; Jihun Lee, Ah-Hyoung Lee, Brown University, United States; David Durfee, Bay computers, United States; Lawrence Larson, Arto Nurmikko, Brown University, United States; Vincent Leung, Baylor University, United States

B13.8 **15:50**
Precise Small-Scale System Tracking Using Angle of Arrival and Time Stamping Technology and its Use in Guiding Distributed Coherent Beamforming
Erik Pineda-Avarez, Ifana Mahbub, University of Texas at Dallas, United States

B13.9 **16:10**
Compact Dual-Band Planar Wireless Power Transfer (WPT) System
Daryn Shaldybayev, Zhanel Kudaibergenova, Galymzhan Nauryzbayev, Mohammad Hashmi, Nazarbayev University, Kazakhstan

B13.10 **16:30**
CSCMR WPT Systems for Wearable Devices
Anastasios Koutinos, Stavros Georgakopoulos, Konstantinos Zekios, Florida International University, United States

Thursday, January 9 | 15:10 - 15:30
Event | Engineering Lobby

Break

Thursday, January 9 15:30 - 17:10
K3 Special Session Room 105

Brain Stimulation Modeling and Design

Session Chair: Luis J. Gomez, Purdue University

K3.1 **15:30**
In vivo brain electrical property mapping using vision transformers and magnetic resonance measurements
Ilias Giannakopoulos, NYU Grossman School of Medicine, United States; Riccardo Lattanzi, NYU Langone Health, United States

K3.2 **15:50**
Real-time Computation of E-field in Transcranial Magnetic Stimulation for Neuronavigation and Optimization
Nahian I. Hasan, Purdue University, United States; Moritz Dannhauer, East Carolina University, United States; Dezhi wang, Purdue University, United States; Zhi-De Deng, National Institutes of Health, United States; Luis J. Gomez, Purdue University, United States

K3.3 **16:10**
A FMM Bidomain Boundary Element Method for Modeling Electromagnetic Brain Stimulation of a Pseudo-Realistic Cell
Vanine Sabino, David M. Czerwonky, Nahian I. Hasan, Luis J. Gomez, Purdue University, United States

K3.4 **16:30**
Numerical Optimization of a 3D Multilayer Dielectric Geometry for MRI Applications
Giuseppe Carluccio, University of Napoli Federico II, Italy; Christopher Collins, Center for Advanced Imaging Innovation and Research (CAI2R) and Bernard and Irene Schwartz Center for Biomedical Imaging, United States; Daniele Riccio, Vincenzo Miranda, Giuseppe Ruello, University of Napoli Federico II, Italy

K3.5 **16:50**
Deep Learning Networks to Estimate Electric Fields From Noisy B1 Maps
Giuseppe Carluccio, University of Napoli Federico II, Italy; Eros Montin, Christopher Collins, Riccardo Lattanzi, Center for Advanced Imaging Innovation and Research (CAI2R) and Bernard and Irene Schwartz Center for Biomedical Imaging, United States; Daniele Riccio, Giuseppe Ruello, University of Napoli Federico II, Italy

Thursday, January 9 15:30 - 17:10
F3 Room 150

Radar and Radiometer Remote Sensing Technology and Applications

Session Co-Chairs: Mehmet Ogut, Jet Propulsion Laboratory; Albin Gasiewski, University of Colorado Boulder

F3.1 **15:30**
SDR-Based S-Band Radiometer for UAS Platforms with Spectrum Monitoring and Dynamic Allocation
Kaies Al Mahmud, Mehmet Kurum, University of Georgia, United States

F3.2 **15:50**
A GNSS-T and LiDAR Fusion Approach to Generate Large Scale Vegetation Optical Depth Map
Abesh Ghosh, Mehmet Kurum, University of Georgia, United States

F3.3 **16:10**
Dual Frequency Improvements to the Time-Series Ratio algorithm for Soil Moisture Retrievals in the SMEX02 Campaign
Dustin Horton, Joel Johnson, Mohammad Al-Khaldi, The Ohio State University, United States; Jeonghwan Park, Rajat Bindlish, NASA Goddard Space Flight Center, United States

F3.4 **16:30**
RF-Photonic Ultra-Wideband Instrument For Planetary Boundary Layer Sensing
Mehmet Ogut, Shannon Brown, Sidharth Misra, Eric Kittlaus, Pekka Kangaslahti, Jet Propulsion Laboratory, United States; Janusz Murakowski, Phase Sensitive Innovations, United States; Michael Gehl, Sandia National Laboratories, United States

F3.5 **16:50**
V-band 2SQCC digital correlating spectrometer – Prototype development and preliminary test results
Aravind Venkitasubramony, Albin Gasiewski, University of Colorado at Boulder, United States

Thursday, January 9 15:30 - 17:10
C2 Room 151

Radio-Communication Systems and Signal Processing II

Session Co-Chairs: Jean Paul Santos, Naval Air Warfare Center Weapons Division; Eric Mokole

C2.1 **15:30**
Toward A 2-28 GHz Reconfigurable RF Tuner with >70 dB SFDR for 2 GHz IBW
Robin Ying, HRL Laboratories LLC, United States

C2.2 **15:50**
Evaluating the Performance Trade-Offs between Resistively-Loaded LTI ESAs and Time-Varying Non-LTI ESAs using OFDM Wafeforms
Samuel Robbins, Syed M. A. Uddin, Michael Artlip, Robert Lucas, Wooram Lee, Gregory Huff, The Pennsylvania State University, United States

C2.3 **16:10**
Channel Scaling Limitations to Spurious Free Dynamic Range for 2-18 GHz Hybrid Digital Array Architectures
Jeffrey Massman, Jordan Besnoff, Brad Hall, Pete Delos, Analog Devices, United States

C2.4 **16:30**
Compact Development Platform for Wideband Digital True Time Delay Beamforming and RFI Cancellation
Nathan Burnett, Mitchell Burnett, Karl Warnick, Brigham Young University, United States

C2.5 **16:50**
Evaluating a Convolutional Neural Network Calibration Algorithm using a 500GHz Radiometer
John Bradburn, Mustafa Aksoy, University at Albany, SUNY, United States

Thursday, January 9 15:30 - 17:10
H2 Room 155

Space Environment Modeling and Forecasting

Session Co-Chairs: Lunjin Chen, University of Texas at Dallas; Ashanthi Maxworth, University of Maine

