2017 IEEE International Symposium on Antennas and Propagation and URSI/USNC National Radio Science Meeting

Final Program

July 9 – 14, 2017
Manchester Grand Hyatt San Diego
San Diego, California, USA

Conference at a Glance

Sunday, July 9

08:00 - 17:00 Short Courses: FD-1, FD-4, FD-6
08:00 - 12:00 Short Course: HD-1
09:00 - 10:30 Amateur Radio License Exam Session
13:00 - 17:00 Short Course: HD-2

Monday, July 10

07:00 - 08:00 Amateur Radio Breakfast Meeting
07:00 - 08:00 Meeting: Standard 1502 Breakfast Meeting
08:00 - 11:40 Technical Sessions (Oral)
12:00 - 13:30 Meeting: Distinguished Lecturer Meeting and Lunch
12:00 - 13:30 Meeting: Transactions Associate Editors and Track Editors Lunch
13:20 - 17:00 Technical Sessions (Oral)
16:00 - 17:00 Meeting: Future Symposia Meeting
17:00 - 18:00 Meeting: APS 2019 Committee Meeting
17:00 - 18:00 Meeting: URSI Commission B Business Meeting
17:00 - 18:00 Meeting: URSI Commission C Business Meeting
17:00 - 18:00 Meeting: URSI Commission F Business Meeting
19:30 - 21:30 Welcome Dessert Reception

Tuesday, July 11

07:00 - 08:00 Meeting: Magazine Staff Breakfast
08:00 - 11:40 Technical Sessions (Oral)
08:00 - 11:40 Student Paper Compeition Presentations
08:00 - 08:30 Student Design Competition (Set-Up - Closed to Others)
08:30 - 09:30 Student Design Competition (Demo for Judges - Closed to Others)
09:00 - 10:00 Meeting: AP History Committee
09:30 - 12:00 Student Design Competition (Demo for Public)
09:30 - 12:00 Meeting: Student Design Competition Judges Meeting
10:00 - 11:00 Meeting: APS 2018 Committee Meeting
12:00 - 13:00 Student Design Competition (Luncheon for Judges and Teams)
12:00 - 13:30 Women In Engineering Lunch and Speaker
13:00 - 17:00 Student Design Competition (Demo for Public)
13:20 - 17:00 Technical Sessions (Oral)
16:00 - 18:00 Technical Sessions (Interactive Forum)
16:00 - 18:00 Interactive Forum Reception
18:30 - 20:30 Young Professionals' Beach Barbecue

Wednesday, July 12

07:00 - 08:00 Student Paper Judges Committee Breakfast
08:00 - 11:40 Technical Sessions (Oral)
12:00 - 13:30 Reviewers' Lunch
13:00 - 14:00 Meeting: Publications Committee Meeting
13:20 - 17:00 Technical Sessions (Oral)
17:00 - 18:00 URSI Commission A Business Meeting
17:00 - 18:00 URSI Commission E Business Meeting
17:00 - 18:00 URSI Commission G Business Meeting
17:00 - 18:00 URSI Commission K Business Meeting
18:00 - 19:00 Awards Presentation
19:00 - 21:00 Celebratory Banquet

Thursday, July 13

08:00 - 11:40 Technical Sessions (Oral)
12:00 - 13:00 Meeting: APS Fellows Committee Lunch
12:00 - 13:00 Meeting: AWPL AE Lunch
12:00 - 13:00 Meeting: Education Committee
12:00 - 13:00 Meeting: IEEE Press Liaison Lunch
12:00 - 14:00 Meeting: Chapter Chairs Lunch
12:00 - 14:00 Meeting: APS Propagation Standards Committee Lunch
13:20 - 17:00 Technical Sessions (Oral)
16:00 - 18:00 Technical Sessions (Interactive Forum)
16:00 - 18:00 Interactive Forum Reception
18:00 - 21:00 MGA, FDI and SIGHT Dinner
18:45 - 22:00 Dinner Sail

Friday, July 14

08:00 - 11:40 Technical Sessions (Oral)
13:20 - 17:00 Technical Sessions (Oral)

Contents

Chairs' Welcome

On behalf of the Conference Organizing Committee, the Antennas and Propagation Society, and USNC-URSI, we welcome you to San Diego and the 2017 IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting. This meeting is the premier international forum for the exchange of ideas on state-of-the-art research in antennas, propagation, electromagnetic engineering, and radio science. Through an exciting lineup of technical and social activities, it will provide the opportunity to interact with the world's leading experts in antennas and propagation from academia, industry, and government.

