USNC-URSI National Radio Science Meeting

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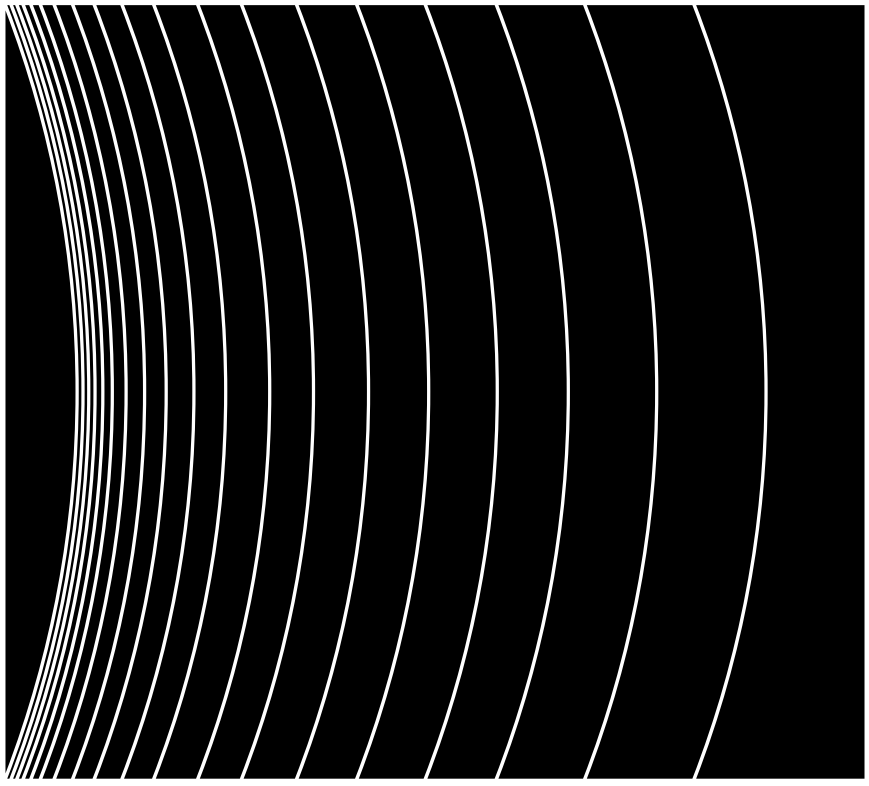

6–9 January 2026

Boulder, Colorado, USA

Sponsored by the US National Committee for the
International Union of Radio Science
and the United States Foundation for Radio Science

Limelight Boulder Hotel

www.nrsmboulder.org

UNITED STATES NATIONAL COMMITTEE
INTERNATIONAL UNION OF RADIO SCIENCE

National Radio Science Meeting
6–9 January 2026
Limelight Boulder Hotel

Meetings and Events Overview

TUESDAY, 6 January

08:30 – 11:30	NRSM Short Courses – Morning Session
	"Brief INCOMPLETE History of Radar"
	"Invex Optimization for Signal/Image Processing and Machine Learning"
13:00 – 16:00	NRSM Short Course and Workshops – Afternoon Session
	"The Ionosphere is a Tool: A Short Course on Data Assimilative Ionosphere Modeling"
	"Spectrum Management for Radio Scientists"
	"Wireless Power Transfer for Implanted Biomedical Devices"
17:00 – 20:30	USNC-URSI Business Meeting - Invitation Only

WEDNESDAY, 7 January

08:20 – 11:15	Plenary Session	
	08:20 – 08:40	Welcome, Introductions, and USNC-URSI, USFRS, & NASEM Updates
	08:40 – 09:35	Dr. Mickey Batson, IARPA
	09:35 – 10:00	USNC-URSI Awards
	10:00 – 10:20	Break (regular coffee, decaf coffee, hot tea, and water)
	10:20 – 11:15	Dr. Paul Ransom, OSM
11:30 – 12:55	Student Mentoring Luncheon (Lunch provided for all students, commission chairs, and USNC-URSI Officers)	
13:10 – 14:50	Student Paper Competition Finalist Presentations	
14:50 – 15:10	Break (regular coffee, decaf coffee, hot tea, iced tea, and water)	
15:10 – 17:10	Technical Sessions	
17:15 – 18:15	Commission Business Meetings (A, C/E, F, G, J)	
18:30 – 20:00	Welcome Reception & SPC Awards	

THURSDAY, 8 January

08:20 – 12:00	Technical Sessions
10:00 – 10:20	Break (regular coffee, decaf coffee, hot tea, and water)
10:20 – 12:00	Technical Sessions
12:10 – 13:10	Women in Radio Science (WIRS) Business Meeting
13:20 – 15:00	Technical Sessions
15:00 – 15:20	Break (regular coffee, decaf coffee, hot tea, iced tea, and water)
15:20 – 17:20	Technical Sessions
17:25 – 18:25	Commission Business Meetings (B, D, H, K)
18:30 – 20:00	WIRS Reception

FRIDAY, 9 January

06:30 – 08:00	USNC–URSI Executive Council Meeting – Invitation Only
08:20 – 10:00	Technical Sessions
10:00 – 10:20	Break (regular coffee, decaf coffee, hot tea, and water)
10:20 – 12:00	Technical Sessions
12:15 – 13:05	Thirteenth Hans Liebe Lecture
13:20 – 15:00	Technical Sessions
15:00 – 15:20	Break (regular coffee, decaf coffee, hot tea, iced tea, and water)
15:20 – 17:00	Technical Sessions

2026 USNC-URSI National Radio Science Meeting

Tuesday, 6 January	08:30–11:30	**Short Courses** **"Brief INCOMPLETE History of Radar" (Meadows B)** **"Invex Optimization for Signal/Image Processing and Machine Learning" (Meadows A)**								
	13:00–16:00	**Short Course and Workshops** **"The Ionosphere is a Tool: A Short Course on Data Assimilative Ionosphere Modeling" (Meadows A)** **"Spectrum Management for Radio Scientists" (Meadows B)** **"Wireless Power Transfer for Implanted Biomedical Devices" (Meadows C/D)**								
	17:00–20:30	**USNC–URSI Business Meeting – Invitation Only (Bear Peak)**								
Time [MST] \ Room		**Trailhead**	**Flatirons 1**	**Flatirons 2**	**Meadows C/D**	**Flatirons 4**	**Meadows A**	**Meadows B**	**Flatirons 3**	**Bear Peak**
Wednesday, 7 January	08:20–11:15	**Plenary Session (Flatirons 1)**								
	11:30-12:55	**Student Mentoring Luncheon (Flatirons 2)**								
	13:10-14:50	**Student Paper Competition Finalist Presentations (Flatirons 1)**								
	15:10–17:10	C1: AI/ ML and Software-Defined EM Systems		F1*: Recent Advances in RF Ducting Research I	H1*: Quantum Inspired Methods in Plasma Wave Dynamics	G1: Radar and Radio Techniques	F2*: Impact of RFI on Earth Observation and Remote Sensing Applications	J1: Radio Astronomy from the Moon	B1: Electromagnetic Theory and Education	A1: Antennas
	17:15–18:15	Commission C/E				Commission G	Commission F	Commission J		Commission A
	18:30–20:00	**Reception and SPC Awards (Flatirons 1)**								

Time [MST] \ Room		Trailhead	Flatirons 1	Flatirons 2	Meadows C/D	Flatirons 4	Meadows A	Meadows B	Flatirons 3	Bear Peak
Thursday, 8 January	08:20–10:00	C2*: RFI in Complex Systems	CF3*: Special Session in Memory of Prof. V. N. Bringi I	F7: Microwave Remote Sensing of the Earth I	GH2*: Space Weather I	G3: Ionospheric Modeling and Data Assimilation I	H2: Waves in Space and Laboratory Plasmas	J2*: AI/ ML in Radio Astronomy	[08:00] B2*: Analytical and Numerical Methods in EM Theory and Applications - In Memory of Chalmers M. Butler	A2: Microwave Standards and Applications
	10:20–12:00			F8: Microwave Remote Sensing of the Earth II	GH4*: Space Weather II	G5: Ionospheric Modeling and Data Assimilation II	H3: Wave-Wave and Wave-Particle Interactions			A3*: Atomic Radio Frequency Sensing
	12:10–13:10	**Women in Radio Science (WIRS) Business Meeting (Flatirons 1)**								
	13:20–15:00	KB1*: Wearable Antennas	CF4*: Special Session in Memory of Prof. V. N. Bringi II	H4: Space as a Research Laboratory	H5*: Physics of the Radiation Belts I	G6: Ionospheric Modeling and Data Assimilation III	F4: Point-to-Point Propagation Effects	J3: New Telescopes, Techniques and Technologies I	B3: Intelligent Devices and Complex Systems	ABF4*: Quantum Technology Applications
	15:20–17:20		B4*: Non-LTI Electromagnetics - Progress, Challenges and Opportunities	D1: Electronics and Photonics	H6*: Physics of the Radiation Belts II	F5: Atmospheric Remote Sensing	F6*: Recent Advances in RF Ducting Research II			
	17:25–18:25	Commission K		Commission D	Commission H				Commission B	
	18:30–20:00			**WIRS Reception (Game Room [The Den])**						

Time [MST] \ Room		Trailhead	Flatirons 1	Flatirons 2	Meadows C/D	Flatirons 4	Meadows A	Meadows B	Flatirons 3	Bear Peak
Friday, 9 January	06:30–08:00	**USNC–URSI Executive Council Meeting – Invitation Only (AJAX Restaurant Private Dining Room)**								
	08:20–10:00	K2*: Safety Standards, SAR and Thermal Analysis	B5*: Antennas for Novel Platforms and RIS	C5: Software-Defined and Cognitive Radio/Radar/Sensing	GH7*: Meteors, Orbital Debris and Dusty Plasmas III	G8*: Ionospheric Storms I	F3: Random Media Models for Remote Sensing and Propagation	J4*: Water Vapor Radiometry Strategies for Earth Atmosphere Sensing	B6: Propagation, Scattering and Sensing	B7*: New Applications Enabled by Intelligent Surfaces in Future Wireless Networks
	10:20–12:00				H7*: Laboratory and Space Plasmas I	G9*: Ionospheric Storms II		J5: New Telescopes, Techniques and Technologies II		
	12:15–13:05	**Thirteenth Hans Liebe Lecture (Flatirons 1)**								
	13:20–15:00	K3: Electromagnetic Imaging, Sensing and Biomedical Wireless Devices	B8: Antenna, Theory, and Design	E1: Systems, Interference Analysis, and Sensors	H8*: Laboratory and Space Plasmas II	G10*: Active Experiments	GH11*: Meteors, Orbital Debris and Dusty Plasmas I	J6*: RFI Challenges and Innovations in Radio Astronomy	B9*: Advanced Modeling Techniques and Algorithms in Computational Electromagnetics	H9*: Ionospheric Modification I
	15:20–17:00	B10*: Multifunctional Antennas and Arrays for Satellite and Wireless Communications			H10*: Laboratory and Space Plasmas III	G12*: TIDS and TADS	GH13*: Meteors, Orbital Debris and Dusty Plasmas II		B11: Numerical Methods	H11*: Ionospheric Modification II

* 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 and USFRS

The U.S. National Committee for URSI (USNC–URSI) is appointed by the National Academies of Sciences, Engineering, and Medicine (NASEM), 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 in July.

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.

The United States Foundation for Radio Science (USFRS) was established in August 2025 to assume financial oversight of USNC-URSI meetings described above. This was necessary due changes in the National Science Foundation (NSF) that resulted in NASEM being no longer able to manage the financial aspects of these meetings. For more information about USFRS, please visit usfrs.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 2026 NRSM

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Invited Speakers

Plenary Session

Remote Observation and Sensing of ElectroMagnetic Anomalies (ROSEMAry)

Dr. Mickey Batson
Intelligence Advanced Research Projects Activity (IARPA)

Abstract: Better understanding of the atmosphere depending on input parameters such as the solar zenith angle, continues to advance, however, characterizing the physics and chemical properties of the 50 - 100 km part of the atmosphere is a difficult task. The ROSEMAry Team will explore the critical process of guiding this investigation.

We will specifically consider how integration of transient energetic events like lightning discharges, meteors, etc., may affect the electrochemistry and energy balance in the 50 - 100 km part, of the atmosphere and could lead to better prediction of propagation.

Approximately, 44,000 tons of meteoritic debris collides, with the earth, on a daily basis. Nearly, all that material is vaporized, in the atmosphere, leading to well defined metallic layers between about 85 and 105 km altitude. These dense temporary clouds, also called sporadic E Layers, significantly impact radio communication and navigation systems. They also couple, with atmospheric winds and tides, linking the troposphere and mesosphere with the ionosphere, allowing lightning discharges, to impact, the metallic layers above. But meteors may have other impacts, including contributing, to the overall energy balance, in the earth-ionosphere system. After nearly 100 years, of investigation, there is still a lack of scientific consensus on the existence, of meteor EM emissions and their impact. Our focus, in ROSEMAry is to analyze data, from global research grade ELF/VLF receiver stations, with thermal and optical images and determine, if and how meteors interact, with the ionosphere plasma, to produce low frequency emissions and how such emissions could advance our understanding, of ionosphere processes.

Biographical Sketch: Dr. Mickey Batson joined IARPA in March 2024. In his current assignment as a Program Manager, Dr. Batson focuses on areas of scientific research that includes electromagnetics, ionosphere geophysics, ionosphere chemistry, and plasma physics.

Prior to joining IARPA, Dr. Batson worked as a research engineer at the NSA Laboratory for Telecommunication Sciences from 2013 to 2024. While there, he investigated electromagnetic anomalies occurring within the ionosphere and researched and supported propagation modeling efforts for low frequencies.

Dr. Batson graduated from the Naval Postgraduate School with a doctorate in electrical engineering and a master's degree in communications engineering.

Plenary Session

Unlocking the Spectrum: How Policy and Innovation Can Deliver Spectrum Access for All

Dr. Paul Ransom
Office of Spectrum Management

Abstract: As global demand for wireless connectivity continues to surge, the way we manage and use the radio frequency spectrum is entering a period of rapid change. This keynote will explore the critical role of the National Telecommunications and Information Administration (NTIA) and its Office of Spectrum Management (OSM) in guiding this transformation.

We'll look ahead to the studies required under the **One Big Beautiful Bill Act**, outlining their goals and the potential impact they could have on future spectrum policy. While these studies are still in the planning stages, they represent a pivotal opportunity to shape how spectrum is accessed and shared in the years to come.

A particularly exciting area of innovation is the rapid commercialization of space-based communications. With a renewed regulatory focus on space-streamlining satellite licensing, updating orbital debris rules, and opening up vast swaths of satellite spectrum-new services are emerging that promise to reshape global connectivity. Among the most promising is direct-to-device (D2D) satellite service, which is already enabling basic emergency communications and messaging

directly to consumer smartphones. These early offerings, driven by partnerships between mobile and satellite operators, are expected to expand dramatically, bringing us closer to a future where seamless, global, device-level connectivity is a reality. Finally, we'll highlight the importance of dynamic sharing and integration of artificial intelligence and machine learning and how these innovations are opening new possibilities.

Biographical Sketch: Dr. Paul Ransom is the Acting Chief of the Strategic Planning Division in the Office of Spectrum Management, the Division and Office of Spectrum Management lead national efforts to shape the future of spectrum policy and planning. He currently chairs the Spectrum Relocation Fund Technical Panel, a congressionally mandated body that approves funding for spectrum research and engineering studies aimed at improving the effectiveness and efficiency of federal spectrum use. The panel also ensures federal spectrum transition plans support auction timelines, promote relocation or sharing of spectrum, and enable the recovery of federal investments.

Dr. Ransom served as the technical lead for the 2024 National Spectrum Strategy and Implementation Plan, a landmark initiative that reflects his leadership and deep expertise in spectrum management. Since joining the division in 2020, he has played a central role in federal spectrum repurposing efforts and serves as the NTIA liaison to the National Science Foundation's Spectrum Innovation Initiative, supporting research and innovation in advanced spectrum technologies.

With over 20 years of federal service, Dr. Ransom brings a wealth of experience across defense, science, and telecommunications domains. He began his career at the Naval Surface Warfare Center in Bethesda, Maryland, conducting advanced research in electromagnetic materials for radar cross section (RCS) reduction and performing both field and laboratory RCS measurements. He later served as a Program Officer at the Office of Naval Research in the Sea Weapons and Warfare Department (now the Advanced Naval Platforms Department), and as Chief Technologist in NOAA's Radio-Frequency Interference Monitoring System Project Management Office, supporting the National Environmental Satellite, Data, and Information Service.

Dr. Ransom holds a B.S. in Electrical Engineering from Southern University and A&M College, an M.S. in Electrical and Computer Engineering from Georgia Tech, and a Ph.D. in Electrical and Computer Engineering from the Catholic University of America.

Thirteenth Liebe Lecture

It all Started with Hans Liebe's MPM: 30 years Measuring the Atmospheric MM/SMM Spectrum from High and Dry Astronomical Sites

Dr. Juan Pardo
Spanish National Research Council
Madrid, Spain

Abstract: Although millimeter-wave astronomy had started two decades earlier, at the beginning of my career in the 1990s new ground-based telescopes were being placed at higher and drier sites to access new frequencies that would widen the range of molecules and physical conditions that could potentially be explored in the Universe. In between the telescope and the outer space there is the terrestrial atmosphere, with its own molecules, affecting the observations in a particularly dramatic way. The new telescopes, operating even at submillimeter wavelengths for the first time, needed an accurate atmospheric radiative transfer model, for both scheduling and calibration.

As a young Ph. D. student at Yebes Observatory in Spain, part of the Germany-France-Spain consortium called Institute de Radioastronomie Millimétrique (IRAM) that was operating an outstanding 30 meter telescope at Pico Veleta (Granada, Spain) and an interferometer at Plateau de Bure (France), I started working on the atmospheric radiative transfer models that were used for those telescopes. Some of the firsts papers that I read in my career were those by Prof. Hans Liebe describing his MPM model, outstanding pieces of literature that still are of basic reference today. It all started with those papers and, for more than 30 years now, I have been working on measuring the mm/submm atmospheric spectrum with state-of-the-art experiments in order to fine tune the atmospheric radiative transfer models used by the observatories,

specially the Atacama Large Millimeter Array (ALMA) located at the 5000 m high Llano the Chajnantor in Chile which, with its 66 antennas, is the leading instrument in mm/submm astronomy.

In this lecture, I will present the exciting experiments in which I had the chance to take part over the years that contributed to make progress on our knowledge of the mm/submm atmospheric spectrum. They include the first ground-based measurements of the atmospheric Zeeman splitting in an isotopologue of molecular oxygen, carried out with a small (2.5 m) radiotelescope at Plateau de Bure (France); ground-based 200-1600 GHz measurements of the atmospheric spectrum from Mauna Kea (Hawai'i); and the recent and not completely published 157-752 GHz study of the atmospheric spectrum at kHz resolution from Llano de Chajnantor (Chile). The quality of the spectra obtained in this last experiment makes it, in my opinion, perfect to honor Prof. Hans Liebe, with whom it all started.

Biographical Sketch: Dr. Pardo is a Research Scientist at the Spanish National Research Council. He obtained his Ph. D. at Paris Pierre et Marie Curie University in 1996, being based at Paris Observatory, an institution for which he is still today an associated scientist. He also spent five years working in the United States for prestigious institutions such as NASA, Columbia University and the California Institute of Technology. During his 30 years long career he has applied molecular spectroscopy to both astronomy and terrestrial remote sensing research, with and evident synergy among the two fields. His mm/submm atmospheric radiative transfer codes, based on state-of-the-art experiments, are used by some of the most important observatories operating at those wavelengths worldwide such as the Atacama Large Millimeter Array (ALMA) in Chile, or the telescopes of the Institute de Radioastronomie Millimétrique (IRAM) in France and Spain. Besides science, Dr. Pardo has served as Councilor for Culture for 16 years in his 1700 inhabitants hometown (Fuentealbilla, Spain) where he has organized over 700 performing arts events, including several operas.