H2.1 **15:30**
Testing Spacecraft Charging Predictions as Parker Solar Probe Approaches the Sun
Delaney Lee-Bellows, David Malaspina, Robert Ergun, Jan Deca, Laboratory for Atmospheric and Space Physics, United States

H2.2 **15:50**
NRL SPADE-2 measurements of ionospheric plasma parameters
Bill Amatucci, Erik Tejero, George Gatling, Naval Research Laboratory, United States

H2.3 **16:10**
The role of cold oxygen ions in the EMIC wave growth
Shujie Gu, The University of Texas at Dallas, United States; Misa Cowee, Xiangrong Fu, LANL, United States; Lunjin Chen, Xu Liu, Vania Jordanova, The University of Texas at Dallas, United States

H2.4 **16:30**
ULF Waves in the Subauroral Geospace
Anatoly Streltsov, Embry-Riddle Aeronautical University, United States; Evgeny Mishin, Boston College, United States

H2.5 **16:50**
~~Impact of May 2024 geomagnetic superstorm on the submarine cables~~
~~*Shibaji Chakraborty, Virginia Tech, United States; David Boteler, NRCan, Canada; Xueling Shi, Virginia Tech, United States; Michael Hartinger, SSI, United States; Joseph Baker, Virginia Tech, United States*~~

Thursday, January 9 15:30 - 17:10
G8 Special Session Room 200

Space Weather II

Session Chair: Sam Shidler, Applied Research Laboratories at the Unversity of Texas at Austin

G8.1 **15:30**
Advancing understanding of mid-latitude L-band scintillations with alternative GNSS-based monitors
Josemaria Gomez Socola, Fabiano Rodrigues, University of Texas at Dallas, United States; Miguel Rojas Quesada, Instituto Tecnológico de Costa Rica, Costa Rica

G8.2 **15:50**
First Results from an Array for VLF Imaging of the D-Region Ionosphere
James Cannon, Robert Marshall, University of Colorado Boulder, United States

G8.3 **16:10**
Global Analysis of Mid-latitude Ionospheric Trough Morphology
Brenna Royersmith, Delores Knipp, University of Colorado Boulder, United States; Gregory Starr, Johns Hopkins University Applied Physics Lab, United States; Jade Morton, University of Colorado Boulder, United States; Sebastijan Mrak, Johns Hopkins University Applied Physics Lab, United States; Qian Wu, University Corporation for Atmospheric Research, United States

G8.4 **16:30**
The 12 May 2021 Strong Geomagnetic Storm Viewed in the Context of Total Electron Content and Power Grid Disturbances
Delores Knipp, Bhagyashree Waghule, University of Colorado Boulder, United States; Anthea Coster, MIT Haystack Observatory 99 Millstone Road Westford, MA 01886, United States

G8.5 **16:50**
Computer Vision-Generated Database of Plasma Waves in the Inner Magnetosphere
Paraksh Vankawala, Robert Marshall, University of Colorado Boulder, United States

Thursday, January 9 17:15 - 18:15
Event Room 151

Commissions C/E Business Meeting

Thursday, January 9 17:15 - 18:15
Event Room 245

Commission F Business Meeting

Thursday, January 9 17:15 - 18:15
Event Room 155

Commission H Business Meeting

Thursday, January 9 17:15 - 18:15
Event Room 265

Commission J Business Meeting

Thursday, January 9 17:15 - 18:15
Event Room 105

Commission K Business Meeting

Thursday, January 9 19:00 - 20:30
Event Embassy Suites

WIRS Reception

Friday, January 10 | 06:00 - 07:50
Event | Embassy Suites

USNC-URSI Executive Committee Meeting - Invitation Only

Friday, January 10 | 08:20 - 09:40
C3 | Special Session | Room 105

Overcoming Physically Constrained Environments

Session Co-Chairs: Miheer Mayekar, North Carolina State University; Shih-Ming Huang, University of California, Los Angeles

C3.1 **08:20**
Experimentally Overcoming Fundamental LTI Bounds via Periodic Temporal Modulations
Francesco Monticone, Matteo Ciabattoni, Cornell University, United States

C3.2 **08:40**
Design, Implementation, and Experimental Characterization of a non-LTI Electrically Small HF Antenna with Improved Bandwidth-Efficiency Product
Ruyu Ma, Shiying Wang, Halil Topozlu, Nader Behdad, Daniel Ludois, University of Wisconsin Madison, United States

C3.3 **09:00**
Optimizing DC-Stabilized Direct Antenna Modulation Transmitters for Electrically-Small Antennas
Miheer Mayekar, Joseph Dusenbury, North Carolina State University, United States; Kurt Schab, Santa Clara University, United States; Jacob Adams, North Carolina State University, United States

C3.4 **09:20**
Low-Power ULF Transmitter Design Using Static Permanent Magnet
Shashank Chinnakkagari, Majid Manteghi, Virginia Tech, United States

Friday, January 10 | 08:20 - 11:40
J5 | Special Session | Room 150

Calibration & Imaging of Nextgen Radio Telescopes

Session Chair: Preshanth Jagannathan, National Radio Astronomy Observatory

J5.1 **08:20**
Development of Next Generation Very Large Array Tropospheric Calibration
Kyle Massingill, T. K. Sridharan, National Radio Astronomy Observatory, United States; Yoshiharu Asaki, National Astronomical Observatory of Japan, Chile

J5.2 **08:40**
Segmenting RFI using Meta's Segment Anything Model
Derod Deal, University of Florida, United States; Preshanth Jagannathan, National Radio Astronomy Observatory, United States

J5.3 **09:00**
Development of a Low Mutual Coupling Antenna for Future 21 cm Interferometers
Marc-Olivier R. Lalonde, Daniel C. Jacobs, Arizona State University, United States; James E. Aguirre, University of Pennsylvania, United States

J5.4 **09:20**
REFERENCE HOPS CALIBRATION PIPELINE FOR THE EVENT HORIZON TELESCOPE
Iniyan Natarajan, Lindy Blackburn, Paul Tiede, Dominic Pesce, Center for Astrophysics | Harvard & Smithsonian, United States

J5.5 **09:40**
Enabling direct imaging radio telescopes and precision cosmology with pyFHD
Bryna Hazelton, University of Washington, United States

J5.6 **10:00**
HPG: A High Performance Gridding Library
Martin Pokorny, California Institute of Technology, United States