This year's meeting will be held at the Manchester Grand Hyatt Hotel, which is directly on the water, and minutes from downtown activities including the San Diego Zoo, Balboa Park and its numerous museums, and the Gaslamp district for dining and nightlife. San Diego is the eighth largest city in the country, and is often referred to as "America's Finest City." Known for its great hotels, beautiful weather, pristine beaches, friendly people and a plethora of entertainment, San Diego is a favorite destination for visitors across the globe. Our downtown airport is conveniently close to our symposium venue, so transportation to the conference will be quick and straight-forward.

We have several new features to enhance this year's conference. In addition to the traditional technical talks, short courses, and exhibits, we will also have eight invited speakers who will present double-length talks. These distinguished experts from both academia and industry will present at the beginning of select technical sessions, allowing an in-depth discussion of timely topics chosen by our technical program committee based on emerging trends and exciting new research areas. We also offer a new format for the interactive forums, which will be presented as happy hour sessions on Tuesday and Thursday with refreshments and light snacks.

We invite you to join us on Monday at the welcome reception aboard the Midway aircraft carrier, including dessert, refreshments, and fireworks. Additional social events throughout the week include the women in engineering lunch with speaker Dr. Marta Martinez-Vázquez, and the young professionals beach blast at the Kona Kai Resort & Spa on Tuesday. We will hold the awards ceremony and celebratory dinner on Wednesday, and on Thursday we invite you to join us aboard the Hornblower Adventure for a dinner cruise, sailing the beautiful San Diego bay and enjoying the city skyline.

We hope you enjoy our exciting lineup of technical talks, short courses, and social activities, and we suggest that you to consider extending your stay to enjoy the beautiful weather and the many attractions that San Diego has to offer.

Dan Sievenpiper & Gabriel Rebeiz, *University of California, San Diego*

Sessions at a Glance — Monday

Location	Morning	Afternoon	
Grand Hall C	MO-SP.1A Additive Manufacturing in Antennas and RF Systems	MO-SP.1P In Memoriam of Per-Simon Kildal	
Grand Hall D	MO-SP.2A Theoretical, Methodological and Technological Advances in Electromagnetic Inverse Scattering	MO-SP.2P Benchmarking at the Frontiers of Computational EM	
Coronado A	MO-A2.1A Electromagnetic Theory	MO-UB.1P Metamaterial Based Designs	
Coronado B	MO-A2.2A New Physics in Guiding Systems I	MO-A2.1P Advances in Frequency Selective Surfaces	
Coronado D	MO-A2.3A Scattering Control through Metasurfaces and Cloaking	MO-A1.1P Leaky Wave Antennas	
Coronado E	MO-A1.1A Reflectarray with Novel Elements	MO-A1.2P Phased Array Antennas: Special Topics I	
America's Cup AB	MO-A1.2A Wideband Slot Antennas	MO-A1.3P Wideband Omni-directional Antennas	
Regatta	MO-A3.1A Integral Equation Applications	MO-UA.1P Materials and Packaging	
Mission Beach AB	MO-A3.2A Design Methodologies for Antennas	MO-A3.1P Optimization Methods in EM Design	
Promenade AB	MO-A1.3A Antenna Theory I	MO-A1.4P Antenna Theory II	
America's Cup CD	MO-A5.1A Advanced Antenna Technologies for User End	MO-UB.2P Frequency Selective Surfaces and Filters	
Hillcrest AB	MO-A4.1A Remote Sensing I	MO-A4.1P Remote Sensing II	
Hillcrest CD	MO-A5.2A Electromagnetics in Medicine and Biology	MO-A5.1P Implantable Antennas and Sensors	
Golden Hill AB	MO-UF.1A Propagation Based on Numerical Weather Prediction Models	MO-UF.1P RF Propagation in Complex Environments	
Torrey Hills AB	MO-UC.A1 Innovative Application and Methods for Detection and Estimation	MO-UB.3P RFID and RF Measurements	MO-UB.4P EM Educational Methods and Tools