Short Courses and Workshops

Short Course

Brief INCOMPLETE History of Radar

Eric Mokole

In this short course, a brief and incomplete history of radar from publicly accessible resources is presented. The discussion is divided into 5 time periods (1865-1930, 1930-1945, 1945-1992, 1992-2007, 2007-present). No individual or nation has had access to all historical information, because such knowledge was (and often still is) considered sensitive with regard to each country's national security and was withheld from publicly releasable venues. Historically, radar-enabling technological developments often occurred simultaneously and independently in different countries, unbeknownst to the other countries. The 1865-1930 segment discusses the theoretical and experimental foundations of radar (radar pre-history). The date 1865 corresponds Maxwell's publication, "A dynamical theory of the electromagnetic field." During the second period (1930-1945), serious developments of operational radars that were secretly initiated in many countries simultaneously and independently in anticipation of World War II (WWII) are discussed. The period (1945-1992) covers Post WWII to the dissolution of the Soviet Union and witnessed the Cold War, the space race, and publication of theoretical concepts that put radar design on a better quantitative foundation. From 1945-1950, progress in radar technology slowed considerably and radar innovation plateaued, because efforts focused principally on WWII developments like monopulse-tracking, moving-target-indication, and phased-array radars. Military and civilian radar developments significantly increased, with widespread use in meteorology, air traffic control, aviation, planetary observation, etc. Major improvements were achieved through significantly better signal-processing software/hardware. Some new radar types were invented (SAR, ISAR, space, ultrawideband). The period 1992-2007 corresponds roughly to the advent of 2nd generation (2G) digital cellular technology; much of its technology base, hardware miniaturization, and increased computer memory/speed formed the foundation for waveform-diverse systems like digital array radar, software- defined radar, micro-Doppler, joint RF functionality, and multifunctional radar. The start of the period from 2007-present is arbitrarily chosen to reflect the beginning of the tremendous growth of bandwidth-intensive communication applications. Discussed topics include spectrum EMC, spectral harmony, RF convergence,

distributed systems, and notions of software-defined and cognitive radars. Two final sections present closing observations and an extensive set of references.

Course Outline

- Introduction: Broad-brush top-level approach, chronological approach during 5 time periods, and introductory comments
- Time Period 1: Radar Prehistory (1865-1930) Theoretical and experimental foundation of radar, notions of radar, first operational radar
- Time Period 2: Earliest Radar Developments (1930-1945) Origin of name radar, explosive development of radars through national efforts, important technological enablers (multicavity resonant magnetron, duplexer, monopulse, plan position indicator, identification of friend or foe, chaff, radar range equation, etc.), corresponding ECM and ECCM efforts
- Time Period 3: Post WWII to Dissolution of Soviet Union (1945-1992) Commercial radars, SAR, ISAR, phased arrays, space radar, UWB technology
- Time Period 4: Telecommunication Explosion Era I (1992-2007) Digital array radar, software-defined radar, micro-Doppler, multifunctional radar, waveform diversity, hardware miniaturization, increased computer memory and speed, onset of spectrum loss by non-communication RF users to communications
- Time Period 5: Telecommunication Explosion Era II (2007-Present: Spectrum EMC / spectral harmony / RF convergence distributed systems, further software-defined and cognitive radar notions, numerous space systems
- Future Directions: Simultaneous transmit and receive (STAR), multifunctional RF, smaller lower-power distributed/multistatic radar, multi-modal systems, multi-modal ontological approach, iterative time-reversal radar, THz radar, cognitive RF
- Closing Comments: Radar-relevant IEEE societies and non-IEEE organizations, decrease of high-power monolithic systems, top-level radar block diagram, breadth/depth of radar design commentary, etc
- References: Some important references will be provided

Biographical Sketch: Eric Mokole (Life Fellow IEEE, MSS Fellow, URSI Senior Member) received the B.S. in applied mathematics from New York University in 1971, the M.S. in mathematics from Northern Illinois University in 1973, and the M.S. in physics, the M.S. in applied mathematics, and the Ph.D. in mathematics from Georgia Institute of Technology in 1976, 1978, and 1982, respectively. In 2017, he joined The MITRE Corporation, McLean VA USA, from which he retired in December 2021. He was on the technical staff of the Sensors, Electromagnetics & EW Department of the MITRE Corporation, where he was the MITRE Lead to the Sensors and Processing Community of Interest (CoI) of the U.S. Under Secretary of Defense for Research and Engineering (USD(R&E)). From 2015-2017, he did volunteer work for the IEEE AP-S and AES-S. In 2014 he retired from the U.S. Naval Research Laboratory (NRL), Washington DC, after 32 years (1986-2014) of conducting and leading radar-related R&D and system analyses for existing and proposed U.S. Navy radars on spaceborne, airborne, shipboard, expeditionary-based, and ultrawideband platforms. At NRL, he was employed in various roles by the Radar Division. From 2001-2005, he was Head of the Surveillance Technology Branch. From 2005-2008, he was Acting Superintendent of Radar. From 2008-2014, he resumed Branch-Head duties until retirement in 2014. From 1983-1986, he worked for the Electronic Warfare Division of the Naval Intelligence Support Center, Washington DC.

Published over 105 conference papers, journal articles, book chapters, and reports and is coeditor/coauthor of 5 books. Some Past/Present Professional Activities: IEEE [AP-S, AES-S, EMC-S, GRS-S, MTT-S, Sensors Council, AES-S Radar Systems Panel (Member, Chair), AP-S (past AdCom, past NTDC Chair, past SIGHT Vice Chair, Standards Committee)]; USNC-URSI [Commission C Chair/Vice Chair/Secretary, Commission E Secretary]; NATO Sensors and Electronics Technology Panel [US Member (2006-2014), Vice Chair (2009-2011), Chair (2011-2014)]; U.S. Navy Lead for Tri-Service Radar Symposia of Military Sensing Symposia (MSS) (2005-2014); Member of Office of Science and Technology Policy (OSTP) Team and America's Mid-Band Initiative Team for assessing release 100 MHz from 3450-3550 MHz for 5G (2020); Member of Radar Spectrum and Technology Working Group (2004).

Short Course

Invex Optimization for Signal/Image Processing and Machine Learning

Samuel Pinilla, Rutherford Appleton Laboratory, United Kingdom
Kumar Vijay Mishra, United States DEVCOM Army Research Laboratory

This short course provides an accessible introduction to invex optimization from a signal processing perspective. While convex formulations are widely used due to their guarantees of global optimality, they rely on idealized assumptions-such as noiseless measurements and precisely modeled priors-that often do not hold in real-world scenarios. In practice, measurement noise is pervasive, and convex regularizers may inadequately capture key data properties like sparsity, low-rankness, smoothness, or anomalies. Although non-convex constrained optimization methods often yield superior reconstruction quality compared to their convex counterparts, ensuring global optimality remains a fundamental challenge. Invex optimization offers a promising alternative, as an invex function guarantees that any critical point is a global minimizer. This short course explores recent advances in invex optimization for constrained inverse problems, covering theoretical foundations, algorithmic developments, and practical applications across various domains, including machine learning, imaging, and signal processing. A key focus is signal restoration, a crucial inverse problem with applications spanning physics, medical imaging, and engineering. Ensuring global optimality in such problems is essential for obtaining the most accurate solutions within given constraints. This short course aims to foster interdisciplinary collaboration, bridging different areas of signal processing and deepening our understanding of nonconvex inverse problems.

Course Outline

- Fundamentals in convex optimization
- Optimization methods
- Advances in invex optimization
- Invexity Applications in Image/Signal Processing and Machine Learning
- Discussion/Q&A

Samuel Pinilla Biographical Sketch: Samuel Pinilla received the B.S. degree (cum laude) in Computer Science in 2014, the B.S. degree in Mathematics, and the M.S degree in Mathematics from Universidad Industrial de Santander, Bucaramanga, Colombia in 2016 and 2017, respectively. His Ph.D. degree from the Department of the Electrical and Computer Engineering, Universidad Industrial de Santander, Bucaramanga, Colombia. He is a senior data scientist at the Rutherford Appleton Laboratory, United Kingdom. In the past, Dr. Pinilla held Visiting Postdoctoral Researcher positions at Tampere University 2020-2021 and worked as a fellow research associate at The University of Manchester 2021-2022. His research interests focus on the areas of high-dimensional structured signal processing, machine learning, scalable AI, and (non)convex optimization methods. Dr. Pinilla is the recipient of the Eloy Valenzuela Prize for his doctoral studies, the International Conference on Acoustics, Speech and Signal Processing top 3% Paper Recognition in 2023.

Kumar Vijay Mishra Biographical Sketch: Kumar Vijay Mishra obtained a Ph.D. in electrical engineering and M.S. in mathematics from The University of Iowa in 2015, and M.S. in electrical engineering from Colorado State University in 2012, while working on NASA's Global Precipitation Mission Ground Validation (GPM-GV) weather radars. He received his B. Tech. summa cum laude (Gold Medal, Honors) in electronics and communication engineering from the National Institute of Technology, Hamirpur (NITH), India in 2003. He is a Senior Fellow at the United States DEVCOM Army Research Laboratory; Research Scientist at the Institute for Systems Research, The University of Maryland, College Park under the ARL-ArtIAMAS program; Technical Adviser to Singapore-based automotive radar start-up Hertzwell; and honorary Research Fellow at SnT - Interdisciplinary Centre for Security, Reliability and Trust, University of Luxembourg. Previously, he had research appointments at the Electronics and Radar Development Establishment (LRDE), Defence Research and Development Organisation (DRDO) Bengaluru; IIHR - Hydroscience & Engineering, Iowa City, IA; Mitsubishi Electric Research Labs, Cambridge, MA; Qualcomm, San Jose; and Technion - Israel Institute of Technology. Dr. Mishra has served as the Distinguished Lecturer (DL) of various societies: IEEE Communications Society (2023-2024), IEEE Aerospace and Electronic Systems Society (AESS) (2023-2024, 2025, 2026), IEEE Vehicular Technology Society (2023-2025, 2025-2027), and IEEE Geoscience and Remote Sensing Society (2024-2025). He has been a Virtual DL of IEEE Future Networks Initiative (2022) and Traveling Lecturer of Optica (2025-). He is the recipient of the IEEE Signal Processing Society Pierre-Simon Laplace Early Career Technical Achievement Award (2024), Special Mention

for the IEEE AESS M. Barry Carlton Award (2023), IET Premium Best Paper Prize (2021), IEEE T-AES Outstanding Editor (2021, 2023, 2024), U. S. National Academies Harry Diamond Distinguished Fellowship (2018-2021), American Geophysical Union Editors' Citation for Excellence (2019), Royal Meteorological Society Quarterly Journal Editor's Prize (2017), Viterbi Postdoctoral Fellowship (2015, 2016), Lady Davis Postdoctoral Fellowship (2017), DRDO LRDE Scientist of the Year Award (2006), NITH Director's Gold Medal (2003), and NITH Best Student Award (2003). He has received Best Paper Awards at IEEE MLSP 2019 and IEEE ACES Symposium 2019. Dr. Mishra is Chair (2023-2026) of the International Union of Radio Science (URSI) Commission C, Chair (2025-) of IEEE AESS Technical Working Group on Integrated Sensing and Communications (ISAC-TWG), and Vice-Chair (2021-present) of the IEEE Synthetic Aperture Standards Committee, which is the first SPS standards committee. He has been Chair (2023-2025) of the IEEE SPS Synthetic Apertures Technical Working Group. He has been an elected member of three technical committees of IEEE SPS: SPCOM, SAM, and ASPS, and IEEE AESS Radar Systems Panel. He is Editor-in-Chief of River Rapids Series in Radar Systems, Signal Processing, Antennas and Electromagnetics (2025-). He has been Senior Area Editor of IEEE Transactions on Signal Processing (2024-), Associate Editor of IEEE Transactions on Aerospace and Electronic Systems (2020-) and IEEE Transactions on Antennas and Propagation (2023-). He has been a lead/guest editor of several special issues in journals such as IEEE Signal Processing Magazine, IEEE Journal of Selected Topics in Signal Processing, IEEE Journal on Selected Areas in Communications, and IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing. He is the lead co-editor of several books on signal processing and radar: Signal Processing for Joint Radar-Communications (Wiley-IEEE Press, 2024), Next-Generation Cognitive Radar Systems (IET Press Electromagnetics and Radar Series, 2023), Advances in Weather Radar Volumes 1, 2 & 3 (IET Press Electromagnetics and Radar Series, 2023), and Handbook of Statistics 55: Multidimensional Signal Processing (Elsevier). His research interests include radar systems, signal processing, remote sensing, and electromagnetics.

Short Course

The Ionosphere is a Tool: A Short Course on Data Assimilative Ionosphere Modeling

Austin Egert, Orion Space Solutions
Jeff Steward, Orion Space Solutions

Dive into the exciting world of ionospheric physics in this engaging half-day course! We'll explore how scientists observe and model the ionosphere to improve HF communications.

Starting with observation strategies, you'll get hands-on experience analyzing real ionospheric data. Next, we'll uncover the secrets of ionosondes - cool instruments that 'sound out' the ionosphere. You'll learn to read ionograms like a pro and understand the difference between vertical and oblique soundings.

But wait, there's more! We'll venture into the cutting-edge realm of assimilative ionosphere models. Don't worry if that sounds complex - we'll break it down step-by-step. You'll see how these models use HF signals to create a clearer picture of the ionosphere and improve our ability to predict signal paths through raytracing. We will also introduce data assimilation and how that can be used to find optimal estimates of space weather forcing parameters and geophysical state.

Throughout the course, you'll participate in interactive demonstrations and practical exercises. By the end, you'll understand how all these pieces fit together to help us communicate better using HF signals.

Whether you're a curious student, an early-career scientist, or a seasoned researcher, this course offers a fun and accessible introduction to advanced ionospheric techniques. Join us for an electrifying journey through the upper atmosphere!

Course Outline

1. Introduction
    1. Overview of the course
    2. Quick look at the ionosphere layers
    3. Brief introduction to ionospheric propagation and its importance in HF communications

2. Observing Strategies
    1. Different methods of observing the ionosphere
    2. Importance of observations in HF communications
3. Ionosondes
    1. What are ionosondes and how do they work?
    2. Types of ionosondes: Verticals and Obliques
    3. Interpreting ionograms
    4. Hands-on activity: Manual scaling with SAO-X
4. Vertical and Oblique Soundings
    1. Detailed explanation of vertical soundings
    2. Applications and limitations of vertical soundings
    3. Oblique soundings: principles and advantages
    4. Comparing vertical and oblique soundings
    5. Case study: Analyzing real-world vertical and oblique sounding data
5. A Brief Introduction to Data Assimilation
    1. Data assimilation concepts
    2. The Kalman Filter family
    3. The Variational (Var) family
    4. Hybrid methods
6. Assimilative Ionosphere Models
    1. Introduction to assimilative modeling
    2. Using HF signals in assimilative ionosphere models
    3. Applying assimilative ionosphere models in raytracing
    4. Practical exercise: Using a simple assimilative model for raytracing
7. Conclusion and Q&A

Austin Egert Biographical Sketch: Austin Egert has extensive experience modeling planetary science, ionospheric physics, and over-the-horizon radar. That means he fights with computer languages and has won enough times to become a scientist. He has also spent many hours cathartically scaling ionograms while listening to dubstep or heavy metal opera. That ultimately landed him with Orion Space Solutions where he happily continues fusing bass-heavy music with space physics.

Jeff Steward Biographical Sketch: Jeff Steward has been called the Michelangelo of data assimilation, which sounded like a complement until he remembered that's one of the Ninja Turtles. But since he does like pizza, he decided that's alright. After his Ph.D. at Florida State, Jeff worked at NASA JPL and NCAR doing data assimilation of satellite data. He now works at Orion Space Solutions learning about space weather and applying data assimilation there.

Workshop

Spectrum Management for Radio Scientists

Charles Baylis, Baylor University

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

- Overview of Radio Spectrum Issues
- Spectrum Regulations
- Current Regulatory Activities Panel

- Break
- User Communities Panel
- Technology Innovations Panel
- Adjourn

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 25 researchers across 15 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.

Workshop

Wireless Power Transfer for Implanted Biomedical Devices

Sima Noghanian, CommScope Ruckus Networks
Ifana Mahbub, University of Texas at Dallas

Wireless power transfer (WPT) is a transformative alternative to traditional battery-powered biomedical devices, which often require surgical replacement. By using implanted coils and antennas, WPT enables continuous, non-invasive power delivery for applications such as implantable sensors, drug delivery systems, and neurostimulators. Two main WPT methods are magnetic coupling and radiative transfer, each with trade-offs in efficiency and depth. Designing effective systems involves addressing challenges like miniaturization, biocompatibility, and safety, particularly with regard to Specific Absorption Rate (SAR) limits. This workshop will cover fundamental concepts of WPT for biomedical applications, compare magnetic and radiative transfer methods, and discuss current challenges and research directions. It will also include modeling and simulation techniques, safety considerations, and experimental validation approaches to equip participants with practical knowledge for designing efficient and safe WPT systems.

Course Outline

- Introduction to WPT
- Tissue Dielectric Properties
- Inductive WPT and Examples
- Radiative WPT and Examples
- Power Transfer Efficiency
- Metasurfaces and Power Focusing
- Simulation Consideration
- Specific Absorption Rate (SAR) Analysis
- Thermal Analysis
- Summary

Sima Noghanian Biographical Sketch: Sima Noghanian is currently a Distinguished Hardware Engineer at CommScope Ruckus Networks. She is also an Antenna/RF consultant with Neuspera Medical Inc and StrokeDx. Dr. Noghanian received a Ph.D. from the University of Manitoba in 2001, and a Post-Doctoral Fellowship from the Natural Sciences and Engineering Research Council of Canada, which she took at the University of Waterloo. From 2002 to 2018 she served as an Electrical Engineering faculty in: the Sharif University of Technology, Iran (2002), the University of Manitoba, Canada (2003-2008), and the University of North Dakota, USA (2008 - 2018). She also served as the Chair of the Electrical Engineering Department at the University of North Dakota (2014 - 2016). She was an Electromagnetic Application Engineer with PADT Inc. (2019 - 2020) and a Principal Antenna Design Engineer at Wafer LLC (2020 - 2021).

Dr. Noghanian is a senior member of IEEE, a fellow of the Applied Computational Electromagnetics Society (ACES), and a senior member of URSI Commissions B and K. Dr. Noghanian currently serves as the Associate Editor of IEEE Transactions on Antennas and Propagation, IEEE Open Journal of Antennas and Propagation, IEEE Antennas and

Propagation Magazine, IET Microwave, Antennas and Propagation, Frontiers in Antennas and Propagation. and as an area editor for the Elsevier International Journal of Electronics and Communications. She is a member of the IEEE Antennas and Propagation Society (AP-S) Administration Committee (2023-2025), Chair of the Technical Committee on Antenna Measurement (TCAM), Vice Chair of AP-S Constitution and Bylaws Committee, Chair of USNC-URSI Commission K, and Vice President of ACES. She is an AP-S Distinguished Lecturer (2024-2026). She is also a Distinguished Lecturer of IEEE AP-S.