J5.7 **10:20**
LibRA: A Scientific Software Library of Radio Astronomy Algorithms
Sanjay Bhatnagar, Genie Hsieh, Felipe Madsen, Preshanth Jagannathan, NRAO, United States

J5.8 **10:40**
The VLA Sky Survey (VLASS) and Beyond: Lessons, Challenges, and Future Surveys
Steven Myers, NRAO, United States

J5.9 **11:00**
Scientific computing at scale : How do we approach a petabyte scale problem?
Srikrishna Sekhar, National Radio Astronomy Observatory, United States

J5.10 **11:20**
Radio Interferometric Imaging on High Throughput Computing Systems
Felipe Madsen, Sanjay Bhatnagar, National Radio Astronomy Observatory, United States

Friday, January 10 | 08:20 - 11:40
B4 | Room 151

Devices, Systems, and Applications

Session Co-Chairs: Branislav Notaroš, Colorado State University; Steven Weiss

B4.1 **08:20**
Characterization of Dielectric Nonlinearity in High-permittivity Materials for High Power mmW Devices
Fan Cheng, The OHIO State University, United States

B4.2 **08:40**
Material Parameter Extraction and Fine-Tuning Techniques for Reducing Overfitting of Deep Neural Networks in Medical Imaging and Diagnostics Applications
Ross Stauder, Stephen Kasdorf, Branislav Notaroš, Colorado State University, United States

B4.3 **09:00**
Development of Voltage Multiplier Rectifier for Energy Harvesting Applications
Adil Karimov, Mohammad Hashmi, Nazarbayev University, Kazakhstan

B4.4 **09:20**
A 10 GHz Parametric Amplifier for Distributed Amplification
Arunima Singh, University of Colorado Boulder, United States; Alexandra Montgomery, CODY SCARBOROUGH, UNIVERSITY OF COLORADO BOULDER, United States

B4.5 **09:40**
Improved Radio Astronomy Interference Characterization Using DevOps
Sylvia Llosa, University of Colorado Boulder, United States; Cole Forrester, University of California Berkeley, United States; Georgiana Weihe, Oren Collaco, Kevin Gifford, University of Colorado Boulder, United States

B4.6 **10:00**
Design and Optimization of 4.7-Tesla RF Coils and Associated Circuits for Use in High-Field Strength and High-Larmor-Frequency Magnetic Resonance Imaging
Christopher Erickson, Pranav Athalye, Colorado State University, United States; Milan Ilić, University of Belgrade, Serbia; Branislav Notaroš, Colorado State University, United States

B4.7 **10:20**
A Reconfigurable Intelligent Surface Using Transparent Conductive Oxide
Michael Suche, Erdem Topsakal, Virginia Commonwealth University, United States

B4.8 **10:40**
Compact Millimeter Wave Band Button Antenna Design for WBAN Off-Body Communication
Jawad Ahmad, Mohammad Hashmi, Nazarbayev University, Kazakhstan

B4.9 **11:00**
Design and Validation of an In-Situ Downconversion Circuit
Trevor Van Hoosier, Adam Goad, Austin Egbert, Baylor University, United States; Aravind Venkitasubramony, University of Colorado, United States; Michael Marques, Orbital Microsystems, United States; David Cox, Charles Baylis, Baylor University, United States; Albin Gasiewski, University of Colorado, United States; Robert Marks, Baylor University, United States

B4.10 **11:20**
Metasurface-infused Sky Radio Quiet Zone for Mitigation of Radio Frequency Interference
Sakib Reza, Hao Xie, Hlaing Minn, Ifana Mahbub, The University of Texas at Dallas, United States

Friday, January 10 | 08:20 - 10:00
H3 | Special Session | Room 155

Active Experiments in Laboratory and Space Plasmas I

Session Chair: Erik M. Tejero, U.S. Naval Research Laboratory

H3.1 **08:20**
Reconnection-Driven Electron Acceleration: Guide Field Effects.
Ripudaman Singh Nirwan, Earl Scime, West Virginia University, United States

H3.2 **08:40**
Thomson Scatter with L band Radar and Potential New Multi-Frequency Ionospheric Radar Utilization
J. Brent Parham, MIT Lincoln Laboratory, United States; Ana Banzer, Stanford University, United States; Amoree Hodges, Mark Dickson, MIT Lincoln Laboratory, United States; Philip Erickson, Frank Lind, Ryan Volz, John Swoboda, Haystack Observatory, United States

H3.3 **09:00**
Stimulated Brillouin Scattering from Satellite Transmissions
Jason Ruszkowski, Kyle Myren, Edgar Bering, University of Houston, United States

H3.4 **09:20**
Simulation and Theoretical Studies on the Validity of Using Langmuir Probes in Hypervelocity Impact Plasma
Xiaohan Mei, Sigrid Elschot, Stanford, United States

H3.5 **09:40**
The Magnetic Imprints of Coronal Currents: Remote sensing of Remote Currents
Peter Schuck, NASA/GSFC, United States

Friday, January 10 | 08:20 - 10:00
G9 | Special Session | Room 200

Studies of the Gannon Storm I

Session Chair: Romina Nikoukar, Johns Hopkins University Applied Physics Laboratory

G9.1 **08:20**

~~Scintillation and High-Rate TEC Observations at Mid Latitudes During the Gannon Storm~~

~~Isaac Wright, Fabiano Rodrigues, University of Texas at Dallas, United States; Christiano Brum, Pedrina Terra, University of Central Florida, United States; Kshitija Deshpande, Embry Riddle Aeronautical University, United States; Philip Erikson, MIT Haystack, United States; Nathaniel Frissell, University of Scranton, United States; Michael Hauan, Citizen Scientist, United States; Dan Layne, Deep Space Exploration Society, United States; Miguel Rojas Quesada, Costa Rica Institute of Technology, Costa Rica; Yvelice Castillo Rosales, National Autonomous University of Honduras, Honduras; Jan Sojka, Ludger Scherliess, Utah State University, United States; Simon Shepherd, Dartmouth, United States; Gregory Taylor, University of New Mexico, United States~~

G9.2 **08:40**

L-band Scintillation Characteristics during the 2024 Gannon Storm

Sebastijan Mrak, JHU/APL, United States; Toshi Nishimura, Boston University, United States; Romina Nikoukar, JHU/APL, United States; Anthea Coster, MIT Haystack observatory, United States; Jade Morton, University of Colorado Boulder, United States; Clayton Cantrall, James Conroy, Patrick Dandenault, Lisa Knowles, Robert Schaefer, JHU/APL, United States; Cathryn Mitchell, University of Bath, United Kingdom