Interactive Forum – Tuesday

Location	Afternoon
Tuesday, July 11, Grand Hall A	
Boards A.1-10	TUP-A1.1P: Antenna Arrays with Non-Uniform Feeding
Boards A.11-20	TUP-A1.2P: Feeding Networks and Arrays
Boards A.21-29	TUP-A1.3P: Gain Enhancement Techniques for Planar Antennas
Boards A.31-38	TUP-A1.4P: High Gain Planar Antenna Array
Boards A.39-52	TUP-A1.5P: Multi-Functional Antennas and Novel Applications
Boards A.53-57	TUP-UB.4P: Broadband and Tunable Arrays
Boards A.58-70	TUP-A1.6P: Planar Antenna Design and Analysis
Boards A.71-80	TUP-A1.7P: Reconfigurable Reflectarrays and Holographic Surfaces
Boards A.81-89	TUP-UB.1P: Array Design and Optimization
Boards A.91-95	TUP-UB.2P: Arrays for Space, Satellite and Optical Applications
Boards A.96-100	TUP-UB.3P: Beamforming Networks for Antennas and Arrays

Sessions at a Glance — Tuesday

Location	Morning		Afternoon	
Grand Hall C				
Grand Hall D	TU-SP.1A Physical Reconfiguration through Advances In Programmable Materials and Adaptive Mechanics		TU-SP.1P History of APS: Early Legends of the Field	
Coronado A	TU-SP.2A Compressive Sensing as Applied to Electromagnetics - Advances, New Trends and Applications		TU-SP.2P Advancement of Metasurfaces and Lenses for Beyond 4G and 5G	TU-SP.3P Higher Symmetries for Flat Meta-lenses
Coronado B	TU-A2.1A New Physics in Guiding Systems II		TU-A2.1P Frequency Selective Surface Applications	
Coronado D	TU-A2.2A Guided and Radiating Structures with Metasurfaces and Metamaterials		TU-UB.1P Nano-antennas and Nano-structures	
Coronado E	TU-A1.1A Phased Array Antennas: Special Topics II		TU-UB.2P Small Antennas	
America's Cup AB	TU-A1.2A Wideband Directional Antennas I		TU-A1.1P Wideband Directional Antennas II	
Regatta	TU-UB.1A Advances in Integral Equation Methods I		TU-UB.3P Advances in Integral Equation Methods II	
Mission Beach AB	TU-UB.2A Acceleration Rechniques for Integral Equations		TU-A3.1P Fast Solvers and Well-Conditioned Formulations	
Promenade AB	TU-A1.3A Antenna Theory III		TU-A1.2P Impedance Matching Devices, Circuits and Techniques	
America's Cup CD	TU-A1.4A Electrically Small Antennas: Metamaterial Inspired		TU-A1.3P Electrically Small Antennas for MIMO WLAN and 5G	
Hillcrest AB	TU-A1.5A Reflector Feed and Applications		TU-A1.4P Wideband Feeds for Directional Antennas	TU-UD.1P Sensors, Filters and Polarizers
Hillcrest CD	TU-A5.1A Biomedical Applications of Antennas		TU-A5.1P Biomedical Microwave to THz Imaging	
Golden Hill AB	TU-A4.1A Wave Propagation in Outdoor and Urban Environments		TU-A4.1P Propagation in Indoor, Urban and Terrestrial Environments	
Torrey Hills AB	TU-A4.2A Wave Propagation in Vehicular Environments	TU-A5.2A Vehicular Antenna and Electromagnetics	TU-UC.1P Recent Developments in Scattering and Propagation Modeling and Experiments	TU-UC.2P Advances in Hardware for MM-Wave Communcations and RADAR
Solana Beach	TU-A1.6A Slot-Array Antennas		TU-A1.5P Array, Lens and SIW Antennas	TU-A1.6P SIW-Based Leaky-Wave Antennas

Interactive Forum – Tuesday

Location	Afternoon
Tuesday, July 11, Grand Hall C	
Boards C.1-9	TUP-A1.10P: Conformal Antennas
Boards C.11-14	TUP-A1.11P: Impact of Mutual Coupling
Boards C.21-29	TUP-A1.12P: Microwave Circuits for Antennas
Boards C.31-38	TUP-A1.13P: Impedance Enhancement Techniques for Planar Antennas
Boards C.41-50	TUP-A1.14P: Microwave Passive Components
Boards C.51-60	TUP-A1.15P: Mitigation of Mutual Coupling
Boards C.61-70	TUP-A1.16P: Pattern Reconfigurable Antennas
Boards C.71-75	TUP-A1.17P: Polarization Reconfigurable Antennas
Boards C.76-80	TUP-A1.8P: Active, Reconfigurable and Smart Antennas
Boards C.81-89	TUP-A1.9P: Circularly-Polarized Patch Antennas
Boards C.91-100	TUP-UA.1P: Measurement of Antenna Performance