Ifana Mahbub Biographical Sketch: Ifana Mahbub is an Associate Professor and the Texas Instruments Early Career Chair Awardee in the Department of Electrical and Computer Engineering at the University of Texas at Dallas, where she leads the Integrated Biomedical, RF Circuits and Systems Laboratory (iBioRFCASL). Her research spans wireless power transfer for implantable and wearable biomedical devices, IoT systems, UAVs, and long-range power beaming using microwave and millimeter-wave technologies. She is particularly focused on developing scalable, efficient, and safe wireless energy delivery systems that enable untethered operation in dynamic or infrastructure-limited environments.

Dr. Mahbub received her B.Sc. degree (2012) in Electrical and Electronic Engineering from the Bangladesh University of Engineering and Technology, and her Ph.D. degree (2017) in Electrical Engineering from the University of Tennessee, Knoxville. She is the recipient of several prestigious honors, including the NSF CAREER Award (2020), DARPA Young Faculty Award (2021), and the DARPA Director's Fellowship (2023).

She currently serves as Vice-Chair for the USNC-URSI Commission K and as an Associate Editor for the IEEE Transactions on Antennas and Propagation. She is also a full member of the IEEE MTT-S Technical Committee 25 (Wireless Power Transfer and Energy Conversion) and the IEEE AP-S Technical Committee on Health and Medicine.

Student Luncheon

Moderator: Charles Bayliss, Baylor University

Dr. Charles 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 funding 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.

Panelists:

Dr. Mickey Batson joined IARPA in March 2024. In his current assignment as a Program Manager, Dr. Batson focuses on areas of scientific research that includes electromagnetics, ionosphere geophysics, ionosphere chemistry, and plasma physics.

Prior to joining IARPA, Dr. Batson worked as a research engineer at the NSA Laboratory for Telecommunication Sciences from 2013 to 2024. While there, he investigated electromagnetic

anomalies occurring within the ionosphere and researched and supported propagation modeling efforts for low frequencies.

Dr. Batson graduated from the Naval Postgraduate School with a doctorate in electrical engineering and a master's degree in communications engineering.

Dr. Paul Ransom is the Acting Chief of the Strategic Planning Division in the Office of Spectrum Management, the Division and Office of Spectrum Management lead national efforts to shape the future of spectrum policy and planning. He currently chairs the Spectrum Relocation Fund Technical Panel, a congressionally mandated body that approves funding for spectrum research and engineering studies aimed at improving the effectiveness and efficiency of federal spectrum use. The panel also ensures federal spectrum transition plans support auction timelines, promote relocation or sharing of spectrum, and enable the recovery of federal investments.

Dr. Ransom served as the technical lead for the 2024 National Spectrum Strategy and Implementation Plan, a landmark initiative that reflects his leadership and deep expertise in spectrum management. Since joining the division in 2020, he has played a central role in federal spectrum repurposing efforts and serves as the NTIA liaison to the National Science Foundation's Spectrum Innovation Initiative, supporting research and innovation in advanced spectrum technologies.

With over 20 years of federal service, Dr. Ransom brings a wealth of experience across defense, science, and telecommunications domains. He began his career at the Naval Surface Warfare Center in Bethesda, Maryland, conducting advanced research in electromagnetic materials for radar cross section (RCS) reduction and performing both field and laboratory RCS measurements. He later served as a Program Officer at the Office of Naval Research in the Sea Weapons and Warfare Department (now the Advanced Naval Platforms Department), and as Chief Technologist in NOAA's Radio-Frequency Interference Monitoring System Project Management Office, supporting the National Environmental Satellite, Data, and Information Service.

Dr. Ransom holds a B.S. in Electrical Engineering from Southern University and A&M College, an M.S. in Electrical and Computer Engineering from Georgia Tech, and a Ph.D. in Electrical and Computer Engineering from the Catholic University of America.

Dr. Susan C. Hagness received the B.S. and Ph.D. degrees in electrical engineering from Northwestern University in 1993 and 1998, respectively. She is currently the Philip D. Reed Professor of the Department of Electrical and Computer Engineering and the Maria Stuchly Professor of Electrical Engineering at the University of Wisconsin-Madison, where she has served as Department Chair since 2018. She previously served as the College of Engineering Associate Dean for Research (2014-2017) and has held a variety of professional society and advisory board appointments and leadership roles within the IEEE, the U.S. National Committee of URSI, the ASEE Engineering Research Council, and ECEDHA. She has co-authored more than 100 journal papers, eight book chapters, and two editions (with Allen Taflove) of Computational Electrodynamics: The Finite-Difference Time-Domain Method (Artech House, 2000 and 2005).

She has received numerous recognitions for her holistic approach to teaching and mentoring and for her research in computational and experimental applied electromagnetics, which currently emphasizes technologies for smart medicine and smart agriculture. Highlights include the Presidential Early Career Award for Scientists and Engineers (2000), the IEEE Engineering in Medicine and Biology Society Early Career Achievement Award (2004), the URSI Issac Koga Gold Medal (2005), the IEEE Trans. Biomedical Engineering Outstanding Paper Award (2007), the IEEE Education Society Van Valkenburg Early Career Teaching Award (2007), the Physics in Medicine and Biology Citations Prize (2011), the UW-Madison Women Faculty Mentoring Program Slesinger Award for Excellence in Mentoring (2017), and College of Engineering awards for excellence in teaching (2014), research (2018), and equity and diversity efforts (2021). She is a Fellow of the IEEE (2009), AAAS (2021), AIMBE (2022), and NAI (2022).

Tuesday, January 6 08:30 - 11:30
SC1 Event Meadows B

Brief INCOMPLETE History of Radar

Tuesday, January 6 08:30 - 11:30
SC2 Event Meadows A

Invex Optimization for Signal/Image Processing and Machine Learning

Tuesday, January 6 10:00 - 10:20
Event

Break (regular coffee, decaf coffee, hot tea, and water)

Tuesday, January 6 11:30 - 13:00
Event

Lunch Break

Tuesday, January 6 13:00 - 16:00
SC3 Event Meadows A

The Ionosphere is a Tool: A Short Course on Data Assimilative Ionosphere Modeling

Tuesday, January 6 13:00 - 16:00
WS1 Event Meadows B

Spectrum Management for Radio Scientists

Tuesday, January 6 13:00 - 16:00
WS2 Event Meadows C/D

Wireless Power Transfer for Implanted Biomedical Devices

Tuesday, January 6 14:30 - 14:50
Event

Break (regular coffee, decaf coffee, hot tea, iced tea, and water)

Tuesday, January 6 17:00 - 20:30
Event Bear Peak

USNC–URSI Business Meeting – Invitation Only

Wednesday, January 7 08:20 - 11:15
Event Flatirons 1

Plenary Session

8:20 - 8:40 Welcome, Introductions, and USNC-URSI, USFRS, & NASEM Updates
8:40 - 9:35 Plenary #1: Dr. Mickey Batson
9:35 - 10:00 USNC-URSI Awards
10:00 - 10:20 Break
10:20 - 11:15 Plenary #2: Dr. Paul Ransom

Wednesday, January 7 10:00 - 10:20
Event

Break (regular coffee, decaf coffee, hot tea, and water)

Wednesday, January 7 11:30 - 12:55
Event Flatirons 2

Student Mentoring Luncheon

Wednesday, January 7 13:10 - 14:50
Event Flatirons 1

Student Paper Competition Finalist Presentations

Wednesday, January 7 14:50 - 15:10
Event

Break (regular coffee, decaf coffee, hot tea, iced tea, and water)

Wednesday, January 7 15:10 - 17:10
C1 Trailhead

AI/ML and Software-Defined EM Systems

Session Co-Chairs: Mohammadreza F. Imani, Arizona State University; Eric Mokole, Retired, U.S. Naval Research Laboratory

C1.1 **15:10**
CubeSat Radiometer Constellation Simulator for the ACCURACy Framework
Lennox Apudo, Mustafa Aksoy, University at Albany, United States

C1.2 **15:30**
Load-Pull Extrapolation of Adjacent Channel Power Ratio (ACPR) and Error Vector Magnitude (EVM) Contours
Jonathan Swindell, Adam Goad, Justin Roessler, Austin Egbert, Baylor University, United States; Casey Latham, Matthew Ozalas, Jason Boh, Andy Howard, Daren McClearnon, Keysight Technologies, United States; Charles Baylis, Robert Marks, Baylor University, United States

C1.4 **16:10**
RIFTS: Architecture and Design of a Radio Interferometer for Thunderstorm Studies
Frank Lind, MIT, United States; Ningyu Liu, Joseph Dwyer, Ivan Dors, University of New Hampshire, United States; Mark Stanley, New Mexico Institute of Mining and Technology, United States

C1.5 **16:30**
A Neural Network Approach to Pulsed Amplifier Linearization
Claire Atkinson, John Mower, University of Washington, United States

C1.6 **16:50**
New Verticals of Long-range Low-Latency Medium Wave (MW) Radio Communication
Arjuna Madanayake, Florida International University, United States; Senaka Wijayakoon, Sri Lanka Broadcasting Corporation, Sri Lanka

Wednesday, January 7 15:10 - 17:10
F1 Special Session Flatirons 2

Recent Advances in RF Ducting Research I

Session Co-Chairs: Caglar Yardim, The Ohio State University; Qing Wang, Naval Postgraduate School

F1.1 **15:10**
RF Ducting, Thermodynamics, and Turbulence in Cases of Warm and Dry Advection over the Water - Results from Recent Field Measurements
Qing Wang, Katherine Mulreany, Ryan Yamaguchi, Naval Postgraduate School, United States; John Kalogiros, National Observatory of Athens, Greece; Raymond Hoheisel, Teravec Technologies, United States; Zhien Wang, Stony Brook University, United States; Djamal Khelif, University of California, Irvine, United States; Jesus Ruiz-Plancarte, Tasha Hansen, John Amparo, Anthony Bucholtz, Naval Postgraduate School, United States

F1.2 **15:30**
Stable Surface Layer Examined During REDSAW 2024 Campaign
Katherine Mulreany, Qing Wang, Naval Postgraduate School, United States

F1.3 **15:50**
High-Resolution Duct Variability from Airborne Coherent Lidar Measurements during REDSAW 2024
Tasha Hansen, Qing Wang, Naval Postgraduate School (NPS), United States; Zhien Wang, Stony Brook University, United States

F1.4 **16:10**
Development and Deployment of the miniDropsonde System during REDSAW
Ryan Yamaguchi, Naval Postgraduate School, United States; Raymond Hoheisel, Sean Fox, Teravec Technologies, United States; John Kalogiros, National Observatory of Athens, Greece; Jesus Ruiz-Plancarte, Katherine Mulreany, Anthony Bucholtz, Roy Woods, Naval Postgraduate School, United States; Elizabeth Shi, Joe Vinci, Caglar Yardim, The Ohio State University, United States; Qing Wang, Naval Postgraduate School, United States

F1.5 **16:30**
Variations of Sea Surface Temperature Over the Salton Sea
John Regi Amparo, Ryan Yamaguchi, Naval Postgraduate School, United States; John Kalogiros, National Observatory of Athens, Greece; Jesus Ruiz-Plancarte, Anthony Bucholtz, Qing Wang, Naval Postgraduate School, United States

F1.6 **16:50**
Numerical Weather Prediction (NWP) Limitation on Radio Frequency (RF) Propagation Variability during the RADAR and Electromagnetic Ducting in the Stable Atmosphere over Water (REDSAW) Experiment
Jordan McCammon, Matthew Jackson, Chance McQuaid, NSWCDD, United States

Wednesday, January 7 15:10 - 16:50
H1 Special Session Meadows C&D

Quantum Inspired Methods in Plasma Wave Dynamics

Session Co-Chairs: Chris Crabtree, US Naval Research Laboratory; Jason Ruszkowski, University of Alaska Fairbanks

H1.1 **15:10**
Shock-capturing quantum algorithm for the advection equation
Samuel Hagele, William Gregory, Yuan Shi, University of Colorado Boulder, United States

H1.2 **15:30**
Geometrical optics in phase space: a quantumlike approach to eliminating spurious singularities at reflection points
Ilya Dodin, Princeton Plasma Physics Laboratory, Princeton University, United States

H1.3 **15:50**
Quantum Simulation of Nonlinear Dynamical Systems Using Repeated Measurement
Joseph Andress, Yuan Shi, Scott Parker, University of Colorado Boulder, United States

H1.4 **16:10**
Quantum Geometrical Effects on Whistler Wave Propagation
Chris Crabtree, US Naval Research Laboratory, United States; Enrico Rossi, William & Mary, United States

H1.5 **16:30**
A Wave-kinetic Approach to Mean-field Turbulent Dynamo
Suying Jin, Massachusetts Institute of Technology, United States; Ilya Dodin, Princeton University/Princeton Plasma Physics Laboratory, United States

Wednesday, January 7 15:10 - 17:10
G1 Flatirons 4

Radar and Radio Techniques

Session Co-Chairs: Thomas Gaussiran, University of Texas at Austin; Romina Nikoukar, Johns Hopkins University Applied Physics Laboratory

G1.1 **15:10**
GNSS S4 Computational Methodologies with Application to a New Low-Cost Receiver
Theodore Beach, Teddy Surco Espejo, Boston College, United States; Anton Kashcheyev, University of New Brunswick, Canada; Keith Groves, Dima Paznukhov, Boston College, United States

G1.2 **15:30**
First electron density profiles estimated from plasma lines at MIT Haystack Observatory
Anthony Abubakar, The University of Texas at Dallas, United States; Enrique Rojas, Katherine Cariglia, Robert Schaefer, Nestor Aponte, William Rideout, MIT Haystack Observatory, United States

G1.3 **15:50**
Hf Signal Properties Associated With Polar Cap Patches Detection
Katarzyna Beser, Gareth Perry, New Jersey Institute of Technology, United States

G1.4 **16:10**
Simulation Study of Rocket Launch Induced Traveling Ionospheric Disturbances Observed by the TRIDENT HF Sounder
Ian Collett, Camella Nasr, Scott Thaller, Federico Gasperini, Anastasia Newheart, Dan Knight, Orion Space Solutions, An Arcfield Company, United States

G1.5 **16:30**
On the Use of High-frequency Surface Wave Oceanographic Research Radars as a Tool for Studying Traveling Ionospheric Disturbances
James Conroy, Val Hernley, Johns Hopkins Applied Physics Lab, United States; Ethan Miller, Systems & Technology Research (STR), United States; Stephen Kaeppler, Clemson, United States; Diego Sanchez, University of Scranton, United States; Sebastijan Mrak, Tom Hanley, Adam Fosbury, Johns Hopkins Applied Physics Lab, United States; Teresa Updyke, Old Dominion, United States

G1.6 **16:50**
D and F Region Ionospheric Coupling Experiment
Giuseppe Carluccio, University Federico II of Napoli, Italy; Eros Montin, Christopher Collins, Riccardo Lattanzi, New York University, United States; Daniele Riccio, Giuseppe Ruello, University Federico II of Napoli, Italy

Wednesday, January 7 15:10 - 16:50
F2 Meadows A

Impact of RFI on Earth Observation and Remote Sensing Applications

Session Co-Chairs: David Kunkee, The Aerospace Corporation; Al Gasiewski, University of Colorado at Boulder

F2.1 **15:10**
Protecting Passive Microwave Bands for Weather Forecasting
Beau Backus, Johns Hopkins Applied Physics Laboratory, United States; Paolo de Matthaeis, NASA Goddard Space Flight Center, United States; David Lubar, Aerospace Corporation, United States; Renee Leduc, Narayan Strategy, United States

F2.2 **15:30**
Hyperspectral Ground-Level Radio Frequency Emission Survey at K- and V-bands
Al Gasiewski, University of Colorado at Boulder, United States; Michael Hurowitz, Weather Stream, Inc., United States

F2.3 **15:50**
Analysis of 500-2000 MHz Microwave Radiometer Measurements Over Northern Canada from the Ultra-Wideband Microwave Radiometer (UWBRAD)
Hayden Ellzey, Mark Andrews, Joel Johnson, The Ohio State University, United States

F2.4 **16:10**
GNSS Radio Frequency Interference Risk Mapping of COSMIC-2 POD Antennas
Jiahua Zhang, Douglas Hunt, Jan-Peter Weiss, John Braun, University Corporation for Atmospheric Research (UCAR), United States

F2.5 **16:30**
Detection and Analysis of Radio Frequency Interference Effects on GNSS Signals and Positioning Accuracy
Venkata Ramana G, Sridhar Miriyala, Koneru Lakshmaiah Education Foundation, India; Niure Kandel Laxima, Embry-Riddle Aeronautical University, United States; Venkata Ratnam D, Koneru Lakshmaiah Education Foundation, India; Kshitija Deshpande, Embry-Riddle Aeronautical University, United States

Wednesday, January 7 15:10 - 16:30
J1 Meadows B

Radio Astronomy from the Moon

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

J1.1 **15:10**
Low Frequency Radio Astrophysics and 21-cm Cosmology from the Moon Using NASA Commercial Landers
Jack Burns, University of Colorado Boulder, United States; Stuart Bale, University of California, Berkeley, United States; Natchimuthuk Gopalswamy, NASA Goddard Space Flight Center, United States

J1.2 **15:30**
Detecting the 21 cm Signal of the Cosmic Dark Ages with a Lunar Far Side Radio Array
Willow Smith, Jonathan Pober, Brown University, United States

J1.3 **15:50**
Seeking the Dark Ages of the Universe: Modeling Radio Observations with LuSEE-Night from the Far Side of the Moon
David W. Barker, Jack O. Burns, University of Colorado Boulder, United States; David Rapetti, NASA Ames Research Center, United States

J1.4 **16:10**
Exploring the low-radio frequency sky with LuSEE-Night from the far side of the Moon
Kaja Rotermund, Aritoki Suzuki, Joseph Silber, LBNL, United States; Jeremy McCauley, Stuart Bale, SSL, UC Berkeley, United States

Wednesday, January 7 15:10 - 16:50
B1 Flatirons 3

Electromagnetic Theory and Education

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

B1.1 **15:10**
Interactive Educational Platform for Digital Modulation Recognition and Signal Analysis
Erwin Karincic, Lauren Linkous, Erdem Topsakal, Virginia Commonwealth University, United States

B1.2 **15:30**
A Video-Based Examination Framework for Electromagnetics Distance Education
Ryan Green, Mississippi State University, United States

B1.3 **15:50**
An Application of the Aperture Field Method for use in Studying Near-Field Properties of Orbital Angular Momentum Beams
Seth Ferrell, Yahya Rahmat-Samii, UCLA, United States

B1.4 **16:10**
Scattering Parameter Symmetries in Monoclinic Media Measurements
Michael Havrilla, Air Force Institute of Technology, United States

B1.5 **16:30**
Backlobe Analysis in Layer-Limited Transmissive Metasurface Antennas: Theory and Validation
Wenman Hu, Yahya Rahmat-Samii, University of California, Los Angeles, United States

Wednesday, January 7 15:10 - 16:50
A1 Bear Peak

Antennas

Session Co-Chairs: Neill Kefauver, University of Colorado, Boulder; Matt Simons, National Institute of Standards and Technology

A1.1 **15:10**
Bandwidth Increase on Wearable Antennas with the use of FPT
Anastasios G. Koutinos, Constantinos L. Zekios, Stavros V. Georgakopoulos, Florida International University, United States

A1.2 **15:30**
Ultra-Compact Tri-Band 6G mmWave Patch: Inset-Fed, Parasitic-Coupled Design with Stable Radiation Patterns
Nusrat Jahan, California State University, United States; Ashikul Haque, Chittagong University of Engineering and Technology, Bangladesh

A1.3 **15:50**
Fast Spherical Near-Field Measurements Using an Actuated Reflector Antenna System
Aditya Varma Muppala, University of California, Berkeley, United States

A1.5 **16:30**
RF Passive Sensing with Beams
Chamara Rathnayaka, Benn Roshnan Thevathasan, Arjuna Madanayake, Florida International University, United States