G9.3 **09:00**

Gannon Storm Scintillation Observations via the NOAA Data Collection System

Theodore Beach, Boston College, United States; Daniel Gillies, William Dronen, NOAA, United States; Keith Groves, Boston College, United States; Brett Betsill, Matt Taylor, Microcom Design, Inc., United States; Nai-Yu Wang, NOAA, United States; Alan Hoskinson, Boston College, United States

G9.4 **09:20**

Unprecedented Nightside Ionospheric Dynamics Observed by GOLD During the 10-11 May 2024 Gannon Storm

Deepak Karan, Laboratory for Atmospheric and Space Physics, United States; Carlos Martinis, Boston University, United States; Robert Daniell, Ionospheric Physics, United States; Richard Eastes, Laboratory for Atmospheric and Space Physics, United States; Wenbin Wang, High Altitude Observatory, United States; William McClintock, Laboratory for Atmospheric and Space Physics, United States; Robert Michell, Goddard Space Flight Center, United States; Scott England, Virginia Polytechnic Institute and State University, United States

G9.5 **09:40**

Assimilative Coupled Modeling of the Gannon Superstorm

Scott Thaller, Ana Newheart, Rachel Stutz, Ian Collett, Cami Nars, Joe Hughes, Orion Space Solutions - An Arcfield Company, United States; Geoff Crowley, Arcfield, United States; John Noto, Junk Wilson, Orion Space Solutions - An Arcfield Company, United States

Friday, January 10 | 08:20 - 11:40
F5 | Special Session | Room 245

Microwave Remote Sensing of Vegetation and Ocean Salinity in Honor of Roger H Lang

Session Chair: Mehmet Kurum, University of Georgia

F5.1 **08:20**

The Continuing Contribution of Roger Lang to the Measurement of the Dielectric Constant of Sea Water

David Le Vine, Goddard Space Flight Center, United States; Roger Lang, Ming Li, The George Washington University, United States; Emmanuel Dinnat, Goddard Space Flight Center, United States; Yiwen Zhou, Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Switzerland

F5.2 **08:40**

Resonant-Perturbation Method Applied to UHF Cryogenic Dielectric Measurements of Saline Ice

Jake Sahli, Albin Gasiewski, University of Colorado Boulder, United States; William Stone, Vickie Siegel, Stone Aerospace, Inc., United States

F5.3 **09:00**

Ocean Salinity Measurements with L-band Passive Airborne and Ground Based Instruments

Mehmet Ogut, Sidharth Misra, Ian Fenty, Severine Fournier, Simik Ghookasian, Jet Propulsion Laboratory, United States; Doug Vandemark, University of New Hampshire, United States

F5.4 **09:20**

Development of the SESAR-LITE P-band Synthetic Aperture Radar

Rafael Rincon, NASA/GSFC, United States

F5.5 **09:40**

Coherence Modeling of Land Cover Observations from Repeat Pass Interferometric Synthetic Aperture Radar

Simon Yueh, Xiaolan Xu, Tianlin Wang, Mario Chaubell, California Institute of Technology, United States

F5.6 **10:00**

Bistatic GO Solution to the Mean RCS of an Object Above a Rough Surface: 2D TE Case

Joseph Gedney, Joel Johnson, Robert Burkholder, The Ohio State University, United States

F5.7 **10:20**

GNSS-T Forest Transmissivity Simulations based on LiDAR-derived Tree Structure

Mohammad Ehsanul Hoque, Mehmet Kurum, University of Georgia, United States

F5.8 **10:40**

Modelling the effective vegetation optical depth and scattering albedo for coniferous forests from P- to Ka- band

Yiwen Zhou, Mike Schwank, Swiss Federal Research Institute WSL, Switzerland; Mehmet Kurum, University of Georgia, United States; Roger Lang, The George Washington University, United States

F5.9 **11:00**

Coherent backscatter from a vegetation canopy – Model vs Experiment

Avinash Sharma, The Johns Hopkins University Applied Physics Laboratory, United States

F5.10 **11:20**

Interpolating SMAP Soil Moisture to 3 km using CYGNSS and Spire Reflectivity Observations: Regional Case Study

Ming Li, Jiahua Zhang, University Corporation for Atmospheric Research, United States; Liza Wernicke, University of Colorado Boulder, United States; John Braun, Jan Weiss, University Corporation for Atmospheric Research, United States

Friday, January 10 | 08:20 - 11:40
J2 | Room 265

New Telescopes, Techniques, and Technologies II

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

J2.1 **08:20**
Hydrogen Epoch of Reionization Array Year 6 Data Analysis
Daniel Jacobs, Arizona State University, United States

J2.2 **08:40**
Status of the MIST Global 21-cm Experiment
Ian Hendricksen, McGill University, Canada

J2.3 **09:00**
Updates on the Array of Long Baseline Antennas for Taking Radio Observations from the Seventy-ninth parallel
Lawrence Herman, McGill University, Canada

J2.4 **09:20**
Drone-Based Antenna Beam Calibration for ALBATROS
Christopher Barbarie, McGill University, Canada

J2.5 **09:40**
Recent Developments on the EIGSEP Experiment for 21-cm Global Signal Detection
Christian H. Bye, University of California, Berkeley, United States

J2.6 **10:00**
Pointing the South Pole Telescope with Machine Learning
Paul Chichura, Thomas Crawford, Alexandra Rahlin, University of Chicago, United States

J2.7 **10:20**
Beam Maps of the Canadian Hydrogen Intensity Mapping Experiment (CHIME) Measured with a Drone
William Tyndall, McGill University, Canada

J2.8 **10:40**
Using beam simulations to model mutual coupling in the MWA Phase II compact array
Katherine Elder, Daniel Jacobs, Arizona State University, United States

J2.9 **11:00**
Exploring the Crosstalk properties of the CHIME Telescope
Pranav Sanghavi, Laura Newburgh, Yale University, United States

J2.10 **11:20**
Dish Surface Characterisation for CHORD and HIRAX using Metrology and Electromagnetic Simulations
Aditya Krishna Karigiri Madhusudhan, McGill University, Canada