Sessions at a Glance — Wednesday

Location	Morning		Afternoon	
Grand Hall C	WE-SP.1A Emerging Techniques in Imaging at Microwave, mmWave and THz Frequencies		WE-SP.1P Loaded Antennas for Next Generation Radar and Communications	
Grand Hall D				
Coronado A	WE-SP.2A Automotive Antennas		WE-SP.2P Innovative Phased Arrays and Beamforming Technology	
Coronado B	WE-A2.1A Active and Tunable Meta- and Nano-structures		WE-A2.1P Nanostructures and Materials	
Coronado D	WE-A2.2A Electromagnetic Material Properties: Measurements		WE-A2.2P Frequency Selective Surfaces: Antenna Applications	WE-A2.3P Electromagnetic Material Properties: Modelling
Coronado E	WE-A1.1A Novel Materials and Techniques for Reconfigurable Antennas		WE-A5.1P Wireless Power Transfer and Harvesting Involving Antenna Arrays and Metamaterials	
America's Cup AB	WE-A1.2A Wideband Antennas for 5G, Full-Duplex, MIMO and AoA		WE-A5.2P Ultra Wideband Antennas and Systems	
Regatta	WE-A3.1A Applications of Computational Electromagnetics		WE-A3.1P Multiphysics Methods and Applications	
Mission Beach AB	WE-A3.2A Numerical Techniques in Electromagnetics		WE-A3.2P Time Domain Integral Equations	WE-UB.1P Fast Methods and Parallelization Techniques
Promenade AB	WE-UB.1A Miniature Antennas and Metamaterial Devices	WE-UB.2A Antenna Measurements	WE-A1.1P Reconfigurable Antennas and Techniques	
America's Cup CD	WE-UB.3A Antenna Theory and Design		WE-A1.2P Application Driven Antenna Design	
Hillcrest AB	WE-A1.3A Reflector Analysis and Design		WE-A1.3P Reflectarray Analysis and Synthesis	
Hillcrest CD	WE-UK.1A Antenna and EM Interactions with the Human Body		WE-UK.1P Therapeutic Applications of EM and Dosimetry	WE-A5.3P Electromagnetics for Therapeutic Applications
Golden Hill AB	WE-UF.1A Random and Complex Media I		WE-UF.1P Random and Complex Media II	
Torrey Hills AB	WE-A5.1A Magnetic Resonance Imaging		WE-UF.2P Remote Sensing Applications	WE-UF.3P Subsurface Remote Sensing
Solana Beach	WE-UB.4A Electromagnetic Metasurfaces		WE-A1.4P Electrically Small Antenna Characteristics	

Interactive Forum – Tuesday

Location	Afternoon
Thursday, July 13, Grand Hall A	
Boards A.1-10	THP-A1.2P: Multi-band Antennas II
Boards A.11-20	THP-A1.3P: Multi-band Antennas III
Boards A.21-30	THP-A5.2P: Remote Sensing and Chipless RFID
Boards A.31-40	THP-UB.1P: Microstrip Antennas and Printed Devices
Boards A.41-58	THP-A3.1P: FDTD Advances
Boards A.59-60	THP-A4.2P: Inverse Scattering and Imaging: Methods II
Boards A.61-67	THP-A4.1P: Inverse Scattering and Imaging: Methods I
Boards A.69-76	THP-A1.1P: Multi-band Antennas I
Boards A.77-84	THP-A5.3P: RFID Tag Antenna design
Boards A.86-94	THP-A5.1P: Antenna for RFID Reader
Boards A.95-99	THP-A4.3P: Inverse Scattering and Imaging: Systems