Wednesday, January 7 17:15 - 18:15
Event Bear Peak

Commission A Business Meeting

Wednesday, January 7 17:15 - 18:15
Event Trailhead

Commissions C/E Business Meeting

Wednesday, January 7 17:15 - 18:15
Event Meadows A

Commission F Business Meeting

Wednesday, January 7 17:15 - 18:15
Event Flatirons 4

Commission G Business Meeting

Wednesday, January 7 17:15 - 18:15
Event Meadows B

Commission J Business Meeting

Wednesday, January 7 18:30 - 20:00
Event Flatirons 1

Welcome Reception and SPC Awards

Thursday, January 8 | 08:00 - 11:20
B2 | Special Session | Flatirons 3

Analytical and Numerical Methods in EM Theory and Applications - In Memory of Chalmers M. Butler

Session Co-Chairs: Piergiorgio L. E. Uslenghi, University of Illinois-Chicago; Donald R. Wilton, University of Houston

B2.R 08:00
Welcome and Remarks by Hardy Butler

B2.1 08:20
HELICOIDAL MODES IN COAXIAL LINES OF POLYGONAL CROSS-SECTION
Piergiorgio L. E. Uslenghi, University of Illinois Chicago, United States

B2.2 08:40
A Low Order Correction For Surface Curvature in Rough Surface Scattering
Gary Brown, Virginia Tech, United States

B2.3 09:00
A Comparison of Some Numerical Techniques for Analyzing Leaky-Wave Antennas Using Full-Wave Solvers
Pratik Deb, David Jackson, University of Houston, United States; Francisco Mesa, University of Seville, Spain; Guido Valerio, Sorbonne University, France; Oscar Quevedo-Teruel, KTY Royal Institute of Technology, Sweden

B2.4 09:20
Design of a TE-Mode Connector for a Parallel-Plate to WR-6 Transition
Amin Rastgordani, Mohammadreza Pav, University of Illinois Chicago, United States; Joe Faia, Peerouz Amleshi, Molex, United States; Danilo Erricolo, University of Illinois Chicago, United States

B2.5 09:40
A Study on Whispering Gallery Mode Laser in a Microring and a Note on Teaching It
Reyhan Baktur, Utah State University, United States

B2.6 10:00
Constructing the field and potential vector diagram and a generalized gauge equation
Donald Wilton, University of Houston, United States; Robert Nevels, Texas A&M University, United States; Kuo-Ho (Tom) Yang, St. Ambrose University, United States

B2.7 10:20
A Tribute to the Legacy of Prof. Chalmers Butler: Revisiting Appearance of Edge/Wedge Conditions in MoM Solutions
YAHYA RAHMAT-SAMII, University of California at Los Angeles (UCLA), United States

B2.8 10:40
New Directions in Design Optimization Using AI-Driven Mesh-Free Computational Toolsets
Constantinos Zekios, John Volakis, Florida International University, United States

B2.9 11:00
Revisiting Eigenfunction Expansions of Electromagnetic Dyadic Green's Functions in Source Regions
Prabhakar Pathak, Prof. Emeritus, the Ohio State University., United States

B2.10 11:20
Analog SIC for Single-Antenna In-Band Full-Duplex Based on IMT and Circulator
Mohammadreza Pav, Amin Rastgordani, Besma Smida, Danilo Erricolo, University of Illinois Chicago, United States

Thursday, January 8 | 08:20 - 11:40
C2 | Trailhead

RFI in Complex Systems

Session Co-Chairs: Charles Dietlein, National Telecommunications and Information Administration; Lawrence Cohen, Naval Research Laboratory-Retired

C2.1 08:20
One Perspective on RF Spectrum: Use, Interference, R&D, and Applications
Eric Mokole, Retired, U.S. Naval Research Laboratory, United States

C2.2 08:40
What a Spectrum Engineer Needs to Know
Lawrence Cohen, Naval Research Laboratory-Retired, United States; Randy Jost, Utah State University, United States

C2.4 09:20
Don't Kick the Can Down the Road: Why a Technological Solution is Needed to Avoid Future Spectrum Strife
Charles Baylis, Andrew Clegg, Austin Egbert, Douglas Sicker, Adam Goad, Baylor University, United States; Casey Latham, Keysight Technologies, United States; Robert Marks, Baylor University, United States

C2.5 09:40
SpectrumX - Radio Frequency Interference Measurement Systems and Experiments
Frank Lind, Mary Knapp, MIT, United States; Nicholas Laneman, University of Notre Dame, United States; Scott Palo, University of Colorado Boulder, United States

C2.6 10:00
Digitally Controlled Preselector for 5G mmWave Out-of-Band Emissions Measurements
Ryan McCullough, Jeffery Wepman, Institute for Telecommunication Sciences, National Telecommunications and Information Administration, United States

C2.7 10:20
Practical waveform design for embedding communications onto radar emissions
Patrick McCormick, University of Kansas, United States

C2.8 10:40
Forcefield for the Stars: RFI Characterization, Control, and Cancellation for Astronomy
Andrew Nguyen, The MITRE Corporation, United States

C2.9 11:00
Movable Antenna-Aided Secondary Transmitter and Incumbent Local Memory and Feedback for RFI Mitigation and Spectrum Coexistence
Alireza Vahid, Rochester Institute of Technology, United States

C2.10 11:20
Opportunistic Spatial Reuse with Location-Aware Beam Selection for Spectrum Coexistence
Tiep M. Hoang, Alireza Vahid, Rochester Institute of Technology, United States

Thursday, January 8 | 08:20 - 11:20
CF3 | Special Session | Flatirons 1

Special Session in Memory of Prof. V. N. Bringi I

Session Co-Chairs: Branislav Notaros, Colorado State University; Merhala Thurai, Colorado State University; Kumar Vijay Mishra, US DEVCOM Army Research Laboratory

CF3.1 08:20
From Beginnings to Legacy: The First and Last Ten Years of Prof. V. N. Bringi's Polarimetric Weather Radar Research
Kumar Vijay Mishra, US DEVCOM Army Research Laboratory, United States; Merhala Thurai, Colorado State University, United States

CF3.2 08:40
Bringi's legacy: differential reflectivity and its applications in radar meteorology
Alexander Ryzhkov, University of Oklahoma, United States

CF3.3 09:00
An overview of the CSU-CHILL dual-offset Gregorian weather radar antenna
Patrick Kennedy, David Brunkow, Colorado State University, United States

CF3.4 09:20
Advancing Polarimetric Raindrop Size Distribution Retrievals with Double-Moment Normalization and Machine Learning
GyuWon Lee, Kyuhee Shin, Kyungpook National University, Korea (South); Merhala Thurai, Colorado State University, United States; Kyo-Sun Sunny Lim, Kyungpook National University, Korea (South)

CF3.5 09:40
Tribute to Prof. V. N. Bringi: Characterization of Winter Precipitation Using In-Situ Field Measurements and Polarimetric Radar Observations
Branislav Notaros, Colorado State University, United States

CF3.6 10:00
Bispectrum Inversion to Separate Weather and Non-Weather Radar Echoes
Samuel Pinilla, The Alan Turing Institute, United Kingdom; Kumar Vijay Mishra, US DEVCOM Army Research Laboratory, United States

CF3.7 10:20
The Legacy of Professor Bringi: Building Bridges Between Atmospheric and Radio Science and Engineering
Michael Bell, Brenda Dolan, Isaac Schluesche, Venkatachalam Chandrasekar, Jim George, Colorado State University, United States

CF3.8 10:40
Drizzle Droplet Distribution Retrieved with Ka-band Vertically Pointing Radar
Christopher Williams, University of Colorado Boulder, United States; Kaitlyn Loftus, Marcus van Lier-Walqui, Columbia University, United States

CF3.9 11:00
The Calibration of Differential Reflectivity
John Hubbert, National Center for Atmospheric Research, United States

Thursday, January 8 | 08:20 - 11:40
J2 | Special Session | Meadows B

AI/ML in Radio Astronomy

Session Co-Chairs: Brian Mason, National Radio Astronomy Observatory; Bryan Butler, National Radio Astronomy Observatory

J2.1 08:20
Emulating Global 21 cm Cosmology Observations from the Lunar Far Side to Achieve Quick and Reliable Physical Constraints
John Dorigo Jones, Jack Burns, University of Colorado Boulder, United States; David Rapetti, NASA Ames Research Center, United States; David Barker, University of Colorado Boulder, United States

J2.2 08:40
Adventures in AI with the Long Wavelength Array
Jayce Dowell, Greg Taylor, University of New Mexico, United States

J2.3 09:00
Integrating Modern AI into Radio Astronomy Software: A Critical Analysis of Costs and Feasibility
Brian Welman, Marcellin Atemkeng, Oleg Smirnov, Rhodes University, South Africa

J2.4 09:20
Bridging Explainable Deep learning and Large Language Models (LLMs) for Radio Galaxy Classifications: A Novel Investigation of Agentic LLMs for Interpreting Explainable AI
Casey Chuma, Brian Welman, Marcellin Atemkeng, Oleg Smirnov, Rhodes University, South Africa

J2.5 09:40
Empowering the Next-Generation ALMA Imaging with AI
Fabrizia Guglielmetti, European Southern Observatory, Germany

J2.6 10:00
Telescope Control with Machine Learning: Pointing Corrections and Observation Scheduling
Paul Chichura, NSF-Simons AI Institute for the Sky (SkAI), United States; Alex Drlica-Wagner, Thomas Crawford, Alexandra Rahlin, University of Chicago, United States

J2.7 10:20
Forecasting the interferometric phase stability at the VLA with machine learning
Brian Svoboda, Bryan Butler, Daniel Faes, Paul Demorest, Kyle Massingill, National Radio Astronomy Observatory, United States

J2.8 10:40
RFI Toolbox - Standardized Framework for Radio Frequency Interference Detection and Benchmarking
Preshanth Jagannathan Preshanth Jagannathan, Srikrishna Sekhar, NRAO, United States

J2.9 11:00
Accelerating and Augmenting Radio Imaging Pipelines via Automated Segmentation and Labeling of Hyperspectral Image Cubes
Ryan Loomis, Brian Mason, Eric Murphy, Tristan Ashton, National Radio Astronomy Observatory, United States; Ziad Al-Halah, Jeff Phillips, El Kindi Rezig, Nikesh Subedi, University of Utah, United States; Ignacio Toledo, Joint ALMA Observatory, United States

Thursday, January 8 | 08:20 - 10:00
F7 | Flatirons 2

Microwave Remote Sensing of the Earth I

Session Co-Chairs: Ming Li, University Corporation for Atmospheric Research; David Kunkee, The Aerospace Corporation

F7.1 08:20
The Experience and Results of the Sixth Edition of The University of Houston's Class on How to Build Geoscience Instruments
Andrew Renshaw, Edgar Bering, University of Houston, United States

F7.2 08:40
Measurement of Anomalous Propagation Using Signals of Opportunity
Alec Yip, Christopher Anderson, Steven Ellingson, Virginia Tech, United States

F7.3 09:00
Finer-resolution Sea Ice Detection Using Spire Near-Nadir GNSS-R and SMAP
Ming Li, Jiahua Zhang, Jan Weiss, John Braun, William Gullotta, Maggie Sleziak, University Corporation for Atmospheric Research, United States

F7.4 09:20
Analysis of Grazing Angle Reflection Events Observed by PlanetiQ Low Earth Orbiting Satellites
Hyeyeon Chang, Y. T. Jade Morton, The University of Colorado Boulder, United States

F7.5 09:40
Modeling and Analysis of Vegetation Effects in UAV Network Coverage Prediction with LiDAR and NVIDIA SionnaRT
Joyita Halder, Mohammad Ehsanul Hoque, Tanvir Anjum, Mehmet Kurum, University of Georgia, United States

Thursday, January 8 | 08:20 - 10:00
GH2 | Special Session | Meadows C&D

Space Weather I

Session Co-Chairs: Sam Shidler, University of Texas at Austin; Alexander Massoud, University of Texas at Dallas

GH2.1 **08:20**
Using Numerical Fractal Process of Diffusion-Limited Aggregation (DLA) for Generating Simulated Scenarios of Equatorial Plasma Bubbles (EPB) Plume Geometry
Rezy Pradipta, Charles Carrano, Keith Groves, Boston College, United States

GH2.2 **08:40**
High-Latitude Scintillation Analysis During Geomagnetic Storms: A Machine Learning Approach Using Isolation Forest and Neural Networks
Jacob Hall, Kshitija Deshpande, Chintan Thakrar, Nick Gachancipa, Mason Lee, Embry-Riddle Aeronautical University, United States

GH2.3 **09:00**
Expanding GNSS Ground-Based Ionospheric Monitoring: Retrieving Absolute TEC from Low-Elevation Wideband Signals During May 2024 Geomagnetic Storm Period
Madeline Evans, Brian Breitsch, Jade Morton, University of Colorado Boulder, United States

GH2.4 **09:20**
Ionospheric Energy Filtering Observed During Gamma-ray Burst GRB-221009A
James Camp, Robert Moore, University of Florida, United States

GH2.5 **09:40**
Radio Frequency Wave Propagation in the Ionospheric Density Irregularities: Ray tracing and Full-wave Simulations
Eun-Hwa Kim, Princeton University, United States; Isaiah Scaffidi, Jay Johnson, Andrews University, United States; Syun'ichi Shiraiwa, Princeton University, United States; Joseph Huba, Syntek Technologies, United States; Kornyanat Hozumi, Scranton University, United States; Simon Wing, Applied Physics Laboratory, United States

Thursday, January 8 | 08:20 - 10:00
G3 | Flatirons 4

Ionospheric Modeling and Data Assimilation I

Session Co-Chairs: Joe Hughes, NorthWest Research Associates; Isaac Wright, University of Texas at Dallas

G3.1 **08:20**
Multiscale Electrodynamics of the Subauroral Ionosphere: Effects of the Ionospheric Valley
Anatoly Streltsov, Embry-Riddle Aeronautical University, United States; Evgeny Mishin, Boston College, United States

G3.3 **09:00**
Simulating Sporadic-E Using Neutral Winds computed using a High-Resolution Whole-Atmosphere Model (HIAMCM)
Patricia Franke, Erich Becker, LJ Nickisch, Northwest Research Associates, United States

G3.4 **09:20**
Parametric Modeling and Analysis of Lightning Sferic Waveforms for D-region Remote Sensing
Mason Matrazzo, Hunter Burch, Auburn University, United States

G3.5 **09:40**
An Optimized Lossless Compression Algorithm for Very Low Frequency Data
Benjamin Smith, Hunter Burch, Auburn University, United States

Thursday, January 8 | 08:20 - 10:00
H2 | Meadows A

Waves in Space and Laboratory Plasmas

Session Co-Chairs: Ashanthi Maxworth, University of Southern Maine; Jason Ruszkowski, University of Alaska Fairbanks

H2.1 **08:20**
Parametric Amplifier with Plasma Discharge Time-modulated Capacitor
Zahra Manzoor, Alexey Shashurin, Purdue University, United States

H2.2 **08:40**
Direction Finding of Auroral Radio Emissions: Simultaneous Observations and Ray Tracing of Medium-Frequency Burst and Hiss
Tedi Godfrey, James LaBelle, Dartmouth College, United States

H2.3 **09:00**
HF ocean wave scattering measurements using HAARP
Stan Briczinski, Joseph Coombs, Carl Siefring, Mark Sletten, US Naval Research Laboratory, United States; Andrew Howarth, The University of Calgary, Canada; Paul Bernhardt, The University of Alaska Fairbanks, United States

H2.4 **09:20**
High-Amplitude Electric Fields and Particle Energization in Fast Earthward Flows: THEMIS Observations
Maria Usanova, Robert Ergun, University of Colorado Boulder, United States

H2.5 **09:40**
Analysis of ELF Whistler-Mode Waves Observed in the DSX Experiments
Anatoly Streltsov, Embry-Riddle Aeronautical University, United States; Jay Albert, Michael Starks, Air Force Research Laboratory, United States

Thursday, January 8 | 08:20 - 10:00
A2 | Bear Peak

Microwave Standards and Applications

Session Co-Chairs: Adam Hicks, Institute for Telecommunication Sciences; Ryan McCullough

A2.1 **08:20**
Meander TRL Calibration Kit for Reduced Coupling between Standards and Improved Calibration
Brennah Satterfield, Laila Marzall, Taylor Barton, Zoya Popovic, University of Colorado Boulder, United States

A2.2 **08:40**
Principles and Applications of Multipath Cross-Correlation Radiometry (MXCR)
Al Gasiewski, University of Colorado at Boulder, United States

A2.3 **09:00**
Design Methodology for Broadband Ka-Band GaN Power Amplifiers Through Impedance Trajectory Analysis and Reactance-Aware Matching Networks
Asmita Dani, Milliwave Technology, India

A2.4 **09:20**
Flat and Arbitrary Frequency Responses from Windowed Nonlinear Chirps
David Cox, Adam Goad, Austin Egbert, Charles Baylis, Robert Marks, Baylor University, United States

A2.5 **09:40**
Low Power Battery-less and Wireless Biosensing
Cecil Williams, John Volakis, Florida International University, United States

Thursday, January 8 | 10:00 - 10:20
Event

Break (regular coffee, decaf coffee, hot tea, and water)

Thursday, January 8 | 10:20 - 11:40
F8 | Flatirons 2

Microwave Remote Sensing of the Earth II

Session Co-Chairs: David Kunkee, The Aerospace Corporation; Tanvir Anjum, University of Georgia

F8.1 **10:20**
Automated Detection of Faulty Rain Gauges using Advanced Interpolation for Improved Precipitation Estimates
Yudhistar Sai Puram, Chandrashekar V, Renzo Bechini, Colorado State University, United States

F8.2 **10:40**
Snowflake Classification Using Machine Learning for Improved Scattering Characterization
Nickolas V. Rhodes, Hein Thant, Branislav M. Notaroš, Colorado State University, United States

F8.3 **11:00**
Impact of Non-Ideal Antenna Characteristics on VOD Retrievals for GNSS-Transmissometry
Mohammad Ehsanul Hoque, Mehmet Kurum, University of Georgia, United States

F8.4 **11:20**
Toward Accurate P-Band SoOp-R from UAS: Antenna Constraints and Operational Parameters
Tanvir Anjum, Mehmet Kurum, University of Georgia, United States

Thursday, January 8 | 10:20 - 12:00
GH4 | Special Session | Meadows C&D

Space Weather II

Session Co-Chairs: Sam Shidler, University of Texas at Austin; Alexander Massoud, University of Texas at Dallas

GH4.1 **10:20**
A Method to Localize Plasma Density Enhancements Along Lines of Sight to Background Radio Sources Through PSP/WISPR's Field of View
Kenny Kenny, University of Colorado at Boulder, United States; Jason Kooi, US Naval Research Laboratory, United States

GH4.2 **10:40**
Observations of a New Radiation Belt Structure Following the May 2024 Solar Storm With CALET on the International Space Station
Anthony Ficklin, Louisiana State University, United States; Alessandro Bruno, NASA Goddard Space Flight Center, United States; Lauren Blum, University of Colorado Boulder, United States; Nicholas Cannady, NASA Goddard Space Flight Center, United States

GH4.4 **11:20**
Study of high latitude ionospheric scintillations as a space weather impact of irregularities, using modeling and machine learning
Kshitija Deshpande, Matt Zettergren, Pralay Vaggu, Embry-Riddle Aeronautical University, United States; Andres Spicher, UiT The Arctic University of Norway, Norway; Leslie Lamarche, SRI International, United States; Toshi Nishimura, Boston University, United States; Don Hampton, University of Alaska, United States; Marie Bals, Embry-Riddle Aeronautical University, United States; Chintan Thakrar, Boeing Inc., United States; Nick Gachancipa, Google, United States