Friday, January 10 | 08:20 - 11:40
B3 | Room 1B40

Antenna Theory and Design

Session Co-Chairs: Hung Luyen, University of North Texas; Steven Weiss

B3.1 **08:20**
Monofilar Helix with Paraboloid Ground Plane
Gabriel Burdan, Jori Platt, Ljubodrag Boskovic, Dejan Filipovic, University of Colorado, Boulder, United States

B3.2 **08:40**
Implementation and Validation of a Novel SAR Imaging-Based Antenna Array Calibration
Duncan Madden, Kamal Sarabandi, The University of Michigan, United States

B3.3 **09:00**
Double-Layer Lightweight Linearly Polarized High-Gain Transmitarray Antenna Design at Ka-Band Based on Ultra-thin Kapton Membrane
Wenman Hu, Yahya Rahmat-Samii, University of California, Los Angeles, United States

B3.4 **09:20**
Reconfigurable Transmitarray Design with Generative Adversarial Network
Huy Nguyen, Sensong An, Hung Luyen, University of North Texas, United States

B3.5 **09:40**
Design of an HF Scimitar Antenna
Joseph Abroquah, Songyi Yen, Dejan Filipovic, University of Colorado Boulder, United States

B3.6 **10:00**
Verification of In-Situ Measurement of Antenna Transmission for Array Calibration and Directional Modulation
Jonathan Swindell, Adam Goad, Austin Egbert, Baylor University, United States; Benjamin Kirk, Alex Bouvy, DEVCOM Army Research Laboratory, United States; Charles Baylis, Robert Marks, Baylor University, United States

B3.7 **10:20**
A Reconfigurable 2-Bit-Phase-Shifting Reflectarray Antenna Utilizing Two PIN Diodes Per Unit Cell
Son Vu, Anh Vu, Hung Luyen, The University of North Texas, United States

B3.8 **10:40**
Antennas made from transparent conductive oxides require multiple optimization criteria
Bill Perkins, Dani Walters, Ryan Green, Mississippi State University, United States

B3.9 **11:00**
Design of an Electrically Small Circularly Polarized Spherical Folded Helix Antenna
Edward Wawrzynek, Songyi Yen, Dejan Filipovic, University of Colorado Boulder, United States

B3.10 **11:20**
CPW Fed 28/38 GHz Dual Band Metasurface Flexible MIMO Antenna for Wearable Applications
Jawad Ahmad, Galymzhan Nauryzbayev, Mohammad Hashmi, Nazarbayev University, Kazakhstan

Friday, January 10 | 10:00 - 10:20
Event | Engineering Lobby

Break

Friday, January 10 | 10:20 - 12:00
H4 | Special Session | Room 155

Active Experiments in Laboratory and Space Plasmas II

Session Chair: Erik M. Tejero, U.S. Naval Research Laboratory

H4.1 10:20
Analyzing Historical Langmuir Probe Data Using Modern Methods
Zoey Bigelow, Massachusetts Institute of Technology, United States; Geoffrey Andrews, Amoree Hodges, MIT Lincoln Laboratory, United States

H4.2 10:40
Plasma Impedance Tomography (PIT): Results of Measurement and Inversion Method
Matthew C. Paliwoda, Erik M. Tejero, George R. Gatling, U.S. Naval Research Laboratory, United States

H4.3 11:00
AERO: Remote Sensing of Auroral Radio Emissions from a Small Satellite Using Electromagnetic Vector Sensors
Philip Erickson, Mary Knapp, Lenny Paritsky, Frank Lind, Allan Weatherwax, Massachusetts Institute of Technology, United States; James LaBelle, Dartmouth College, United States

H4.4 11:20
Laser Induced Fluorescence Measurements of Flow Velocity in a Rotating Plasma Layer
Alexander Hyde, Erik Tejero, Bill Amatucci, Naval Research Laboratory, United States

H4.5 11:40
Plasma Impedance Probes and E Field Sensor Instabilities: Two Sides of the Same Coin
John Bonnell, Univ. of California, Berkeley, United States; Justin Bowman, West Virginia University, United States; Erik Tejero, Bill Amatucci, U.S. Naval Research Laboratory, United States; Katherine Goodrich, West Virginia University, United States

Friday, January 10 | 10:20 - 11:20
G10 | Special Session | Room 200

Studies of the Gannon Storm II

Session Chair: Romina Nikoukar, Johns Hopkins University Applied Physics Laboratory

G10.1 10:20
Ionospheric response During the 10-12 May 2024 Geomagnetic Storm and it's Connection to GICs
Bhagyashree Waghule, Delores Knipp, University of Colorado Boulder, United States

G10.2 10:40
Extreme Low Latitude Scintillation Structure Evolution
Charles Charles Rino, Charles Carrano, Theorodore Beach, Keath Groves, Boston College, United States

G10.3 11:00
Multi-Scale Estimation and Parameterization of Severe Storm Impacts at High Latitudes
Susan Skone, Emma Spanswick, University of Calgary, Canada

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

Twelfth Hans Liebe Lecture

Rydberg Atom-Based Sensors: "Transforming Measurements and Detection of Radio-Frequency Fields and Time-Varying Signals"

Christopher L. Holloway

National Institute of Standards and Technology

Friday, January 10 | 13:30 - 14:50
F7 | Special Session | Room 150

Remote Sensing and Spectrum Allocation for Small Satellites

Session Chair: Steven Reising, Colorado State University

F7.1 13:30
Development and Testing of the Prototype Configurable Reflectarray Wideband Scanning Radiometer (PT-CREWSR)
William Blackwell, Sonny Jeong, Cara Kataria, Vince Leslie, Adam Milstein, William Moulder, Michael Pieper, MIT Lincoln Laboratory, United States; Gabriel Rebeiz, University of California - San Diego, United States

F7.2 13:50
Realtime Geospatial Spectrum Sharing between Earth Exploration Satellite Services and Communication Networks via Geofencing of co-operative 5G/6G transmitters
Arvind Aradhya, Oren Collaco, Elliot Eichen, University of Colorado, Boulder, United States

F7.3 14:10
A Novel Radiometric Scene Generator for Reconfigurable Microwave Remote Sensing
Renish Thomas, Steven Reising, Colorado State University, United States; William Blackwell, Massachusetts Institute of Technology, United States; V. Chandrasekar, Malisa Abedin, Zayed Mohammad, Sharmin Farzana, Colorado State University, United States; Adam Milstein, Michael Pieper, Vincent Leslie, Massachusetts Institute of Technology, United States