Sessions at a Glance — Thursday

Location	Morning		Afternoon	
Grand Hall C				
Grand Hall D	TH-SP.1A Applications of Electromagnetics and RF Techniques in Medicine and Biology		TH-SP.1P Wideband Phased Arrays for 5G Wireless and Beyond	
Coronado A	TH-SP.2A 3D Printed Antennas and Components		TH-SP.2P Modern Longwave Antennas	
Coronado B	TH-A2.1A Applications of Metamaterials		TH-A2.1P Applications of Metasurfaces	
Coronado D	TH-A5.1A Terahertz Devices		TH-A5.1P Terahertz IR and Optical Applications	
Coronado E	TH-A5.2A Wireless Power Transfer		TH-A1.1P Dielectric Resonator and Slot Antennas: High Gain or Circular Polarized Deisgns	
America's Cup AB	TH-A1.1A Wideband Horn and Vivaldi Antennas		TH-A1.2P Spiral and Log-Periodic Antennas	
Regatta	TH-A3.1A Hybrid Methods		TH-A3.1P Basis Functions and Numerical Integration	
Mission Beach AB	TH-A3.2A Layered Medium Integral Equation Methods	TH-A3.3A Novel Integral Equation Formulations	TH-A3.2P Advances in the Finite Element Methods	TH-UB.1P Advances in Differential Equation Based Methods
Promenade AB	TH-A1.2A Frequency Reconfigurable Antennas		TH-A1.3P Phased Array Antennas: Theory and Design	
America's Cup CD	TH-A1.3A Smart, Beam Switching and Multi-beam Antennas		TH-A5.2P Antennas for Energy Harvesting	
Hillcrest AB	TH-A4.1A Wave Propagation in Indoor Environments		TH-A4.1P Wave Propagation in Terrestrial, Oceanic and Atmospheric Environments	
Hillcrest CD	TH-UB.1A Reconfigurable Antennas and Cognitive Radio		TH-UK.1P Biological Imaging and Sensing	
Golden Hill AB	TH-UF.1A RF Propagation Modeling and Measurements		TH-UE.1P Electromagnetic Compatability and Interference	
Torrey Hills AB	TH-A5.3A MIMO Technology Implementations		TH-A5.3P MIMO Antenna Design	
Solana Beach	TH-UB.2A Millimeter Wave Antennas		TH-A2.2P Applications of Periodic Structures	
Mission Beach C				TH-UB.2P 3D Printed and Planar Structures

Interactive Forum – Tuesday

Location	Afternoon
Thursday, July 13, Grand Hall C	
Boards C.1-9	THP-A1.4P: Planar Antennas for Mobile Applications
Boards C.11-20	THP-A5.10P: Metamaterial Based mmWave Antennas
Boards C.21-24	THP-A5.11P: mmWave and Subwavelength Antennas
Boards C.26-30	THP-A5.12P: Wideband Antennas for High Frequency Communications
Boards C.36-40	THP-A5.5P: 60 GHz Radars and Communications
Boards C.41-48	THP-A5.4P: 3D Printed Antennas and Structures
Boards C.51-60	THP-A5.6P: Additively Manufactured Antennas
Boards C.61-68	THP-A5.7P: Antennas for THz and 5G Communications
Boards C.71-80	THP-A5.8P: Antennas, Applications and Relevant Issues
Boards C.81-89	THP-A5.9P: Arrays for mmWave Applications
Boards C.91-98	THP-UA.1P: Antenna Fabrication Techniques

Sessions at a Glance — Friday

Location	Morning		Afternoon	
Grand Hall C	FR-SP.1A In-Body Devices for Wireless Biotelemetry: Implants and Ingestibles		FR-A4.1P Reduction of Complex Structures	
Grand Hall D	FR-SP.2A Handset LTE Antenna Design and Challenges		FR-SP.1P AMTA Special Session - Advances in RF Measurement Technology	FR-SP.2P International Standards Development and Applications
Coronado A	FR-A2.1A Design and Analysis of Metasurfaces I		FR-A2.1P Metasurfaces for Antenna Applications	
Coronado B	FR-A2.2A Metamaterial-Inspired Antennas		FR-A2.2P Design and Analysis of Metamaterials	
Coronado D	FR-A5.1A Terahertz Antennas and Sources		FR-UB.1P Terahertz Antennas and Focal Plane Arrays	
Coronado E	FR-A1.1A Dielectric Resonator Antennas	FR-A1.2A Techniques for Coupling and Side-lobes Control	FR-A1.1P Beam Scanning Antennas and Arrays	
America's Cup AB	FR-A1.3A Wideband Printed Antennas		FR-UA.1P Microwave to Millimeter Measurements and Standards	
Regatta	FR-UB.1A Time Domain Methods		FR-UB.2P Advanced Concepts in Metamaterials	
Mission Beach AB	FR-UB.2A Frequency Domain Methods	FR-UB.3A Hybrid and Optimization Techniques	FR-A1.2P Electrically Small Antennas: Applications	
Promenade AB	FR-A1.4A Phased Array Antenna Designs		FR-A1.3P Phased Array Antennas: Analysis, Synthesis and Optimization	
America's Cup CD	FR-A5.2A On-chip Antennas	FR-A1.5A Design of Phased Array Elements	FR-A5.1P Wireless Power Transfer and Energy Harvesting	FR-UB.3P Theory and Application of Guided Waves
Hillcrest AB	FR-A4.1A Propagation in Complex Environments		FR-UB.4P Propagation Phenomena and Scattering of EM Waves	
Hillcrest CD	FR-A4.2A Scattering and Diffraction		FR-A3.1P High Frequency and Asymptotic Methods	
Golden Hill AB	FR-UB.4A Electromagnetic Interaction, Propagation and Scattering	FR-A4.3A Millimeter Wave Propagation	FR-A1.4P Novel Reflectarray Designs and Applications	FR-UB.5P Wave-guiding Devices and Applications
Torrey Hills AB	FR-A5.3A MIMO System Applications		FR-UB.6P MIMO Antennas and Systems	FR-UB.7P Microwave Imaging