GH4.5 **11:40**
ScintPi 4.0: Description and Measurements of Low-Latitude Phase Scintillation
Isaac Wright, Josemaria Gomez Socola, Fabiano Rodrigues, University of Texas at Dallas, United States; João Francisco Galera Monico, Italo Tsuchiya, São Paulo State University, Brazil; Alison Oliveira Moraes, São José dos Campos, Brazil; Mario Azevedo Filho, Universidade Federal do Ceara, Brazil

Thursday, January 8 | 10:20 - 12:00
G5 | Flatirons 4

Ionospheric Modeling and Data Assimilation II

Session Co-Chairs: Joe Hughes, NorthWest Research Associates; Isaac Wright, University of Texas at Dallas

G5.1 **10:20**
Revisiting Ionospheric Tomography Across Scales: Nonlinear Fitting with Electron Density Profiles and Gravity Wave Signatures
Maya McKean, Embry-Riddle Aeronautical University, United States; Enrique Rojas, MIT Haystack Observatory, United States

G5.2 **10:40**
Unsupervised Machine Learning for VLF Sferics Discovery Using CNNs and Dimensionality Reduction
Spencer Plep, Hunter Burch, Auburn University - Applied Radio Science Lab, United States

G5.3 **11:00**
Real-time ionospheric data assimilation using an automated oblique ionogram trace extractor
Matthew Hogan, Kelsey Kramer, Shawn Kraut, Sergey Fridman, L.J. Nickisch, NorthWest Research Associates, United States

G5.4 **11:20**
How Bad Could It Be? Quantifying the Errors in Quasi-Midpoint Mapping for Ingesting Oblique Ionograms
Joe Hughes, LJ Nickish, Matt Hogan, Kelsey Kramer, Sergey Fridman, NorthWest Research Associates, United States

G5.5 **11:40**
Investigating Spectral Features and Multiscale Structuring of Ionospheric Irregularities in the Auroral Region using Modeling
Pralay Raj Vaggu, Embry-Riddle Aeronautical University, United States; Gary Bust, Johns Hopkins University Applied Physics Laboratory, United States; Kshitija Deshpande, Embry-Riddle Aeronautical University, United States; Gytis Blinstrubas, Seebany Datta-Barua, Illinois Institute of Technology, United States; Matt Zettergren, Embry-Riddle Aeronautical University, United States

Thursday, January 8 | 10:20 - 12:00
H3 | Meadows A

Wave-Wave and Wave-Particle Interactions

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

H3.1 **10:20**
The saturation properties of EMIC waves and heating of cold ions
Shujie Gu, Lunjin Chen, The University of Texas at Dallas, United States

H3.3 **11:00**
Observational analysis on the relationship between Chorus waves and MeV electron precipitation
JORGE ROMERO-MINAYA, LAUREN BLUM, University of Colorado Boulder, United States

H3.4 **11:20**
Evolution of NWC Transmitter Wave Power Distribution During the Propagation from the Topside Ionosphere into the Inner Magnetosphere
Zhiyang Xia, Lunjin Chen, The University of Texas at Dallas, United States

H3.5 **11:40**
Ground Detected Stimulate Electromagnetic Emissions Near the High-Frequency Active Auroral Research Program as a Means of Measuring Ionospheric Electron Temperature
Samuel McKay, Paul Bernhardt, Alexander Morris, Mike McCarrick, University of Alaska - Fairbanks, United States; Stanley Briczinski, Naval Research Laboratory, United States

Thursday, January 8 | 10:20 - 12:00
A3 | Special Session | Bear Peak

Atomic Radio Frequency Sensing

Session Co-Chairs: Matt Simons, National Institute of Standards and Technology; Christopher Holloway, National Institute of Standards and Technology

A3.1 **10:20**
Rydberg sensor performance review, prediction, and comparison to traditional radio receivers
Jamie MacLennan, Kathryn Nicolich, Zachary Haresty-Shaw, Neel Malvania, Bonnie Marlow, Charles Fancher, MITRE, United States

A3.2 **10:40**
Electric field sensing with Rydberg atoms excited through the 7P1/2 state
Devin Willey, Darmindra Arumugam, JPL, United States

A3.3 **11:00**
Simultaneous Detection and Direct Demodulation of Communication Signals Using a Rydberg Atom-Based Sensor
Stone Oliver, University of Colorado Boulder, United States; Samuel Berweger, National Institute of Standards and Technology, United States; Eugeniy Mikhailov, The College of William and Mary, United States; Dixith Manchaiah, Nikunjkumar Prajapati, Christopher Holloway, Matthew Simons, National Institute of Standards and Technology, United States

A3.4 **11:20**
Rydberg Dissipative Time-Crystals for ELF to VLF Field Sensing
Darmindra Arumugam, Jet Propulsion Laboratory, United States

A3.5 **11:40**
Ground Penetrating Radar Imaging Using a Rydberg Atom Receiver
William Watterson, Nikunjkumar Prajapati, National Institute of Standards and Technology, United States; Rodrigo Castillo-Garza, RTX Technology Research Center (RTRC), United States; Samuel Berweger, Noah Schlossberger, Alexandra Artusio-Glimpse, Christopher Holloway, Matthew Simons, National Institute of Standards and Technology, United States

Thursday, January 8 | 12:10 - 13:10
Event | Flatirons 1

Women in Radio Science (WIRS) Business Meeting

Thursday, January 8 | 13:20 - 16:40
KB1 | Special Session | Trailhead

Wearable Antennas

Session Co-Chairs: YAHYA RAHMAT-SAMII, University of California, Los Angeles; Sima Noghanian, CommScope Ruckus Networks

KB1.1 **13:20**
Advancing Biomedical and Sensing Antennas: The UCLA Antenna Lab Experience
YAHYA RAHMAT-SAMII, University of California at Los Angeles (UCLA), United States

KB1.2 **13:40**
Efficiency and Safety Analysis of Wearable Wireless Power Transfer with Double-Sided Fractal Metamaterials
Abbas Ali Lotfi-Neyestanak, Medical Cytometrix Inc, Canada; Sima Noghanian, CommScope Ruckus Networks, United States

KB1.3 **14:00**
A Wearable Loop Sensor System for Joint Angle Estimation with Two Degrees of Freedom
Yingzhe Zhang, Asimina Kiourti, The Ohio State University, United States

KB1.4 **14:20**
Textile Integrated MIMO Antenna with Distinct Elements for On/Off Body mmWave 5G Wearables
Damilya Abzhanova, Jawad Ahmad, Galymzhan Nauryzbayev, Mohammad Hashmi, Nazarbayev University, Kazakhstan

KB1.5 **14:40**
Optically Transparent Wearable RFID
Sarah Johnson, Erdem Topsakal, Virginia Commonwealth University, United States

KB1.6 **15:00**
Wearable Antenna Technology: A Review of Contributions by Penn State CEARL
Connor Haney, Douglas Werner, Pingjuan Werner, The Pennsylvania State University, United States

KB1.7 **15:20**
Washability of Cotton based Frequency Selective Surface (FSS) for 2.4 GHz WIFI Shielding
Amber Nunnally, Erdem Topsakal, Virginia Commonwealth University, United States

KB1.8 **15:40**
A Hybrid Reconfigurable Wearable Antenna for Body-Centric IoT Applications
Akkula S. Vaishnavi, Debanjali Sarkar, VIT-AP University, India; Partha P. Shome, SR University, India; Sembiam R. Rengarajan, California State University, United States

KB1.9 **16:00**
Wireless Power Transfer Study for a Subdural Distributed Spinal Cord Stimulator Array
Marinus Daling, Kaveh Ramezani, Baylor University, United States; Lawrence Larson, David Borton, Arto Nurmikko, Brown University, United States; Vincent Leung, Baylor University, United States

KB1.10 **16:20**
Wireless Power and Information Transfer System Employing DGS based Resonators
Anel Murat, Zhanel Kudaibergenova, Galymzhan Nauryzbayev, Mohammad Hashmi, Nazarbayev University, Kazakhstan

Thursday, January 8 13:20 - 16:40
J3 Meadows B

New Telescopes, Techniques and Technologies I

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

J3.1 **13:20**
Complete Sampling of the uv Plane with Realistic Radio Arrays: Introducing the RULES Algorithm, with Application to 21 cm Foreground Wedge Removal
Vincent MacKay, Jacqueline Hewitt, Zhilei Xu, Massachusetts Institute of Technology, United States; Ruby Byrne, California Institute of Technology, United States

J3.3 **14:00**
Altitude Estimation of Radio Frequency Interference Sources via Interferometric Near-Field Corrections
Jade Ducharme, Jonathan Pober, Brown University, United States

J3.4 **14:20**
LibRA: A foundational architecture and a library of algorithms for radio aperture synthesis telescope
Sanjay Bhatnagar, NRAO, SOcorro, United States

J3.5 **14:40**
Scilab: A New Open-Source Frontend for CASPER Toolflow
Wei Liu, Jonathon Kocz, Dan Werthimer, University of California, Berkeley, United States; Mitchell Burnett, Brigham Young University, United States; Ben Godfrey, University of California, Berkeley, United States

J3.6 **15:00**
The LWA Swarm Telescope
Greg Taylor, Jayce Dowell, Craig Taylor, Univ. of New Mexico, United States; Tom Maccarone, Texas Tech University, United States; Judd Bowman, Arizona State University, United States; Gregg Hallinan, Caltech, United States

J3.7 **15:20**
A Coherent All Sky Monitor for Detecting Local Universe Fast Radio Bursts
Pranav Sanghavi, Liam Connor, Harvard University, United States; Vikram Ravi, California Institute of Technology, United States; Vishnu Balakrishnan, Harvard University, United States; Saren Daghlian, Michael Gutierrez, Charlie Harnach, Mark Hodges, California Institute of Technology, United States; Calvin Leung, University of California, Berkeley, United States; Obinna Modilim, Harvard University, United States; Advait Mehla, California Institute of Technology, United States; Mei Lin, Lingzhen Zeng, Nimesh Patel, Harvard University, United States

J3.8 **15:40**
At-Scale Radio Astronomy Software - A case for Modern DevOps and Performance Engineering
Preshanth Jagannathan, Sanjay Bhatnagar, Mingyu Hsieh, Felipe Madsen, NRAO, United States

J3.9 **16:00**
Deploying the CASPER Tool-Flow on an Intel Development Board Using a Scilab Front-End
Benjamin Godfrey, Dan Werthimer, Wei Liu, Jonathon Kocz, UC Berkeley, United States; Mitchell Burnett, Isotropic Ventures, United States

J3.10 **16:20**
Characterizing radio dish beams using GNSS satellite signals.
Shronim Tiwari, McGill University, Canada

Thursday, January 8 13:20 - 16:40
B3 Flatirons 3

Intelligent Devices and Complex Systems

Session Co-Chairs: Aakash A. Sahai, University of Colorado Denver; Karl Warnick, Brigham Young University

B3.1 **13:20**
A Soft-Robotics Enabled Reconfigurable RF Capacitor
Phillip Hagen, Patrick White, Ting-Yen Shih, University of Idaho, United States

B3.2 **13:40**
Machine-Learning-Enhanced, Reconfigurable Impedance Matching and Decoupling Networks at the HF Band
Saeed Bilaki, University of Wisconsin Madison, United States; Arman Afsari, North Carolina State University, United States; Barry Van Veen, Nader Behdad, University of Wisconsin Madison, United States

B3.3 **14:00**
Microwave Sensing of Water Accumulation using a Microstrip Line
Arum Okwo, Brandon Herrera, Stephen McClain, Yang Li, Baylor University, United States

B3.4 **14:20**
An HF Diplexer for Simultaneous Multi-band Communications
Jacob Abramow, Songyi Yen, Dejan Filipovic, University of Colorado Boulder, United States

B3.5 **14:40**
Flexible Digital Downconversion in CASPER Framework with RFSoC for Radio Astronomy, Radar, and Wireless Communications
Ridge Poll, Mitch Burnett, Karl Warnick, Brigham Young University, United States

B3.6 **15:00**
Ultra-Wideband RF-Photonic Integrated Instrument For Planetary Boundary Layer Sensing
Mehmet Ogut, Shannon Brown, Sidharth Misra, Eric Kittlaus, Pekka Kangaslahti, JPL, United States; Janusz Murakowski, Phase Sensitive Innovations, United States; Michael Gehl, Sandia National Laboratories, United States

B3.7 **15:20**
Prototyping Extreme Plasmons to access PV/m fields using experiment E-339 at SLAC
Aakash A. Sahai, University of Colorado Denver, United States; David Graham, Powerbeam Research LLC, United States; Kalyan Tirumalasetty, University of Colorado Denver, United States; Alexander Knetsch, SLAC National Accelerator Laboratory, United States; Peter Taborek, University of California Irvine, United States; Brendan O'Shea, Mark J. Hogan, Ivan Rajkovic, SLAC National Accelerator Laboratory, United States

B3.8 **15:40**
Laser alignment of nanofabricated plasmonic tubes with ultra-relativistic electron beam for the E339 experiment at SLAC national laboratory
Kalyan Tirumalasetty, University of Colorado Denver, United States; David Graham, Powerbeam Research, United States; Mark Golkowski, Aakash A. Sahai, University of Colorado Denver, United States

B3.9 **16:00**
Thin-Film GeTe PCM RF Switch: Reduced Stack-Up Complexity Using a Thermal Modeling Approach
Abu Hena Murshed, Sourav Dutta, Ifana Mahbub, The university of Texas at Dallas, United States

B3.10 **16:20**
RF-Induced Heating Dependence on Lead Spacing on Active Medical Device in Dual Leads at 1.5T MRI
Yuhui Xu, Lingfei Zhang, Qingyan Wang, University of Houston, United States; Angela (Grace) Huang, Cypress Woods High School, United States; Zhongrui Wang, Ji Chen, University of Houston, United States

Thursday, January 8 13:20 - 16:20
ABF4 Special Session Bear Peak

Quantum Technology Applications

Session Co-Chairs: Saba Mudaliar, Air Force Research Laboratory; Matt Simons, National Institute of Standards and Technology

ABF4.1 **13:20**
Low Complexity Quantum Enhanced Sensing Architecture
Amr S. Helmy, University of Toronto, Canada

ABF4.2 **13:40**
Analytical Quantum Full-Wave Solution of Single-Photon Transport Through a 3D Transmon
Soomin Moon, Thomas Roth, Purdue University, United States

ABF4.3 **14:00**
Electron Scattering in MOSFETs Based on the Schrödinger Equation Using 2D FDTD
Kai Ren, South Dakota School of Mines and Technology, United States

ABF4.4 **14:20**
Cryogenic Calibration Techniques for Quantum-Based RF Metrology
Jeremy Thomas, NIST, United States; Johannes Hoffmann, METAS, Switzerland; Nathan Flowers-Jacobs, Anna Fox, Nicholas Jungwirth, Raegan Johnson-Wilke, Paul Dresselhaus, Samuel Benz, NIST, United States

ABF4.5 **14:40**
Quantum Theory of Anderson Localization and Classical EM Applications
A. Ishimaru, University of Washington, United States

ABF4.6 **15:00**
A Transport Theoretic Model for the Dynamics of Quantized EM Signals in Random Media
Saba Mudaliar, Air Force Research Laboratory, United States

ABF4.7 **15:20**
Frequency-Tunable Sensitivity Enhancement of an X-band Rydberg-Atom Microwave Receiver
Georgia Sandidge, Zoya Popovic, University of Colorado at Boulder, United States

ABF4.8 **15:40**
Exact Numerical Algorithm for Efficient Simulation of Atomic Sensors
Omar Nagib, Thad G. Walker, University of Wisconsin-Madison, United States

ABF4.9 **16:00**
Cryogenic RF Calibrations and Standards for Quantum Computing
Peter Hopkins, Lafe Spietz, Adam Sirois, Manuel Castellanos-Beltran, Nathan Flowers-Jacobs, Elyse McEntee Wei, Chris Long, Dylan Williams, Paul Dresselhaus, Samuel Benz, National Institute of Standards and Technology, United States

Thursday, January 8 13:20 - 14:40
CF4 Special Session Flatirons 1

Special Session in Memory of Prof. V. N. Bringi II

Session Co-Chairs: Branislav Notaros, Colorado State University; Merhala Thurai, Colorado State University; Kumar Vijay Mishra, US DEVCOM Army Research Laboratory

CF4.1 **13:20**
Case Analysis of the 2017 Tropical Storm Irma over Huntsville, Alabama, using Ground-based Measurements and S-band Polarimetric Radar Scans
Merhala Thurai, Colorado State University, United States; Patrick Gatlin, NASA-MSFC, United States; Mathew Wingo, NSSTC UAH ESSC, United States

CF4.2 **13:40**
Using polarimetric radar in pursuit of understanding microphysical processes– building on the Bringi legacy
Brenda Dolan, Michael Bell, Lauren Beard, Stephen Saleeby, V Chandrasekar, Colorado State University, United States

CF4.3 **14:00**
KPOP-MS 2023 Field Campaign and Mesoscale Convective Systems
GyuWon Lee, Jeong-Eun Lee, Kyungpook National University, Korea (South)

CF4.4 **14:20**
Characterizing and Profiling Freefall Snow Particles Using the Snowflake Measurement and Analysis System
Hein Thant, Nickolas Rhodes, Branislav Notaros, Colorado State University, United States

Thursday, January 8 13:20 - 15:00
H4 Flatirons 2

Space as a Research Laboratory

Session Co-Chairs: Anatoly Streltsov, Embry-Riddle Aeronautical University; William Amatucci, Naval Research Laboratory

H4.1 **13:20**
Magnetospheric Response to Solar Activity: Insights from Magnetic Duct Observations
Dori Stein, Salman A. Nejad, Anatoly Streltsov, Embry-Riddle Aeronautical University, United States

H4.2 **13:40**
Dual LF/MF/HF interferometer at Toolik Lake, Alaska, to investigate auroral radio emissions
James LaBelle, Tedi Godfrey, Dartmouth College, United States; Steve Kaeppler, Clemson University, United States; David McGaw, Dartmouth College, United States

H4.3 **14:00**
The New Mexico Tech Space Weather Explorer
Anders M. Jorgensen, Seda Senay, Ashok K. Ghosh, New Mexico Institute of Mining and Technology, United States; Janos Lichtenberger, Eotvoes University, Hungary; Hien Vo Bich, Vietnamese-German University, Viet Nam

H4.4 **14:20**
First Results from the TRACERS Double Probe Electric Field Instrument (EFI)
John Bonnell, Roger Roglans, Marit Oieroset, Univ. of California, Berkeley, United States; Katherine Goodrich, Skylar Shaver, West Virginia University, United States; James LaBelle, Dartmouth College, United States; Iver Cairns, The University of Sydney, Australia

Thursday, January 8 13:20 - 15:00
H5 Special Session Meadows C&D

Physics of the Radiation Belts I

Session Co-Chairs: Mark Golkowski, University of Colorado, Denver; Raahima Khatun-E-Zannat, University of Colorado, Denver

H5.1 **13:20**
Radiation Belt Electron Dynamics: A Comparative Perspective from Earth and Jupiter
Wen Li, Qianli Ma, Longzhi Gan, Xiaochen Shen, Boston University, United States

H5.2 **13:40**
ELF/VLF Whistler-Mode Waves in Magnetic and Density-double ducts
Salman A. Nejad, Anatoly Streltsov, Embry-Riddle Aeronautical University, United States

H5.3 **14:00**
EMIC Wave Observations Deep in the Inner Magnetosphere
Maria Usanova, University of Colorado Boulder, United States

H5.4 **14:20**
Electron Precipitation Driven by Ducted Lightning-Generated Whistlers
Longzhi Gan, Qianli Ma, Wen Li, Boston University, United States; Lauren Blum, Drake Miller III, Laboratory for Atmospheric and Space Physics, United States