F7.4 14:30
Space-borne Doppler Weather Radar Modeling for Radar Design Evaluation
Manoja Weiss, Sara Tucker, BAE Systems, Inc., United States

Friday, January 10 | 13:30 - 16:50
B10 | Special Session | Room 151

Reconfigurable Intelligent Surfaces for Sensing and Imaging

Session Chair: Georgios Trichopoulos, Arizona State University

B10.1 13:30
Nearfield Sensing and Imaging with a Millimeter Wave Reconfigurable Intelligent Surface
Daniel Lu, Aditya Shekhawat, Mohammed Aladsani, Georgios Trichopoulos, Arizona State University, United States

B10.2 13:50
Metasurface-Backed Luneburg Lens for Backscatter Data Exfiltration
Timothy Sleasman, Samuel Kim, Ra'id Awadallah, Avrami Rakovsky, David Shrekenhamer, Johns Hopkins University Applied Physics Laboratory, United States

B10.3 14:10
Reconfigurable Nonlocal Metasurface for Tunable Frequency, Quality-factor, and Geometric Phase
Yoshiaki Kasahara, The University of Texas at Austin, United States; Adam Overvig, Stevens Institute of Technology, United States; Gengyu Xu, Andrea Alù, The City University of New York, United States

B10.4 14:30
An Experimental Proof of Concept for Sensing Using Hybrid Reconfigurable Intelligent Surfaces
Idban Alamzadeh, Mohammadreza F. Imani, Arizona State University – Tempe, United States

B10.5 14:50
Reconfigurable Intelligent Surface-Assisted Beam Management for AI Signal Classification in mmWave Networks
Eyad Shtaiwi, George Sklivanitis, Dimitris Pados, Florida Atlantic University, United States

B10.6 15:10
Multi-Modal Sensing Aided RIS Communications
Tawfik Osman, Aditya Shekhawat, Ahmed Alkhateeb, Georgios Trichopoulos, Arizona State University, United States

B10.7 15:30
A Novel Computational Imaging Method Using Reconfigurable Intelligent Surfaces
Kavian Zirak, Mohammadreza F. Imani, Arizona State University, United States

B10.8 15:50
On RIS Bandwidth: Bandwidth Discussion and Trade-offs for a Dual Resonant, Dual Linearly Polarized Element
Benjamin Bradshaw, Miguel Saavedra-Melo, University of California, Irvine, United States; Satish Sharma, San Diego State University, United States; Filippo Capolino, University of California, Irvine, United States

B10.9 16:10
Novel 1-bit Hybrid Reconfigurable Intelligent Surface With Mitigated Quantization Lobe
Sajedeh Keshmiri, Mohammadreza F. Imani, Arizona State University, United States

B10.10 16:30
A Broadband Metasurface-Based Polarization Converter with Reconfigurable Characteristics for Intelligent Reflecting and Sensing Systems
Abu Hena Murshed, Ifana Mahbub, The university of Texas at Dallas, United States

Friday, January 10 13:30 - 14:50
H5 Special Session Room 155

Active Experiments in Laboratory and Space Plasmas III

Session Chair: Kyle Hrenyo, U.S. Naval Research Laboratory

H5.1 **13:30**
Direct comparisons of whistler mode excitation between an electric and loop dipole antenna in a laboratory plasma
Jesus Perez, UCLA, United States; Seth Dorfman, Space Science Institute, United States; Quinn Marksteiner, Los Alamos National Laboratory, United States; Patrick Pribyl, Basic Plasma Science Facility, United States; Troy Carter, Oak Ridge National Lab, United States; Gian Luca Delzanno, Los Alamos National Laboratory, United States

H5.2 **13:50**
Characterization of whistler mode waves launched by phased array high-μ core magnetic loop antennas
Kyle Hrenyo, William Amatucci, U.S. Naval Research Laboratory, United States; Konstantinos Papadopoulos, University of Maryland, United States

H5.3 **14:10**
Design and Study of a Transient Plasma Array with Static Magnetic Fields for Detection of Multispecies Interactions in Hypervelocity Impact Plasmas
Neilabjo Maitra, Nicolas Lee, Sigrid Elschot, Stanford University, United States

H5.4 **14:30**
Hunting for Electromagnetic Solitons in the Laboratory
Erik Tejero, Chris Crabtree, Ami DuBois, Jonathan Wargo, Bill Amatucci, Guru Ganguli, US Naval Research Laboratory, United States

Friday, January 10 13:30 - 15:10
GH5 Special Session Room 200

Ionospheric Modification I

GH5.1 **13:30**
Nonlinear HF Propagation in the Ionosphere above HAARP
Harrison Burch, Robert Moore, University of Florida, United States

GH5.2 **13:50**
Beneficial Impact of Rocket Engine Burns Over Ground VLF Transmitters for Radiation Belt Remediation
Paul Bernhardt, University of Alaska Fairbanks, United States; Jeff Baumgardner, Boston University, United States; Jacob Bortnik, University of California Los Angeles, United States; Bengt Eliasson, University of Strathclyde, United Kingdom; Andrew Howarth, univeristy of cal, Canada

GH5.3 **14:10**
Nonlinear Model Excitation by VLF Transmitters
Joshua Santos, Robert Moore, University of Florida, United States

GH5.4 **14:30**
VLF Scattering and Polarization at HAARP
James Camp, Robert Moore, University of Florida, United States

GH5.5 **14:50**
Improving the modeling of Artificial Periodic Inhomogeneities for the entire Ionosphere Regions
Brian La Rosa, David Hysell, Cornell University, United States

Friday, January 10 13:30 - 16:10
F4 Room 245

Models for Remote Sensing in Random Complex Media

Session Co-Chairs: Saba Mudaliar, Air Force Research Laboratory; Duncan Madden

F4.1 **13:30**
Scattering Coefficients of Forested Mountainsides at L Band
Can Suer, The George Washington University, United States; Daniel Breton, Cold Regions Research & Engineering Labs, United States; Roger Lang, The George Washington University, United States

F4.2 **13:50**
~~Estimation of Statistics of Long-Range Millimeter-Wave Propagation in Rain Based on Full-Wave Analysis~~
~~Kamal Sarabandi, Behzad Yektakhah, The University of Michigan, United States~~