Registration

The on-site Registration Desk is located at the **Third Floor Landing**, adjacent to the escalator and close to the Seaport Tower. The Registration Desk may be reached by phone at 817-554-5378 during the regular operating hours shown below.

Registration will be open during the following hours:

Sunday, July 9 .....07:00 – 17:00
Monday, July 10 .....07:00 – 17:00 (Badge pick-up only: 17:00 - 20:00)
Tuesday, July 11 .....07:00 – 17:00
Wednesday, July 12.....07:30 – 17:00
Thursday, July 13 .....07:30 – 17:00
Friday, July 14 .....07:30 – 17:00

Devotions

The **Pier Room** on the Third Level of the Harbor Tower is available for devotions from 07:00 – 17:00 Sunday, July 9 through Friday, July 14.

Speaker Preparation Room

The **Cove Room** on the Third Level of the Harbor Tower is the Speaker Preparation Room and is available from 07:00 - 17:00 daily Sunday, July 9 - Friday, July 14. The room contains a computer identical to those used in the presentation rooms. The speakers may use his room and equipment to test presentations prior to the scheduled presentation.

Internet Access

Wireless internet access (WiFi) is provided to all participants throughout the meeting space and lobby areas at the Manchester Grand Hyatt. Attendees can connect to the `IEEE` network. The access password is `APSURSI17`.

If you are staying at the Hyatt, please note that the complimentary access from your guest room will be different, and you should follow the instructions noted there.

Morning and Afternoon Refreshment Break Locations

Please note that on Monday, July 10, morning and afternoon breaks (at 09:40 and 15:00 respectively) will be held in the Foyer Areas on the Fourth Level of the hotel – Coronado, Regatta and America's Cup.

Tuesday through Friday, July 11–14, the breaks will be held in Grand Halls ABC, which are located on the Lobby Level. Grand Hall B is the Exhibit Hall.

Meeting and Event Schedule

Sunday, July 9

09:00 - 10:30	Amateur Radio License Exam Session	Mission AB

Monday, July 10

07:00 - 08:00	Amateur Radio Breakfast Meeting	Bayview Room
07:00 - 08:00	Standard 1502 Breakfast Meeting	Ocean Beach
10:00 - 11:00	APS 2019 Committee Meeting	Ocean Beach
12:00 - 13:30	Distinguished Lecturer Meeting and Lunch	Ocean Beach
12:00 - 13:30	Transactions Associate Editors and Track Editors Lunch	Bayview Room
16:00 - 17:00	Future Symposia Meeting	Bayview Room
17:00 - 18:00	URSI Commission B Business Meeting	Regatta
17:00 - 18:00	URSI Commission C Business Meeting	America's Cup AB
17:00 - 18:00	URSI Commission F Business Meeting	America's Cup CD
19:30 - 21:30	Welcome Dessert Reception	The Midway

Tuesday, July 11

07:00 - 08:00	Magazine Staff Breakfast	Ocean Beach
08:00 - 11:40	Student Paper Competition Presentations	Coronado Foyer
08:00 - 08:30	Student Design Competition (Set-Up - Closed to Others)	Coronado Foyer
08:30 - 09:30	Student Design Competition (Demo for Judges - Closed to Others)	Coronado Foyer
09:30 - 12:00	Student Design Competition (Demo for Public)	Coronado Foyer
09:30 - 12:00	Student Design Competition Judges Meeting	Cortez Hill A
10:00 - 11:00	APS 2018 Committee Meeting	Ocean Beach
12:00 - 13:00	Student Design Competition (Luncheon for Judges and Teams)	Cortez Hill A
12:00 - 13:30	Women In Engineering Lunch and Speaker	Bayview Room
13:00 - 17:00	Student Design Competition (Demo for Public)	Coronado Foyer
18:30 - 20:30	Young Professionals' Beach Barbecue	Kona Kai Resort & Marina