H5.5 **14:40**
Energy Spectrum Analysis of Rapid Electron Precipitation Events within the Plasmasphere Detected by REPTile-2 on CIRBE
Drake Miller III, Lauren Blum, Xinlin Li, Yang Mei, University of Colorado Boulder, United States; Longzhi Gan, Boston University, United States

Thursday, January 8 13:20 - 15:00
G6 Flatirons 4

Ionospheric Modeling and Data Assimilation III

Session Co-Chairs: Joe Hughes, NorthWest Research Associates; Marcos Inonan, University of Texas at Dallas

G6.1 **13:20**
Assessing Ionospheric Specification with GloTEC through Observing System Simulation Experiments
Dominic Fuller-Rowell, Lynker, United States; Tzu-Wei Fang, NOAA, United States; Tibor Durgonics, Lynker, United States; Joseph Hughes, North West Research Associates, United States

G6.2 **13:40**
Reconstruction of the D-region from HF measurements using GPSII assimilative model
Sergey Fridman, L.J. Nickisch, Kelsey Kramer, NorthWest Research Associates, United States; Ivan Galkin, University of Massachusetts Lowell, United States; J. Vincent Eccles, Space Dynamics Laboratory, United States; Joseph Malins, Air Force Research Labs, United States

G6.3 **14:00**
The use of a local ensemble transform Kalman filter (LETKF) on data from the Array for VLF Imaging of the D-region
James Cannon, Robert Marshall, University of Colorado Boulder, United States

G6.4 **14:20**
Tomographic Reconstruction of Plasma Density During the GIRAFF 381 Sounding Rocket Mission
Alexander Mule, Dartmouth College, United States; Romina Nikoukar, Johns Hopkins University, United States; Robert Michell, Emma Mirizio, NASA, United States; Paul Bernhardt, University of Alaska Fairbanks, United States; Leslie Lamarche, SRI International, United States; Kristina Lynch, Dartmouth College, United States

G6.5 **14:40**
Determination of Ionospheric D Region Reflection Height Using HAARP ELF/VLF Transmissions
Gabriel da Silva, Mark Golkowski, Malek Abusnina, Raahima Khatun-E-Zannat, Robert Moore, CU Denver, United States

Thursday, January 8 13:20 - 14:40
F4 Meadows A

Point-to-Point Propagation Effects

Session Co-Chairs: Patrick Bidigare, Synoptic Engineering; Zachary Beever, Johns Hopkins University Applied Physics Laboratory

F4.1 **13:20**
A Citizen Science HF Channel Sounder
Robert Johnk, Institute for Telecommunication Sciences NTIA/ITS (Retired), United States

F4.2 **13:40**
Matched-field phase-calibration of a sparse array
LEE ROGERS, Scripps Institution of Oceanography, United States; Patrick Bidigare, Synoptic Engineering, United States

F4.3 **14:00**
Coherent ISM Dispersion Simulation
Ross Donnachie, Johan Schoeman, University of Pretoria, South Africa

F4.4 **14:20**
Constructing an Arbitrarily Polarized EM Field from PE Output
Zachary Beever, Johns Hopkins University Applied Physics Laboratory, United States

Thursday, January 8 15:00 - 15:20
Event

Break (regular coffee, decaf coffee, hot tea, iced tea, and water)

Thursday, January 8 15:20 - 17:00
B4 Special Session Flatirons 1

Non-LTI Electromagnetics - Progress, Challenges and Opportunities

Session Co-Chairs: Ryan Westafer, Georgia Tech Research Institute; Daniel Richardson, University of Colorado Boulder

B4.1 **15:20**
Report on a Non-LTI Electromagnetics Workshop
Ryan Westafer, Georgia Tech Research Institute, United States

B4.2 **15:40**
An Electrically Small E-Spin Patch Antenna with Direct Antenna Modulation for Wideband Communications
Yuanxun Ethan Wang, Shih-Ming Huang, University of California, Los Angeles, United States

B4.3 **16:00**
Field-Based Transition of Vanadium Dioxide for Nonlinear Applications
Carolina Hau Loo, David West, Sree Adinarayana Dasari, Walter Disharoon, Nima Ghalichechian, Georgia Institute of Technology, United States

B4.5 **16:40**
Broadband Frequency Control using Fast Time-Modulated Metasurfaces with Optimized Topology
Daniel Richardson, Marcus Wolff, Alan Brannon, University of Colorado at Boulder, United States

Thursday, January 8 15:20 - 16:40
D1 Flatirons 2

Electronics and Photonics

Session Co-Chairs: Jonathan Chisum, University of Notre Dame; Laila Marzall, University of Colorado Boulder

D1.1 **15:20**
Enabling Reliable Coexistence of Dynamic Transmitters: Progress on In-Situ Monitoring for Adaptive Wireless Systems
Rebekah Edwards, David Cox, Adam Goad, Trevor Van Hoosier, Baylor University, United States; Aravind Venkitasubramony, University of Colorado Boulder, United States; Michael Marques, Orbital Micro Systems, United States; Austin Egbert, Charles Baylis, Baylor University, United States; Albin Gasiewski, University of Colorado Boulder, United States; Robert Marks, Baylor University, United States

D1.2 **15:40**
Design Aspects of a Digital Phased Array Demonstrator for Spectrum Sharing Experiments
Nate Golding, Ariana Kazemi, Laila Marzall, Zoya Popovic, University of Colorado Boulder, United States

D1.3 **16:00**
A Tapered Slot Array with High Gain and Enhanced Scanning Return Loss
Isaiah Pisani, Kevin Hernandez, Nainesh Lad, Laila Marzall, University of Colorado Boulder, United States

D1.4 **16:20**
A 3-Stage GaN W-band LNA for High Linearity
Brennah Satterfield, Seth Johannes, Taylor Barton, Zoya Popovic, University of Colorado Boulder, United States

Thursday, January 8 | 15:20 - 17:00
H6 | Special Session | Meadows C&D

Physics of the Radiation Belts II

Session Co-Chairs: Mark Golkowski, University of Colorado, Denver; Raahima Khatun-E-Zannat, University of Colorado, Denver

H6.1 **15:20**
Propagation of Lightning Generated Whistler Mode Waves in Latitude Limited Magnetospheric Ducts
Raahima Khatun-E-Zannat, Vijay Harid, Mark Golkowski, University of Colorado Denver, United States; Oleksiy Agapitov, University of California, Berkeley, United States; Poorya Hosseini, University of Colorado Denver, United States

H6.2 **15:40**
An Active System to Broadcast High Power VLF Whistler Waves and Eliminate Radiation Belt Particle Fluxes that are a Hazard to Satellite Electronics
Paul Bernhardt, Samual McKay, University of Alaska, United States; Jeff Baumbardner, Boston University, United States

H6.3 **16:00**
Probing the dynamics of MeV electrons in the inner radiation belt and slot region
Lauren Blum, University of Colorado - Boulder - Boulder, CO, United States; Max Feinland, University of Colorado Boulder, United States

H6.4 **16:20**
CLARE: Classification-based Regression for Electron Temperature Prediction
Naomi Maruyama, Michael Liang, Blake Dehaas, Xiangning Chu, University of Colorado Boulder, United States; Takumi Abe, Institute of Space and Astronautical Science (ISAS,JAXA), Japan; Koh-ichiro Oyama, International Center for Planetary and Space Environment Study, Japan

H6.5 **16:40**
Studying the Evolution of Density Structures in the Plasmasphere Using Joint Van Allen Probe Observations
Tyler Bishop, Lauren Blum, University of Colorado Boulder, United States

Thursday, January 8 | 15:20 - 17:00
F5 | Flatirons 4

Atmospheric Remote Sensing

Session Co-Chairs: William Blackwell, MIT Lincoln Laboratory; Steven Reising, Colorado State University

F5.1 **15:20**
Recent Progress in Smallsat Constellations, Beam-Steering Arrays, and Cognitive Sensing for Microwave Imaging and Sounding of the Atmosphere
William Blackwell, MIT Lincoln Laboratory, United States

F5.2 **15:40**
Sensing Earth's Planetary Boundary Layer using Next-Generation Hyperspectral Microwave Sounders: High-frequency Microwave and Millimeter-wave Radiometer HD
Steven Reising, Colorado State University, United States; Ahmed Mohamed, Omkar Pradhan, Akim Babenko, Shannon T. Brown, Alan B. Tanner, Pekka Kangaslahti, Jet Propulsion Laboratory, United States; Renish Thomas, Sharmin Farzana, Malisa Abedin, Adam Whitney, Colorado State University, United States

F5.3 **16:00**
Tropospheric wind measurements with AMISR-14: Experimental setup and preliminary results
Alexander Massoud, Fabiano Rodrigues, The University of Texas at Dallas, United States; Jorge Chau, Leibniz Institute of Atmospheric Physics, Germany; Karim Kuyeng, Danny Scipión, Radio Observatorio de Jicamarca, Peru

F5.4 **16:20**
No presentation scheduled

F5.5 **16:40**
A Novel Transformer-based Deep Learning Model for Satellite Precipitation Enhancement
Liping Wang, Haonan Chen, Colorado State University, United States

F5.6 **17:00**
The Impact and Sources of Radio Frequency Interference on GNSS Signals
Endawoke Yizengaw, The Aerospace Corporation, United States

Thursday, January 8 | 15:20 - 17:20
F6 | Special Session | Meadows A

Recent Advances in RF Ducting Research II

Session Co-Chairs: Katherine Mulreany, Naval Postgraduate School; Caglar Yardim, The Ohio State University

F6.1 **15:20**
RADAR and Electromagnetic Ducting in the Stable Atmosphere over Water (REDSAW) Propagation Data Acquisition Working Group (DAWG) Standard for Data Processing
Chance McQuaid, Jordan McCammon, NSWCDD, United States

F6.2 **15:40**
Preliminary Joint Inversion Results Using Drone-Based Data
Elizabeth Shi, Johns Hopkins Applied Physics Laboratory, United States; Caglar Yardim, The Ohio State University, United States; Joe Vinci, Johns Hopkins Applied Physics Laboratory, United States

F6.3 **16:00**
In-Situ Calibration of Large Vertical Antenna Arrays for Overwater Propagation Research
Patrick Bidigare, Synoptic Engineering, United States; Ted Rogers, Scripps Institute of Oceanography, United States; Anthony Bucholtz, Naval Postgraduate School, United States

F6.4 **16:20**
Assessing the Correspondence of Array-Based Polarimetric Differences to Wind and Wave Activity
Ilana Heintz, Patrick Bidigare, Synoptic Engineering, United States; Ryan Yamaguchi, John Regi Amparo, Qing Wang, Naval Postgraduate School, United States

F6.5 **16:40**
Long Duration Maritime Troposcatter Experiment
Sunil Ramlall, Jia-Chi Chieh, Naval Information Warfare Center Pacific, United States

F6.6 **17:00**
Characterizing the Atmospheric Channel during a Long Term Troposcatter Experiment
Jacob DeFilippis, Katherine Adams, Edward Bertot, Sunil Ramlall, Jia-Chi Chieh, NIWC Pacific, United States

Thursday, January 8 | 17:25 - 18:25
Event | Flatirons 3

Commission B Business Meeting

Thursday, January 8 | 17:25 - 18:25
Event | Flatirons 2

Commission D Business Meeting

Thursday, January 8 | 17:25 - 18:25
Event | Meadows C&D

Commission H Business Meeting

Thursday, January 8 | 17:25 - 18:25
Event | Trailhead

Commission K Business Meeting

Thursday, January 8 | 18:30 - 20:00
Event | Game Room (The Den)

WIRS Reception

Friday, January 9 06:30 - 08:00

Event

AJAX Restaurant Private Dining Room

USNC-URSI Executive Committee Meeting - Invitation Only

Friday, January 9 08:20 - 10:40

K2 Special Session Trailhead

Safety Standards, SAR and Thermal Analysis

Session Co-Chairs: Sima Noghanian, CommScope Ruckus Networks; Ananya Nandikanti, University of Houston

K2.1 **08:20**

TEM Cell for 3 GHz Pulsed Microwave Exposure and Monitoring of the Thermoelastic Response of Tissue: Aperture Design and Characterization

Carissa Roper, Chu Ma, Susan Hagness, University of Wisconsin Madison, United States

K2.2 **08:40**

In Silico Temperature Assessment of Tibial Nail System: Influence of Surgical State, Bone Adhesives and Implant Characteristics at 1.5 T and 3.0 T MRI

Ananya Nandikanti, Jianfeng Zheng, Stuart A. Long, Ji Chen, University of Houston, United States

K2.3 **09:00**

Study of SAR and Ohmic Losses in a Layered Brain Tissue Model

Sima Noghanian, CommScope Ruckus Networks, United States; Hamed Fazel-Rzai, University of California, Irvine, United States; Abbas Ali Lotfi-Neyestanak, Medical Cytometrix Inc, Canada

K2.4 **09:20**

Effects of EMF Resonant Frequencies Across kHz, MHz, and GHz Bands on Cancer Cell Viability and Cell-Cycle Dynamics

Abigail Johnson, Hakki Gurhan, Frank Barnes, University of Colorado at Boulder, United States

K2.5 **09:40**

Multi-Phenotypic Dynamics of Cellular Growth and Metabolic Responses to External Electromagnetic Stimuli

Nhat Dang, Jason Keller, Frank S. Barnes, University of Colorado Boulder, United States

K2.6 **10:00**

Rotman Lens-Fed CP MIMO Antenna Array for Multi-Target Human Vital Sign Detection

Karthik Kakaraparty, Onur Toker, Nathan Dawson, Florida Polytechnic University, United States

K2.7 **10:20**

Design and Evaluation of a Passive Implantable RFID System for Emergency Medical Applications

Seyma Tufan, Erdem Topsakal, Virginia Commonwealth University, United States

Friday, January 9 08:20 - 11:40

B5 Special Session Flatirons 1

Antennas for Novel Platforms and RIS

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

B5.1 **08:20**

A Review of Antenna Designs for UAV Platforms

Taimoor Khan, National Institute of Technology Silchar, India; Sembiam R. Rengarajan, California State University North, United States

B5.2 **08:40**

Enabling Practical UAV-Swarm Based Phased Arrays Through Magnetic RF Connectors

Junming Diao, Bidya Debnath, Mst Mostary Begum, Prashant Neupant, Brooke Molen, Mississippi State University, United States

B5.3 **09:00**

Designing an RF Hat for an X-band CubeSat Antenna

Gabriel Burdan, Boston Abrams, Anantha Datta Dhruva, Scott Palo, University of Colorado Boulder, United States

B5.4 **09:20**

Circularly Polarized Meshed Patch Antenna using Diagonal Mesh Lines

Ethan Wayland, Reyhan Baktur, Utah State University, United States

B5.5 **09:40**

Design Study of Folded Cylindrical Helix Antenna for HF Maritime Communications

Aadesh Neel, University of Colorado Boulder, United States

B5.6 **10:00**

Optically Transparent and Flexible ITO Antennas for Next-G

Alptug Ayyildiz, Erdem Topsakal, Virginia Commonwealth University, United States

B5.7 **10:20**

A Study on the Challenges of Optically Transparent Reconfigurable Intelligent Surfaces Using Indium Tin Oxide

Michael Suche, Lauren Linkous, Erdem Topsakal, Virginia Commonwealth University, United States

B5.8 **10:40**

Additively Manufactured Wideband mmWave Reconfigurable Metasurfaces

Fineus Reilly, Jing Wang, Gokhan Mumcu, University of South Florida, United States

B5.9 **11:00**

Validation of Reconfigurable Intelligent Surface (RIS) Scattering Model in the Context of a Digital Twin

Jacob Tamasy, Daniel Richardson, Ryan Montoya, Marcuss Wolff, Cody Scarborough, Alan Brannon, University of Colorado Boulder, United States

B5.10 **11:20**

A Viability Study of Optically Transparent Frequency Selective Surfaces for Electromagnetic Pulse Shielding

Robert Calabrese, Dani Walters, Benjamin Wilkinson, Mississippi State University, United States; Lauren Linkous, Virginia Commonwealth University, United States; Ryan Green, Mississippi State University, United States

Friday, January 9 08:20 - 11:40
C5 Flatirons 2

Software-Defined and Cognitive Radio/Radar/Sensing

Session Co-Chairs: Charles Dietlein, National Telecommunications and Information Administration; Eric Mokole, Retired, U.S. Naval Research Laboratory

C5.1 **08:20**
J-ARGUS: Project description and status of the new tristatic radar system
Marcos Inonan Moran, Fabiano Rodrigues, Evan Biggins, The University of Texas at Dallas, United States; Danny Scipion, Geophysical Institute of Peru - IGP, Jicamarca Radio Observatory, Peru; Marco Milla, David Torres, Pontifical Catholic University of Peru - PUCP, Peru; David Hysell, Cornell University, United States; Jorge Chau, Leibniz Institute for Atmospheric Physics - IAP, Germany; Kenneth Obenberger, Air Force Research Laboratory - AFRL, United States

C5.2 **08:40**
Foot Gesture Recognition using a FMCW Radar and Deep Convolutional Neural Networks
James Usher, Nathan Hunter, Jordan Edwards, Scott Koziol, Yang Li, Baylor University, United States

C5.3 **09:00**
A Time Synchronization Model with Time-Reversal Robust to Multipath Channels
Michael Baram, Jonathan Chisum, University of Notre Dame, United States

C5.4 **09:20**
Adaptive Waveform Implementation on RFSoC FPGA for Multistatic Radar
Ryan Watson, Alex Pierce, Karl Warnick, Brigham Young University, United States

C5.5 **09:40**
Digital True-Time Delay (TTD) based Ultrawideband Beamformer on an RFSoC
Kefayet Ullah, Satheesh Bojja Venkatakrishnan, John L. Volakis, Florida International University, United States

C5.6 **10:00**
COTS mmW radar systems for remote sensing of vital signs
Anastasios G. Koutinos, Constantinos L. Zekios, Stavros V. Georgakopoulos, Florida International University, United States

C5.7 **10:20**
Non-Coherent DSSS-OQPSK Communication Link using Software-Defined Radios (SDRs)
Arnaldo Sans, Florida Internation University, United States; John Willis, Florida Internatinal University, United States; Wilfredo Rivas-Torres, Keysight Technologies, United States; Satheesh Venkatakrishnan, Florida Internation University, United States; John Volakis, Florida Internatinal University, United States

C5.8 **10:40**
Scalable AI Engines for Wideband Radio ML
Gayani Rathnasekara, Buddhipriya Gayanath, Hasitha Weerasooriya, Nimasha Pilippange, Arjuna Madanayake, Florida International University, United States; Justin Delva, Lockheed Martin, United States

C5.9 **11:00**
Jammer Resistant Analog Approximate DFT
Michael Nilan, Arjuna Madanayake, Florida International University, United States; Vinod Kurian Jacob, Sudhakar Pamarti, University of California, United States

C5.10 **11:20**
New Verticals of Long-range Low-Latency Medium Wave (MW) Radio Communication
Arjuna Madanayake, Florida International University, United States; Senaka Wijayakoon, Sri Lanka Broadcasting Corporation, Sri Lanka

Friday, January 9 08:20 - 11:40
F3 Meadows A

Random Media Models for Remote Sensing and Propagation

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

F3.1 **08:20**
L-Band Scattering from a 15 Foot Fir Tree with the Inclusion of Near Field Effects II
Roger Lang, Edward Michaelchuck Jr., George Washington University, United States

F3.2 **08:40**
Efficient LOS Path Loss Estimation Through Multiple Vegetation Classes
Nathanael Frisch, Daniel Breton, Cold Regions Research and Engineering Laboratory, United States

F3.3 **09:00**
Troposcatter Path Loss and Delay using Parabolic RF Propagation and Turbulence Scattering Phenomenology
Amit Itagi, Jonathan Gehman, Nathaniel Winstead, Johns Hopkins University Applied Physics Laboratory, United States