F4.3 **14:10**
Off-axis laser-radiation detection using intensity interferometry: signal-to-noise ratio
elizabeth Bleszynski, marek Bleszynski, thomas Jaroszewicz, Monopole Reseacrh, Thousand Oaks, Ca91360, United States

F4.4 **14:30**
Solution of Radiative Transfer Equation for Plane-Parallel Medium Using a Discontinuous Galerkin Method and Adaptive Mesh Refinement
Md Ershadul Haque, Hang Wang, Abedi Reza, University of Tennessee Space Institute, United States; Mudaliar Saba, Air Force Research Laboratory, Wright-Patterson AFB, United States

F4.5 **14:50**
Detection and Statistical Modeling of the Effect of Mima Mounds on Bistatic Radar Scattering
Erik Hodges, James D. Campbell, Amer Melebari, University of Southern California, United States; Tianlin Wang, Jet Propulsion Laboratory, California Institute of Technology, United States; Joel T. Johnson, The Ohio State University, United States; Mahta Moghaddam, University of Southern California, United States

F4.6 **15:10**
Measurement of Extinction Rate of Waves Propagating through Heterogeneous Media
Saba Mudaliar, Air Force Research Laboratory, United States

F4.7 **15:30**
Enhanced Adaptive Learning Model for Accurate Dual-Polarization Radar Rainfall Mapping
Liangwei Wang, Haonan Chen, Colorado State University, United States

F4.8 **15:50**
Radar Beam Blockage Correction for Improved QPE over Complex Terrain
Songjian Tan, Haonan Chen, Colorado State University, United States

Friday, January 10 13:30 - 15:10
J6 Special Session Room 265

DSA-2000

Session Co-Chairs: Francois Kapp, Caltech; Katie Jameson, Caltech

J6.1 **13:30**
DSA-2000 System Overview
Francois Kapp, Caltech, United States

J6.2 **13:50**
Design and Performance of the DSA-2000 Antennas
David Woody, Caltech, United States; Matt Fleming, Minex Engineering Corp., United States

J6.3 **14:10**
DSA-2000 Feed and Antenna System Performance
Jonas Flygare, Caltech Owen's Valley Radio Observatory, United States

J6.4 **14:30**
The Design of an Ultra Low-Noise, Ambient-Temperature Amplifier for the DSA-2000 using Automatic Differentiation
Kiran Shila, Caltech, United States

J6.5 **14:50**
The DSA-2000 Radio Camera
Martin Pokorny, California Institute of Technology, United States

Friday, January 10 13:30 - 15:10
B12 Special Session Room 1B40

Spectrum Management and Secure Communications

Session Co-Chairs: John Volakis, Florida International University; Satish Sharma, San Diego State University

B12.1 **13:30**

Unambiguous Phase Modulation Approach for SDR LPD Waveforms

Arnaldo Sans, John Willis, John Volakis, Satheesh Venkatakrishnan, Florida International University, United States; Wilfredo Rivas-Torres, Keysight Technologies, United States

B12.2 **13:50**

Wideband Dual-Circularly Polarized Phased Array Antenna using a Novel Radiating Element for Ku-band SATCOM Applications

Nhat Truong, Sanghamitro Das, Satish Sharma, San Diego State University, United States; Jia-Chi Chieh, Raif Farkouh, Naval Information Warfare Center Pacific, United States; Gabriel Rebeiz, University of California San Diego, United States

B12.3 **14:10**

The Computational Burden of Next-Gen Terahertz SDR and Algorithmic Paths for Solutions

Arjuna Madanayake, Florida International University, United States; Renato Cintra, Universidade Federal de Pernambuco, Brazil; Yasaman Ghasempour, Princeton University, United States; Josep Jornet, Northeastern University, United States

B12.4 **14:30**

Efficient Use of the Frequency Spectrum and Secure Communications in Consideration to Antenna Design

Satish Sharma, San Diego State University, United States

B12.5 **14:50**

Networked AI for Detection Classification and Localization of RF Signal Emitters

Jose Viloria, George Sklivanitis, Dimitris Pados, Florida Atlantic University, United States; Elizabeth Bentley, Air Force Research Laboratory, United States

Friday, January 10 15:10 - 15:30
Event Engineering Lobby

Break

Friday, January 10 15:30 - 17:10
F9 Special Session Room 150

NASA Investigation of Convective Updrafts (INCUS) Earth Venture Mission-3

Session Co-Chairs: V. Chandrasekar, Colorado State University; Brenda Dolan, Colorado State University; Steven Reising, Colorado State University

F9.1 **15:30**

Storm Chasing with the INCUS Mission

Susan van den Heever, Colorado State University, United States; Ziad Haddad, Simone Tanelli, Derek Posselt, Jet Propulsion Laboratory, California Institute of Technology, United States; Kristen Rasmussen, Colorado State University, United States; Graeme Stephens, Jet Propulsion Laboratory, California Institute of Technology, United States; Rachael Auth, Jennie Bukowski, Amy Burzynski, Randy Chase, Brenda Dolan, Colorado State University, United States; Sean Freeman, University of Alabama in Huntsville, United States; Patrick Gatlin, NASA Marshall Space Flight Center, United States; Leah Grant, Colorado State University, United States; George Huffman, NASA Goddard Space Flight Center, United States; Pavlos Kollias, State University of New York at Stony Brook, United States; Gabrielle Leung, Colorado State University, United States; Zhengzhao Luo, City College of New York, United States; Gerald Mace, University of Utah, United States; Peter Marinescu, Colorado State University, United States; Mary Morris, Jet Propulsion Laboratory, California Institute of Technology, United States; Philip Partain, Colorado State University, United States; Walter Petersen, NASA Marshall Space Flight Center, United States; Sai Prasanth, Jet Propulsion Laboratory, California Institute of Technology, United States; Steven Reising, Richard Schulte, Colorado State University, United States; Courtney Schumacher, Texas A&M, United States; Itinderjot Singh, Colorado State University, United States; Rachel Storer, University of California Los Angeles, United States; Ousmane Sy, Hanii Takahashi, Jet Propulsion Laboratory, California Institute of Technology, United States

F9.2 **15:50**

Quantifying Uncertainty in Space-Borne Radar Estimates of Cloud and Precipitation Properties

Derek Posselt, Rachel Storer, Jet Propulsion Laboratory, United States; Rick Schulte, Randy Chase, Colorado State University, United States; Ousmane Sy, Simone Tanelli, Jet Propulsion Laboratory, United States; Susan van den Heever, Colorado State University, United States