Wednesday, July 12

07:00 - 08:00	Student Paper Judges Committee Breakfast	Ocean Beach
12:00 - 13:30	Reviewers' Lunch	Grand Hall D
13:00 - 14:00	Publications Committee Meeting	Grand Hall D
17:00 - 18:00	URSI Commission A Business Meeting	Torrey Hills
17:00 - 18:00	URSI Commission E Business Meeting	Golden Hill
17:00 - 18:00	URSI Commission G Business Meeting	Hillcrest AB
17:00 - 18:00	URSI Commission K Business Meeting	Hillcrest CD
18:00 - 19:00	Awards Presentation	Grand Hall C
19:00 - 21:00	Celebratory Banquet	Grand Hall D

Thursday, July 13

12:00 - 13:00	APS Fellows Committee Lunch	Bankers Hill
12:00 - 14:00	APS Propagation Standards Committee Lunch	Cortez Hill A
12:00 - 13:00	AWPL AE Lunch	Cortez Hill C
12:00 - 14:00	Chapter Chairs Lunch	Ocean Beach
12:00 - 13:00	Education Committee	Boardwalk
12:00 - 13:00	IEEE Press Liaison Lunch	Cortez Hill B
18:00 - 21:00	MGA, FDI and SIGHT Dinner	Boardwalk
18:45 - 22:00	Dinner Sail	The Marina at the San Diego Marriott Marquis

Full Day

FD-1 - Multibeam Antennas and Beamforming Networks

Giovanni Toso, Piero Angeletti

Sunday, July 9, 08:00 - 17:00

Location: Hillcrest A

Multibeam Antennas are becoming more and more important in different applications requiring high performances, flexibility and reconfigurability. In particular, the topic is of interest not only for Space Applications but also for Radar Systems and Mobile Communications (including emerging MIMO for 5G). The course has been previously proposed during EUCAP and IEEE conferences with excellent participation and feedbacks. The course content is updated regularly by the two co-authors who are deeply involved since twenty years in this field.

The objective of this course consists in presenting the state of the art and the on-going developments in Multi-Beam Antennas (MBAs) and Beam-Forming Networks (BFNs). MBAs find application in several fields including communications, remote sensing (e.g. radars, radiometers, etc.), electronic surveillance and defense systems, science (e.g. multibeam radio telescopes), RF navigation systems, etc. The BFN plays an essential role in any antenna system relaying on a set of radiating elements to generate a beam. The course will cover both theoretical and practical aspects for the following topics:

FD-4 - Base station antennas for 5G – System aspects and design

Claes Beckman

Sunday, July 9, 08:00 - 17:00

Location: Hillcrest B

This short course gives the participants an overview of the application, implementation and design of current and future base station antennas for mobile communications from 1G to 5G. In particular It is aimed at microwave, RF- and antenna engineers in the wireless area, but also useful for researchers looking for relevant research topics and system engineers needing a deeper understanding of the antenna component of their system. The course explains underlying theoretical and practical implementation aspects of base station antennas in mobile communication networks of today and in 5G networks.

FD-6 - Reflector Antenna Design and Analysis

Peter Meincke

Sunday, July 9, 08:00 - 17:00

Location: Hillcrest C

The course gives an introduction to the design and analysis of single and dual reflector antennas, center-fed as well as offset. After a review of the analysis methods commonly employed for space- and Earth-station reflector antennas, the basic design principles are presented. First, single and dual spot-beam antennas are considered with the relation between size, feed illumination, directivity, and sidelobe level. Second, the influence of blockage by struts, subreflector, and feed is discussed. Third, the origin of cross polarization in offset designs is addressed and it is shown how to improve the polarization characteristics in dual reflector systems by employing the Mizuguchi compensation principle. Hands-on experience in reflector antenna design is obtained during the course by using the software package GRASP (participants must bring their own laptop).

Half Day (Morning)

HD-1 - Reflectarray Antennas: Theory, Designs, and Applications

Payam Nayeri, Fan Tang, Atef Elsherbeni

Sunday, July 9, 08:00 - 12:00

Location: Golden A

This course will be presented in two parts. In the first part, the history of reflectarray antenna development is first reviewed and then basic theories for analysis and design of reflectarray antennas are presented in detail. This section of the course builds the fundamental knowledge one needs to have in order to understand the governing dynamics of a reflectarray antenna system, and efficiently design and analyze reflectarray antennas. The second part of the course is intended for researchers that have a good knowledge of the basic theories in reflectarray, and aim at designing reflectarray antennas for specific applications/operations. This part starts with a discussion on bandwidth limitation and solutions for broadband designs, and afterwards several advanced application oriented topics in reflectarray antennas will be presented.