F3.4 **09:20**
Preliminary Scintillation Analysis using Phased Array in Ducting Environments
Joseph Vinci, Johns Hopkins University, United States; Caglar Yardim, The Ohio State University, United States; Elizabeth Shi, Johns Hopkins University, United States

F3.5 **09:40**
Off-axis laser-radiation detection based on intensity interferometry: effects of atmospheric turbulence on the signal-to-noise ratio
Elizabeth Bleszynski, Marek Bleszynski, Thomas Jaroszewicz, Monopole Research, United States

F3.6 **10:00**
Path Loss Measurement of EM Waves Propagating through Heterogeneous Channel
Saba Mudaliar, Air Force Research Laboratory, United States

F3.7 **10:20**
A Decoupled Model for the Mean RCS of an Object Below a Rough Surface
Joseph Gedney, Joel Johnson, Robert Burkholder, The Ohio State University, United States

F3.8 **10:40**
Remotely Sensing Near-Surface Temperature and Humidity Vertical Profiles Over the Ocean
Daniel P. Greenway, Caleb R. Sease, Lara Gonzalez Siaba Dillmann, Karina Griffin, Coastal Carolina University, United States; Joe Vinci, Caglar Yardim, The Ohio State University, United States; Erin E. Hackett, Coastal Carolina University, United States

F3.9 **11:00**
Rocket Launch Induced Traveling Ionospheric Disturbances Studied by TIDDBIT
Scott Thaller, Anastasia Newheart, Ian Collett, Geoff Crowley, Junk Wilson, Dan Knight, Orion Space Solutions - An Arcfield Company, United States

F3.10 **11:20**
2D Graded-Index Effects in Radiative Transfer: A Discontinuous Galerkin Method
Md Ershadul Haque, Abedi Reza, University of Tennessee Knoxville, United States; Mudaliar Saba, Air Force Research Laboratory, Wright-Patterson AFB, United States

Friday, January 9 08:20 - 11:20
B6 Flatirons 3

Propagation, Scattering and Sensing

Session Co-Chairs: Ari Sihvola, Aalto University; Satish Sharma, San Diego State University

B6.1 **08:20**
RCS of Targets due to Excitation with Structured Waves
Matthew Dodd, Kobe Prior, Joseph Diener, Colorado School of Mines, United States; Veysel Demir, Northern Illinois University, United States; Atef Elsherbeni, Colorado School of Mines, United States

B6.2 **08:40**
High-Gain Circularly Polarized Quadrifilar Helix Antenna for Multi-Target Farfield EM Sensing
Karthik Kakaraparty, Onur Toker, Florida Polytechnic University, United States

B6.3 **09:00**
Neural Network-based Approach to Design FSS Configuration Applicable for Tunable Structures
Farzad Mir, Farshad Ebrahimi, University of Houston, United States; Lida Kouhalvandi, Dogus University, Turkey; Mahtab Jeyhani, University of Houston, United States; Ladislau Matekovits, Politecnico di Torino, Italy

B6.4 **09:20**
Direction Finding via a Single Moving Receiver and Weighted Spherical Harmonics
William Shoub, Hunter Burch, Auburn University, United States

B6.5 **09:40**
Scattering and absorption by lossless-index, conjugate, and anti-hermitian objects
Ari Sihvola, Aalto University, Finland

B6.6 **10:00**
Characteristic Mode Analysis of the Interaction of Hermite-Gaussian Beams with Wires
Matthew Kunkle, Md Hasibul Islam, Matthew Lindboe, Roy Allen, University of Missouri-Kansas City, United States; Atef Elsherbeni, Colorado School of Mines, United States; Edward Garboczi, National Institute of Standards and Technology, United States; Hichem Guerboukha, Ahmed Hassan, University of Missouri-Kansas City, United States

B6.7 **10:20**
5G Millimeter-Wave Cellular User Equipment Measurements for Precipitation Estimation
AJ Cuddeback, CU Boulder / NTIA-ITS, United States; Scott Palo, CU Boulder, United States

B6.8 **10:40**
Wave Propagation in Time-Varying Plasmas
Hossein Mehrpour Bernety, Mark Cappelli, Stanford University, United States

B6.9 **11:00**
Dual-Polarized Ground-Penetrating Radar for Characterizing Electromagnetic Properties in Stratified Specular Media
Christopher Chock, Thomas Pratt, Luke Saladis, Robert Kossler, Eric Jesse, University of Notre Dame, United States

Friday, January 9 08:20 - 11:40
B7 Special Session Bear Peak

New Applications Enabled by Intelligent Surfaces in Future Wireless Networks

Session Co-Chairs: Mohammadreza F. Imani, Arizona State University; Georgios Trichopoulos, Arizona State University

B7.1 **08:20**
Wideband, 1-bit and Low-Phase Error Reconfigurable Inteligent Surface for 5G/6G Communications
Tatiana Valera, Stavros Koulouridis, Satheesh Venkataksrishnan, John Volakis, Florida International University, United States

B7.2 **08:40**
Genetic Algorithm-Based Metasurfaces for Flexible Beamforming Design
Daniel Lu, Arizona State University, United States; Quang Nguyen, DEVCOM Army Research Laboratory, United States; Georgios Trichopoulos, Arizona State University, United States

B7.3 **09:00**
RIS-Aided Near-Field ISAC for Smart Vehicle Cabins
Ziyu Chen, Alvin Yang, Matthew T. Kouchi, Wayne A. Shiroma, Aaron T. Ohta, Yao Zheng, Hanqing Guo, University of Hawai'i at Mānoa, United States

B7.5 **09:40**
Reconfigurable Holographic Surfaces with Optically Driven Control Circuitry
Feiyu Shan, Georgios Trichopoulos, Arizona State University, United States

B7.6 **10:00**
Steerable Reflectarray formed of Tightly Coupled Dipoles Across a 6:1 Bandwidth
Zayed Mohammad, Muhammad Mubasshir Hossain, Tatiana Valera, Florida International University, United States; Cedric Wee Liang Lee, Theng Huat Gan, National University of Singapore, Singapore; Satheesh Bojja Venkatakrishnan, John L Volakis, Florida International University, United States

B7.7 **10:20**
Full-wave Validation of a Network-Based RIS Beamshaping Framework
Kavian Zirak, Arizona State University, United States; Anish Pradhan, Harpreet S. Dhillon, Virginia Tech, United States; Mohammadreza F. Imani, Arizona State University, United States

B7.8 **10:40**
Beamforming with a Metasurface Connected to Reactive Loads/Networks
Anthony Grbic, Malik Almunif, University of Michigan, United States

B7.9 **11:00**
One-Shot Beam Training for Reconfigurable Intelligent Surface
Qiufeng Rui, Princeton University, United States; Jurui Qi, University of California San Diego, United States; Haoze Chen, Ruiyi Shen, Atsutse Kludze, Heyu Guo, Princeton University, United States; Gabriel Rebeiz, University of California San Diego, United States; Yasaman Ghasempour, Princeton University, United States

B7.10 **11:20**
Beamsteering by a Finite 2-D Hybrid Reconfigurable Intelligent Surface with Mitigated Quantization Lobes
Sajedeh Keshmiri, Suren Jayasuriya, Mohammadreza F. Imani, Arizona State University, United States

Friday, January 9 08:20 - 09:20
GH7 Special Session Meadows C&D

Meteors, Orbital Debris and Dusty Plasmas III

Session Co-Chairs: Sigrid Elschot, Stanford University; Michael Kwara

GH7.1 **08:20**
Analysis of ELF/VLF Transients Observed Durations during the Perseid Meteor Shower
Robert Moore, Richard McCoy, University of Florida, United States

GH7.2 **08:40**
Advancing Meteor Population Statistics via Head Echo Analysis in Mesospheric Radar Data Collected by SAAMER
Ana Banzer Morgado, Stanford University, United States; Diego Janches, Goddard Space Flight Center, United States; Trevor Hedges, Stanford University, United States; Daniel O'Connor, Genesis Software, Australia; Sigrid Elschot, Stanford University, United States

GH7.3 **09:00**
Modeling The Effect of Mode Conversion on Meteor Plasmas
Michael Kwara, Sigrid Elschot, Stanford University, United States

Friday, January 9 | 08:20 - 10:00
G8 | Special Session | Flatirons 4

Ionospheric Storms I

Session Co-Chairs: Anthea Coster, MIT Haystack; Kshitija Deshpande, Embry-Riddle Aeronautical University

G8.1 **08:20**
Diagnostic Back Propagation Analysis of Extreme Scintillation
Charles Rino, Charles Carrano, Boston College, United States; Dmytro Vasylyev, Solar-Terrestrial Physics, German Aerospace Center, Germany; Luca Spogli, Yu Morton, National Institute of Geophysics and Volcanology, Rome, Italy, Germany

G8.2 **08:40**
Spatio-Temporal Evolution of Ionospheric Irregularities and Their Impact on GPS Positioning: Insights From the May 2024 Solar Storm
Waqar Younas, Toshi Nishimura, Weixuan Liao, Josh Semeter, Boston University, United States; Sebastijan Mrak, Johns Hopkins University, United States; Jade Morton, University of Colorado, United States; Keith Groves, Boston College, United States; Tetsuo Motoba, Johns Hopkins University, United States; Tim Everett, RTK Consultant LLC, United States

G8.3 **09:00**
Intermittency of Electron Density Turbulence in the Ionosphere During Geomagnetic Storms
Romina Nikoukar, Johns Hopkins University Applied Physics Laboratory, United States; Andres Spicher, The Arctic University of Norway, Norway; Wojciech J. Miloch, Lasse B. N. Clausen, University of Oslo, Norway

G8.4 **09:20**
Impact of the extreme westward auroral electrojet on the ionosphere: A case study during the 23-24 April 2023 storm
Yunbo Liu, Qingyu Zhu, University of Texas at Dallas, United States; Ying Zou, Johns Hopkins University Applied Physics Laboratory, United States; Shunrong Zhang, MIT Haystack Observatory, United States

G8.5 **09:40**
Analysis of High-Latitude Total Electron Content and Scintillation during Recent Geomagnetic Storms
Anthea Coster, Allan Weatherwax, Nestor Aponte, MIT Haystack Observatory, United States; Keith Groves, Theodore Beach, Boston College, United States

Friday, January 9 | 08:20 - 10:00
J4 | Special Session | Meadows B

Water Vapor Radiometry Strategies for Earth Atmosphere Sensing

Session Co-Chairs: Brian Svoboda, National Radio Astronomy Observatory; Kyle Massingill, National Radio Astronomy Observatory

J4.1 **08:20**
24/31 GHz Dual-Band Phased Array for Water Vapour Radiometry
Heinrich Laue, Tinus Stander, University of Pretoria, South Africa

J4.2 **08:40**
LO Considerations in a 183 GHz Mixer-First WVR
Reuben Neate, Tinus Stander, University of Pretoria, South Africa; David Hiriart, Stanley Kurtz, Universidad Nacional Autonoma de Mexico, Mexico

J4.3 **09:00**
CubeSounder: Flying a Novel 3D Weather Imaging Sensor on a High-Altitude Balloon
Tyler Karasinski, Michael Baricuatro, Daniel Bliss, Sean Bryan, Delondrae Carter, Walter Goodwin, Jonathan Greenfield, Christopher Groppi, Jae Joiner, Arizona State University, United States; Kyle Massingill, National Radio Astronomy Observatory, United States; Phillip Mauskopf, Bianca Pina, Philip Rybak, Scott Smas, Roshni Suresh, Joesph Tinlin, Peter Wullen, Arizona State University, United States

J4.4 **09:20**
Scanning Water Vapor Radiometers for CMB Observatories in Chile and at South Pole
Scott Mackey, Alexander Papen, University of Chicago, United States; Denis Barkats, Center for Astrophysics, Harvard & Smithsonian, United States; Darcy Barron, Ian Birdwell, University of New Mexico, United States; Sofia Fatigoni, California Institute of Technology, United States; John Kovac, Scott Paine, Matthew Petroff, Center for Astrophysics, Harvard & Smithsonian, United States; Abigail Vieregg, University of Chicago, United States

J4.5 **09:40**
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; Brian Svoboda, National Radio Astronomy Observatory, United States

Friday, January 9 | 10:00 - 10:20
Event

Break (regular coffee, decaf coffee, hot tea, and water)

Friday, January 9 | 10:20 - 12:00
H7 | Special Session | Meadows C&D

Laboratory and Space Plasmas I

Session Co-Chairs: Chris Crabtree, US Naval Research Laboratory; William Amatucci, Naval Research Laboratory

H7.1 **10:20**
The SYSTER/COUSIN Sounding Rocket: Targeting Small-Scale Auroral Region Energy Deposition
David Malaspina, University of Colorado, Boulder, United States; Nickolay Ivchenko, KTH, United States; James Clemmons, University of New Hampshire, United States; Roderick Heelis, University of Texas, Dallas, United States; Allison Jaynes, University of Iowa, United States; Marilia Samara, Robert Michell, Goddard Spaceflight Center, United States; Matthew Zettergren, Embry-Riddle Aeronautical University, United States; Wesley Cole, Carl Himpsel, Sally Haselschwardt, University of Colorado, Boulder, United States

H7.2 **10:40**
Radio Emission, Plasma Waves, and Charged Particles in Jupiter: Quasilinear Analysis and Modeling of JUNO Spacecraft Data
Peter Yoon, University of Maryland, United States

H7.3 **11:00**
Observation of soliton excitation by a charged object in a flowing plasma
Krishan Kumar, West Virginia University, United States; Erik Tejero, Ami DuBois, Alexander Hyde, Naval Research Laboratory, United States; Gregory Lusk, Thomas Rood, West Virginia University, United States; William Amatucci, Naval Research Laboratory, United States; Piyush Mehta, Earl Scime, West Virginia University, United States

H7.4 **11:20**
The Origin of Non-Gyrotropic Distribution Functions in Compressed Magnetotail Current Sheets
Ami DuBois, Chris Crabtree, Emily Lichko, Guru Ganguli, U.S. Naval Research Laboratory, United States

H7.5 **11:40**
Space Measurements of A Rocket-Released Turbulence (SMART)
George Gatling, Carl Siefring, Gururdas Ganguli, Joseph Coombs, Christopher Crabtree, William Amatucci, Jason McLain, US Naval Research Laboratory, United States; William Farrell, Space Sciences Institute, United States; Alexander Fletcher, NASA, United States; Robert Holzworth, Michael McCarthy, University of Washington, United States

Friday, January 9 | 10:20 - 11:40
G9 | Special Session | Flatirons 4

Ionospheric Storms II

Session Co-Chairs: Anthea Coster, MIT Haystack; Kshitija Deshpande, Embry-Riddle Aeronautical University

G9.1 **10:20**
Ionospheric Dynamics and Its Impact on RF Applications During Superstorm Events
Endawoke Yizengaw, The Aerospace Corporation, United States

G9.2 **10:40**
Distributed Observations of Mid-Latitude L-band Scintillation and TEC Response to the Gannon Storm 2024
Isaac Wright, Fabiano Rodrigues, Josemaria Gomez Socola, University of Texas at Dallas, United States; Reeshab Anumula, Texas A&M University, United States; Christiano Garnett Marques Brum, Pedrina Terra, University of Central Florida, United States; Kshitija Deshpande, Embry-Riddle Aeronautical University, United States; Philip Erickson, MIT Haystack Observatory, United States; Nathaniel Frissell, University of Scranton, United States; Michael Hauan, Citizen Volunteer, 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 G. Shepherd, Dartmouth, United States; Gregory Taylor, University of New Mexico, United States

G9.3 **11:00**
Response of High-Latitude GNSS Scintillations to Ionospheric Gradients and Particle Precipitation During Storms and Substorms
Jay Johnson, Braeden Peterson, Noah Koliadko, Andrews University, United States; Simon Wing, Johns Hopkins University, United States; Chris Inae, Andrews University, United States; Sebastijan Mrak, Johns Hopkins University, United States; Yukitoshi Nishimura, Boston University, United States; Eun-Hwa Kim, Andrews University, United States

G9.4 **11:20**
Modeling of the ionospheric irregularities and scintillation during moderate and extreme storm times in high latitude
Pralay Raj Vaggu, Kshitija Deshpande, Matt Zettergren, Embry-Riddle Aeronautical University, United States; Toshi Nishimura, Boston University, United States

Friday, January 9 | 10:20 - 12:00
J5 | Meadows B

New Telescopes, Techniques and Technologies II

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

J5.1 10:20
A 1420 MHz Offset Feed for the Westford Radio Telescope
Daniel Sheen, Samuel The, Frank Lind, Massachusetts Institute of Technology, United States

J5.2 10:40
Propagation Measurements in the 7 GHz Band Near the VLA Telescope
Sarah Tanveer, Ali Abedi, University of Wisconsin-Madison, United States

J5.4 11:20
The Black Hole Explorer: A Space VLBI Mission Concept
Daniel Marrone, University of Arizona, United States

J5.5 11:40
Fielding the Next Generation of Far-Infrared Detector Arrays with the Terahertz Intensity Mapper
Evan Mayer, The University of Arizona, United States

Friday, January 9 | 12:15 - 13:05
Event | Flatirons 1

Thirteenth Hans Liebe Lecture

Friday, January 9 | 13:20 - 16:20
B8 | Flatirons 1

Antenna, Theory, and Design

Session Co-Chairs: Atef Elsherbeni, Colorado School of Mines; Laila Fighera Marzall, CU Boulder

B8.1 13:20
Low-cost software-controlled phase shifting network for generating spatiotemporally variable waveforms
Kobe Prior, Aidan Malensek, Matthew Dodd, Atef Elsherbeni, Colorado School of Mines, United States

B8.2 13:40
Antenna Arrays Optimization for Generating Structured Beams
Matthew Lindboe, Matthew Kunkle, Roy Allen, Hichem Guerboukha, Ahmed Hassan, University of Missouri-Kansas City, United States

B8.3 14:00
Fast Algorithm to Optimize a Reconfigurable Pixel-Based Array
Luke Mello, Justin Roessler, Aadi Mehta, Hannah Sanders, Austin Egbert, Charles Baylis, Robert Marks, Baylor University, United States; Dimitrios Peroulis, Purdue University, United States

B8.4 14:20
Microstrip Patch Antennas for Creeping-Wave Excitation
Nanik Ram, Maliha Rahim, David Jackson, Shantanu Sarkar, Jose Contreras-Vidal, University of Houston, United States

B8.5 14:40
Circularly Polarized Patch Antennas for use in Mining Environments
Silje Ostrem, Atef Elsherbeni, Jamal Rostami, Colorado School of Mines, United States

B8.6 15:00
Design of Circular Array Lenses Through the Quasi-Conformal Transformation Optics
Edward Wawrzynek, Songyi Yen, Dejan Filipovic, University of Colorado Boulder, United States

B8.7 15:20
Ridge Gap Waveguide (RGW)-Based Antenna for Long Range High Power Beaming Applications
Nayan Sarker, The University of Texas at Dallas, United States; Aditya Dave, Samsung Research America, Plano, TX 75024,, United States; Ifana Mahbub, The University of Texas at Dallas, United States

B8.8 15:40
An Active Embedded Pattern-Based Model for Polarimetric Mutual Coupling in Finite Arrays
Jeffrey Massman, Analog Devices, United States

B8.9 16:00
Properties of Tightly-Coupled Self-Complementary Rectenna Arrays
Spencer Orne, Alexandra Montgomery, Zoya Popovic, University of Colorado Boulder, United States

Friday, January 9 | 13:20 - 16:20
E1 | Flatirons 2

Systems, Interference Analysis, and Sensors

Session Co-Chairs: Adam Hicks, Institute for Telecommunication Sciences; Charles Dietlein, National Telecommunications and Information Administration