F9.3 **16:10**

Potential Contributions of the Dynamical Microwave Radiometer on the INCUS Mission based on the Scientific Achievements of the TEMPEST-D and TEMPEST-H8 Missions

Steven Reising, V. Chandrasekar, Chandrasekar Radhakrishnan, Colorado State University, United States; Shannon T. Brown, NASA/Caltech Jet Propulsion Laboratory, United States

F9.4 **16:30**

A Principal Component Analysis of Convective Environments, and their Relationship to Satellite-observed Storm Characteristics

Richard Schulte, Colorado State University, United States; Randy Chase, Cooperative Institute for Research in the Atmosphere, United States; Brenda Dolan, Colorado State University, United States; Sean Freeman, University of Alabama in Huntsville, United States; Peter Marinescu, Colorado State University, United States; Derek Posselt, Jet Propulsion Laboratory, United States; Kristen Rasmussen, Susan van den Heever, Colorado State University, United States

F9.5 **16:50**

Testing INCUS Methods Experiment – Suborbital preLaunch Investigation of Convective Evolution (TIME-SLICE)

Brenda Dolan, Kristen Rasmussen, Colorado State University, United States; Pavlos Kollias, Stony Brook University, United States; Ed Luke, Brookhaven National Lab, United States; V Chandrasekar, Ivan Arias Hernandez, Colorado State University, United States; Bernat Treserras, McGill University, United States; Susan van den Heever, Rachael Auth, Chelsea Bekenmeier, Jennie Bukowski, Randy Chase, Zoe Douglas, Nick Falk, Megan Franke, Colorado State University, United States; Sean Freeman, University of Alabama Huntsville, United States; Brody Fuchs, WeatherFlow-Tempest, United States; Patrick Gatlin, NASA Marshall, United States; Paul E Johnston, NOAA Physical Science Laboratory, United States; Tom Juliano, Yoonjin Lee, Isabel Maloney, Gabrielle Leung, Peter Marinescu, Allie Mazurek, Jyong-En Miao, Christine Neumaier, Angelie Nieves Jimenez, Colorado State University, United States; Walter Petersen, NASA Marshall Space Flight Center, United States; Derek Posselt, Jet Propulsion Laboratory, United States; Charlie Remmers, Richard Schulte, Colorado State University, United States; Courtney Schumacher, Texas A & M, United States; Julia Shates, Jet Propulsion Laboratory, United States; Lexi Sherman, I. T. Singh, Alyssa Stansfield, Colorado State University, United States; Simone Tanelli, Jet Propulsion Laboratory, United States; Daniel Veloso-Aguila, Ines Vongpaseut, Colorado State University, United States; Christopher Williams, University of Colorado, United States; David Wolff, NASA Wallops Flight Facility, United States

Friday, January 10 15:30 - 16:30
GH6 Special Session Room 200

Ionospheric Modification II

GH6.1 **15:30**

Multi-wave generation studies using beat mode excitation at HAARP

Stan Briczinski, Vladimir Sotnikov, Carl Siefring, US Naval Research Lab, United States; Robert Moore, Harrison Burch, University of Florida, United States; Paul Bernhardt, Mike McCarrick, University of Alaska Fairbanks, United States

GH6.2 **15:50**

Broadband Scattering from the HAARP-Disturbed D-Region Ionosphere

Jeremiah Lightner, Morris Cohen, Georgia Institute of Technology, United States

GH6.3 **16:10**

Mapping the Spatial Distribution of the Auroral Electrojet at HAARP

Logan Musante, Harrison Burch, Robert Moore, University of Florida, United States

Friday, January 10 15:30 - 17:10
J3 Room 265

New Telescopes, Techniques, and Technologies III

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

J3.1 **15:30**
F-Engine Development Towards a CHORD Pathfinder Array
Ian Hendricksen, McGill University, Canada

J3.2 **15:50**
Nanosecond Differential Timing Using Inexpensive Differential GNSS Receivers
Benjamin Godfrey, Wei Liu, Nico Rault-Wang, Jonathon Kocz, Dan Werthimer, University of California, Berkeley, United States

J3.3 **16:10**
Holographic Beam Mapping for CHIME: Current Status and Future Directions
Alex Reda, Yale University, United States

J3.4 **16:30**
Validation of EDGES software suite using 10 days of EDGES-3 data
Akshatha Vydula, Arizona State University, United States

J3.5 **16:50**
A Digital Calibration Source for 21 cm Cosmology Telescopes
Kalyani Bhopi, West Virginia University, United States; Will Tyndall, Morgan Cole, Mallory Helfenbein, Yale University, United States; Kevin Bandura, West Virginia University, United States; Laura Newburgh, Yale University, United States

Friday, January 10 15:30 - 17:10
B11 Special Session Room 1B40

Reflectarrays and Reconfigurable Apertures

Session Chair: John Volakis, Florida International University

B11.1 **15:30**
Bandwidth increase of active reflectarrays
Malak Elaouinate, Christos Exadaktylos, Anastasios Koutinos, Konstantinos Zekios, Stavros Georgakopoulos, Florida International University, United States

B11.2 **15:50**
Experimental Generation of Biasing Voltage Distribution along a RIS by Using Standing Wave Control
Miguel Saavedra-Melo, Benjamin Bradshaw, Filippo Capolino, University of California, Irvine, United States

B11.3 **16:10**
Design of an Antenna Synthesis Algorithm for Application with a Reconfigurable Phased Array
Luke Mello, Justin Roessler, Austin Egbert, Charles Baylis, Robert Marks, Baylor University, United States; Alex Bouvy, Benjamin Kirk, Army Research Laboratory, United States; Dimitrios Peroulis, Purdue University, United States

B11.4 **16:30**
Robust Reflectarray Healing Enabled by Adjoint Optimization
Ryan J Chaky, Dongha Yang, Sawyer D Campbell, Galestan Mackertich-Sengerdy, Pingjuan L Werner, Douglas H Werner, The Pennsylvania State University, United States

B11.5 **16:50**
High-Power Dual-Polarized Reconfigurable Reflectarray with All-Metal Antenna and Stacked Phase Shifters
Muhammad Mubasshir Hossain, Tatiana Valera, Satheesh Bojja Venkatakrishnan, John L. Volakis, Florida International University, United States

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