E1.1 13:20
Interference Monitoring with NRDZ-as-a-Service at Hat Creek Radio Observatory
Curtis Watson, William Young, Patricia Larkoski, The MITRE Corporation, United States

E1.2 13:40
Wi-Fi Interference on a Satellite System in GEO
Mustafa Yilmaz, National Telecommunications and Information Administration, United States

E1.3 14:00
L-Band Mobile-Satellite Uplink Interference to GPS: Measurements and Simulations
Yankai Peng, J. Nicholas Laneman, University of Notre Dame, United States

E1.4 14:20
A Simple Formula for the Mean Peak-to-Average Power Ratio of Sampled Complex-Valued White Gaussian Noise and Its Application to Radio Spectrum Measurements
Adam Wunderlich, Aric Sanders, National Institute of Standards and Technology, United States

E1.5 14:40
Estimating the Number of Captures Required to Characterize In Situ Received Power Measurements of Deployed 5G Networks in the Presence of Nonstationarity
Aric Sanders, Adam Wunderlich, NIST, United States

E1.6 15:00
A Comparison of Fast Techniques to Monte Carlo Techniques for Aggregate Modelling Including Clutter
Joel Dumke, Institute for Telecommunication Sciences, United States

E1.7 15:20
Modeling and Measurement of NASCTN SEA Sensors in CBRS Ecosystem
Thao Nguyen, Duncan McGillivray, Aric Sanders, National Institute of Standards and Technology, United States; Todd Schumann, National Telecommunications and Information Administration, United States

E1.8 15:40
Preliminary Selection Criteria and Considerations for Receiver Site Installation at McMurdo, Station Antarctica
Adam Hicks, Robert Achatz, ITS, United States

E1.9 16:00
Long-Term Calibration Trends and Observations from Deployed NASCTN SEA Sensors
Todd Schumann, National Telecommunications and Information Administration, United States; Aric Sanders, Duncan McGillivray, National Institute of Standards and Technology, United States

Friday, January 9 13:20 - 16:20
J6 Meadows B

RFI Challenges and Innovations in Radio Astronomy

Session Co-Chairs: Namir Kassim, Naval Research Laboratory; Dave DeBoer, University of California, Berkeley

J6.1 **13:20**
Satellite unintended emissions and radio astronomy : Challenges under ITU-R RA.769-2
Gregory Hellbourg, California Institute of Technology, United States

J6.2 **13:40**
EMILY : Electro Magnetic Interference Ledger & registrY
Gregory Hellbourg, Caltech, United States; Neal Patwari, University of Utah, United States; Ning Zhang, Washington University Saint-Louis, United States

J6.3 **14:00**
Designing for and Teaching Radio Astronomy in a High-RFI Environment
Jorian Benke, Daniel Sheen, Oliver Trevor, Massachusetts Institute of Technology, United States

J6.4 **14:20**
Survey of Satellite-driven Unintended Electromagnetic Radiation at 50–70~MHz with the Orville Wideband Imager
John Marino, Nicholas Rainville, James Monaco, Scott Palo, University of Colorado Boulder, United States; Gregory Taylor, Jayce Dowell, University of New Mexico, United States

J6.5 **14:40**
Electromagnetic Compatibility Control Plan for the DSA-2000 Radio Telescope
Abraham Otto, Herzberg Astronomy and Astrophysics Research Centre, Canada; Francois Kapp, Gregory Hellbourg, California Institute of Technology, United States

J6.6 **15:00**
RFI Mitigation for 3.3 GHz CH Observations of Dark Molecular Gas with the Arecibo 12m Telescope
Liam Gallagher, Hector Ramos, William Dellinger, Anish Roshi, University of Central Florida, United States; Mitchell Burnett, Florida Space Institute, United States; Wei Liu, Dan Werthimer, University of California, Berkeley, United States; Allison Smith, University of Puerto Rico, Mayagüez, United States; Emmanuel Butler, University of Puerto Rico, Utuado, United States; Rafael Rodríguez-Solís, University of Puerto Rico, Mayagüez, United States

J6.7 **15:20**
Radio Astronomy: Maintaining Access to the Sky
Frank Schinzel, Chris De Pree, NRAO, United States

J6.8 **15:40**
The Impact of Mega-Constellations on Radio Astronomy
Samuel Thé, Frank Lind, Daniel Sheen, Massachusetts Institute of Technology, United States

J6.9 **16:00**
Characterizing Low-Frequency RF Signatures of Aircraft with the OVRO-LWA
Gregory Hellbourg, Caltech, United States; Balthasar Indermuehle, CSIRO, Australia; Dylan Grigg, CIRA, Australia; Cees Bassa, ASTRON, Netherlands; Xiang Zhang, Observatoire de Paris, France

Friday, January 9 13:20 - 15:00
K3 Trailhead

Electromagnetic Imaging, Sensing and Biomedical Wireless Devices

Session Co-Chairs: Sima Noghanian, CommScope Ruckus Networks; M Shifatul Islam, The Ohio State University

K3.1 **13:20**
Validating Deep Neural Networks Trained with Circular and Elliptic Cylinders
Giuseppe Carluccio, University Federico II of Napoli, Italy; Eros Montin, Christopher Collins, Riccardo Lattanzi, New York University, United States; Daniele Riccio, Giuseppe Ruello, University Federico II of Napoli, Italy

K3.2 **13:40**
Uncertainty Quantification of Breast Tissue Properties for Microwave Breast Cancer Detection
Kaitlin Hall, Cynthia Furse, University of Utah, United States

K3.3 **14:00**
Differential Microwave Sensing for Localizing Breast Tumors: A Voxel Model Simulation
M Shifatul Islam, Audrey Havrilla, Asimina Kiourti, The Ohio State University, United States

K3.5 **14:40**
Human Tissue Phantoms Based on Carbon-Rubber Mixtures
Nico Kadonaga, Ocean Reamer, Joseph Dunbar, Zoya Popovic, University of Colorado Boulder, United States

Friday, January 9 13:20 - 15:00
H8 Special Session Meadows C&D

Laboratory and Space Plasmas II

Session Co-Chairs: Chris Crabtree, US Naval Research Laboratory; William Amatucci, Naval Research Laboratory

H8.1 **13:20**
Exploring Energy Transport Mechanisms in the Quiet Time Radiation Belts
Austin Brenner, Alex Glocer, Mei-Ching Fok, Suk-Bin Kang, Aleida Higginson, Peter Schuck, NASA, United States

H8.2 **13:40**
What Can Global GPS Anomaly Data Reveal About Spread-F?
Amy Tao, New York University, United States; Peter Schuck, Aleida Higginson, NASA, Goddard Space Flight Center, United States

H8.3 **14:00**
In-house electronic systems for driving multi-loop antenna phased arrays for launching whistler and EMIC mode waves in laboratory plasmas.
Kyle Hrenyo, William Amatucci, U.S. Naval Research Laboratory, United States; Dennis Papadopoulos, University of Maryland, United States

H8.4 **14:20**
"Cat and Mouse": In-Situ Active and Passive Characterization of Pinned and Precursor Solitons from RSOs in LEO
John Bonnell, Univ. of California, Berkeley, United States

H8.5 **14:40**
Laser Induced Fluorescence Measurements of Flow Velocity in a Rotating Plasma Layer
Alexander Hyde, Erik Tejero, William Amatucci, Naval Research Laboratory, United States

Friday, January 9 13:20 - 14:40
G10 Special Session Flatirons 4

Active Experiments

Session Co-Chairs: Paul Bernhardt, University of Alaska Fairbanks; Marcos Inonan, University of Texas at Dallas

G10.1 **13:20**
Pulse Shaping for Enhanced Time of Arrival Analysis at HAARP
Quinn Hunter-Gilbert, Hunter Burch, Auburn University, United States

G10.2 **13:40**
Updated Method for Ionospheric Tomography using Unconventional GNSS Signals
Brenna Royersmith, Brian Breitsch, Jade Morton, University of Colorado at Boulder, United States

G10.3 **14:00**
VLF Wave Generation via HF Heating as a Plasma Diagnostic at HAARP
Hunter Burch, Taylor Lindley, Auburn University, United States

G10.4 **14:20**
Optimization of VLF Wave Generation via Beat Wave HF Heating
Christopher Lathram, Hunter Burch, Auburn University, United States

Friday, January 9 | 13:20 - 15:00
GH11 | Special Session | Meadows A

Meteors, Orbital Debris and Dusty Plasmas I

Session Co-Chairs: Sigrid Elschot, Stanford University; Michael Kwara

GH11.1 13:20
Measurements of the Ionization Efficiency of Silicon Micrometeoroids During Ablation in Air and N2
Santiago Pinzon-Cortes, The Catholic University of America, United States; Austin Smith, University of Colorado, United States; Juan Diego Carrilo-Sanchez, NASA Goddard Space Flight Center, United States; Zoltan Sternovsky, University of Colorado, United States; Diego Janches, NASA Goddard Space Flight Center, United States

GH11.2 13:40
On the Persistence of Landau-Damped Solitons for Space-Debris Detection
Ashwyn Sam, Stanford University, United States; Chris Crabtree, US Naval Reasearch Lab, United States; Sigrid Elschot, Stanford University, United States

GH11.3 14:00
Influence of Meteor-Induced Ionospheric Disturbances on HF Radio Signal Propagation
Xueyicheng Xu, Zheng Liu, Mingcheng Yang, Taniish Agarwal, University of Washington, United States; Maxwell Mamishev, University of Illinois Urbana-Champaign, United States; Gokul Nathan, Sep Makhsous, University of Washington, United States; Nick Donnangelo, University of Maryland, United States; Mickey Batson, IARPA, United States

GH11.4 14:20
Tracking the Orbits of Small Space Debris with Ionospheric Plasma Waves
Paul Bernhardt, University of Alaska, United States; Bengt Eliasson, Dept, of Phys., SUPA, Univ. of Strathclyde, Glasgow, UK, United States; Andrew Howarth, University of Calgary, Calgary, AB, Canada, Canada; Samual McKay, University of Alaska, Fairbanks, United States

GH11.5 14:40
Persistent ELF/VLF Radio Bursts: A New Impulsive Radio Transient Associated with Bolides
Robert Moore, R. William McCoy, University of Florida, United States; NIck Donnangelo, University of Maryland, United States; Mickey Batson, IARPA, United States

Friday, January 9 | 13:20 - 15:00
B9 | Special Session | Flatirons 3

Advanced Modeling Techniques and Algorithms in Computational Electromagnetics

Session Co-Chairs: Ata Zadehgol, University of Idaho; Branislav Notaros, Colorado State University

B9.1 13:20
Error Estimation Techniques for Adaptive Anisotropic hp-Refinement in Computational Electromagnetics Using the Refinement by Superposition Framework
Ross Stauder, Jeremiah Corrado, Branislav Notaros, Colorado State University, United States

B9.2 13:40
Radiation Loss Induced by Sidewall Roughness in Planar Dielectric Waveguides
Bikesh Shrestha, Ata Zadehgol, University of Idaho, United States

B9.3 14:00
Adjoint and Surrogate Model Methods for Uncertainty Quantification and Adaptive Mesh Refinement in Radar Cross Section Computations
Christopher Erickson, Jake Harmon, Stephen Kasdorf, Branislav Notaroš, Colorado State University, United States

B9.4 14:20
Heuristic CPML Tuning with Particle Swarms using Auxiliary Simulations
Steven Perry, Clint Snider, Auburn University, United States

B9.5 14:40
Computer Aided Design Integration into Finite-Difference Time-Domain Simulations
Henry Nance, Clint Snider, Auburn University, United States

Friday, January 9 | 13:20 - 15:00
H9 | Special Session | Bear Peak

Ionospheric Modification I

Session Co-Chairs: Robert Moore, University of Florida; Ashanthi Maxworth, University of Southern Maine

H9.1 13:20
Ionospheric Modification by HF Heating with Stepwise Frequency-Swept Pulses: Duct Formation, Excited ELF/VLF Wave Generation, and Guided Propagation
Salman A. Nejad, Dori Stein, Nicholas Harwood, Anatoly Streltsov, Embry-Riddle Aeronautical University, United States

H9.2 13:40
Comparisons of ELF and VLF Recordings of Lightning Impulses
Mark Golkowski, Alex Sandersfeld, Malek Abusnina, University of Colorado Denver, United States

H9.3 14:00
Validation of Single Station Lightning Location Estimation Technique with WWLLN Data
Ashanthi Maxworth, University of Southern Maine, United States; Janos Lichtenberger, Eötvös Loránd University, Hungary; Mark Golkowski, University of Colorado Denver, United States; Prasanna Liyanage, University of Peradeniya, Sri Lanka

H9.4 14:20
ELF Group Velocity Remote Sensing of Ionospheric Disturbances from Gamma Ray Bursts and Solar Flares
Mark Golkowski, University of Colorado Denver, United States; Zenon Nieckarz, Jerzy Kubisz, Michal Ostrowski, Jagiellonian University, Poland; Janos Lichtenberger, Eötvös University, Hungary

H9.5 14:40
Generation of Super Low Frequency Signals at the HAARP Facility for Long Range Propagation
Malek Abusnina, University of Colorado Denver, United States

Friday, January 9 | 15:00 - 15:20
Event

Break (regular coffee, decaf coffee, hot tea, iced tea, and water)

Friday, January 9 | 15:20 - 16:40
B10 | Special Session | Trailhead

Multifunctional Antennas and Arrays for Satellite and Wireless Communications

Session Co-Chairs: Satish Sharma, San Diego State University; Md Nur Alam, Florida International University, USA

B10.1 15:20
Wideband Circularly Polarized Receive Fixed Beam Array Antenna for Ku-Band SATCOM
Nhat Truong, Satish Sharma, San Diego State University, United States; Raif Farkouh, Jia-Chi Chieh, NIWC-Pacific, United States

B10.2 15:40
A Compact Wideband Circularly Polarized MIMO Antenna for High Data Rate Communications
Sharif Uddin, Washington State University Vancouver, United States; Abu Horaira Hridhon, University of Maryland, United States; Matvei Stalmakou, Tutku Karacolak, Washington State University Vancouver, United States

B10.3 16:00
Co-located Individually Excited Dual-band Miniaturized Loop Antennas Utilizing Inherent Impedance Matching
Arthur Gratas, San Diego State University, United States; Sanghamitro Das, Jones Microwave, Inc., Canada; Nhat Truong, Satish Sharma, San Diego State University, United States

B10.4 16:20
A Multi-Beam Lens-Assisted Tri-Band Shared Aperture with High Frequency Ratio
Md Nur Alam, Elias A. Alwan, Florida International University, USA, United States

Friday, January 9 | 15:20 - 16:20
H10 | Special Session | Meadows C&D

Laboratory and Space Plasmas III

Session Co-Chairs: Chris Crabtree, US Naval Research Laboratory; Bill Amatucci, Naval Research Laboratory

H10.1 15:20
NRL SPADE-3 Experiment
Bill Amatucci, Erik Tejero, George Gatling, Naval Research Laboratory, United States

H10.2 15:40
Hunting for Electromagnetic Solitons in the Laboratory
Erik Tejero, Chris Crabtree, Dave Blackwell, Rualdo Soto-Chavez, Ami DuBois, Bill Amatucci, US Naval Research Lab, United States

Friday, January 9 | 15:20 - 16:40
G12 | Special Session | Flatirons 4

TIDS and TADS

Session Co-Chairs: Anthony Abubakar, University of Texas at Dallas; Geoff Crowley, Arcfield

G12.1 **15:20**
Impacts of Resolved Gravity Waves on Global-Scale Wave Variability in the Ionosphere- Thermosphere System: A Case Study
Federico Gasperini, Orion Space Solutions, United States; Hanli Liu, National Center for Atmospheric Research, United States

G12.2 **15:40**
4-D Lomb-Scargle Spectral Analysis Technique for Studies of the Ionospheric Effects of Rocket Launches Based on Dynasonde Echo Data
Joseph Hughes, Nikolay Zabotin, L.J. Nickisch, Liudmila Zabotina, NorthWest Research Associates, United States; Joe Malins, Air Force Research Labs, United States

G12.3 **16:00**
Tracing Medium-Scale Traveling Ionospheric Disturbance Propagation with TRIDENT
Anastasia Newheart, Scott Thaller, Federico Gasperini, Ian Collett, Dan Knight, Orion Space Solutions, United States; Geoff Crowley, Arcfield, United States

G12.4 **16:20**
Unraveling Storm-Time Ionospheric Disturbances: The Roles of PEFs and TIDs
Lauren Christenson, Ann and H.J. Smead Aerospace Engineering Sciences, University of Colorado Boulder, United States; Naomi Maruyama, Laila Andersson, Laboratory for Atmospheric and Space Physics, United States; Shunron Zhang, Haystack Observatory, Massachusetts Institute of Technology, United States; Luis Navarro, Ann and H.J. Smead Aerospace Engineering Sciences, University of Colorado Boulder, United States

Friday, January 9 | 15:20 - 16:40
GH13 | Special Session | Meadows A

Meteors, Orbital Debris and Dusty Plasmas II

Session Co-Chairs: Sigrid Elschot, Stanford University; Michael Kwara

GH13.1 **15:20**
Utilizing a Quasi-Specular Scattering Model to Enable Monte Carlo Simulation of Specular Meteor Radar Networks
James Monaco, John Marino, Scott Palo, University of Colorado Boulder, United States

GH13.2 **15:40**
Toward a Polarimetric Theory of Meteor Radar Echoes
John Marino, Nicholas Rainville, Scott Palo, University of Colorado Boulder, United States

GH13.3 **16:00**
Investigating Plasma Wave Signatures Due To Orbital Debris
Bobby West, Beatrice Evans, Naomi Maruyama, David Malaspina, University of Colorado, Boulder, United States

GH13.4 **16:20**
Plasma signatures of small orbital debris in LEO
Gian Luca Delzanno, Pedro Resendiz, Justin Holmes, Salomon Janhunen, Los Alamos National Laboratory, United States

Friday, January 9 | 15:20 - 16:20
B11 | Flatirons 3

Numerical Methods

Session Chair: Clint Snider, Auburn University

B11.1 **15:20**
Reinterpreting Conformal Mapping as Magnetic Surface Current
Jack Ulmer, Mohammed Hadi, Melinda Piket-May, University of Colorado, United States

B11.2 **15:40**
A Mesh-Free Neural Network-Based Method for the Analysis of Electromagnetic Structures
Nusrat Zahan Priota, John Volakis, Markondeya Raj Pulugurtha, Constantinos Zekios, Florida International University, United States

B11.3 **16:00**
Nonlinear Laplace Solver for Simulation of Multi-layer Ceramic Capacitors
Zachary Gayford, William Snider, Auburn University, United States

Friday, January 9 | 15:20 - 16:20
H11 | Special Session | Bear Peak

Ionospheric Modification II

Session Co-Chairs: Robert Moore, University of Florida; Ashanthi Maxworth, University of Southern Maine

H11.1 **15:20**
Source-Imposed Nonlinear Waveguide Excitation by VLF Sources
Joshua Santos, Robert Moore, University of Florida, United States

H11.2 **15:40**
D-Region Heating Experiments at HAARP
Robert Moore, R. William McCoy, James Camp, Joshua Santos, Harrison Burch, University of Florida, United States

H11.3 **16:00**
Density Observations of Ionospheric Duct Formation During HAARP HF Experiments Using a Toroidal Beam
Chynna Spitler, Amani Reddy, Paul Bernhardt, Geophysical Institute, University of Alaska Fairbanks, United States; Jason Lee, University of Colorado Boulder, United States; Peter Delamere, Mike McCarrick, Geophysical Institute, University of Alaska Fairbanks, United States; Neeti Sonth, University of Colorado Boulder, United States

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