Half Day (Afternoon)

HD-2 - Surface Electromagnetics in Antenna Engineering: From EBG to Meta-surface and Beyond

Yahya Rahmat-Samii, Fan Yang

Sunday, July 9, 13:00 - 17:00

Location: Golden A

Amateur Radio Breakfast Meeting

The Amateur Radio Breakfast Meeting is open to all conference participants who hold an amateur radio call sign, but pre-registration is required and your call sign is requested. The intent of the gathering is to gather support for AP-S student, outreach, SIGHT and educational activities involving amateur radio.

Date: Monday, July 10

Time: 07:00 - 08:00

Location: Bayview Room, 32nd Floor, Seaport Tower

Fee: Complimentary, but advance registration is required. An amateur radio license is required for attendance.

Additional Information on Amateur Radio activities at AP-S/URSI 2017 are listed on the following pages.

Welcome Reception Aboard the USS Midway

The Steering Committee has chosen a spectacular venue for the APS 2017 Welcome Reception... USS Midway, one of America's longest serving aircraft carries. Just minutes away from the Manchester Grand Hyatt, the Midway sits as a majestic and historic reminder of one of the most challenging periods of time in United States history.

Please note that the reception begins at 19:30 and is a Dessert Reception. This timing allows you the flexibility of enjoying one of San Diego's many (and varied) local restaurants:

http://www.sandiegorestaurants.com/

For more information about this special venue, please visit their site - http://www.midway.org/

Date: Monday, July 10

Reception: Doors open at 19:30. Please note that this is a Dessert Reception, and that guests are asked to have dinner at their leisure prior to arriving at USS Midway. Note, too, that there will be docent tours available and The Battle of Midway Theatre will run its movie, "Battle of Midway," throughout the evening.

Transportation: The USS Midway is a 10-minute walk from the Manchester Grand Hyatt. There will be symposium guides along the route to assist in directing you. For guests requiring transportation, there will be limited shuttle service between the hotel and the venue.

Fee: Complimentary for AP-S 2017 registered attendees and their guests. Delegates must indicate attendance during registration in order to receive a ticket.

Women in Engineering - Lunch and Speaker

Join the AP-S WIE for a special luncheon and speaker, Dr. Marta Martinez-Vázquez, as she shares with you her experience during her featured presentation "Mom Talk - An Engineer's Bedside Story." This event is open to all conference participants, but pre-registration is required. The scopes of interest of the WIE include increasing the participation of women within IEEE, gathering and disseminating information regarding the status of women, and initiatives for, by and on behalf of women in engineering and science.

Date: Tuesday, July 11

Location: Manchester Grand Hyatt San Diego, Bayview Room, 32nd Floor, Seaport Tower

Fee: Advance registration is required, and there is a$20.00 fee for the two course, plated lunch.

Young Professionals' Beach Blast at the Kona Kai Resort & Spa

The Young Professionals' Beach Blast is open to all Graduates of the Last Decade (GOLD). Enjoy beach games (beach volleyball, corn hole and ladder ball, to name a few), live music, sitting by one of their fire pits and a barbecue buffet dinner. A limited number of passes will be available for use of the hotel's pool.

Date: Tuesday, July 11

Time: This event begins at 18:30, with motorcoach shuttles leaving from the Manchester Grand Hyatt San Diego beginning at 18:00.

Location: Kona Kai Resort & Spa - http://www.resortkonakai.com

Fee: Advance registration is required. Complimentary for GOLD attendees; $25.00 for advisors.

Reviewers' Lunch

The Reviewers' Lunch is open to all reviewers of the last year for the APS Transactions and Journals.

Date: Wednesday, July 12

Time: 12:00 - 13:20

Location: Grand Hall D, Lobby Level

Fee: Complimentary for all registered attendees who participated in the APS Transactions and Journals review process during the last year. Advance registration is required.

Awards Presentation

Please join the Antennas and Propagation Society's Awards Committee, as they honor the distinguished accomplishments of the society's professional community, including recognition of the 2017 IEEE AP-S Fellows. NOTE the format, introduced during the 2016 event, as the awards will be presented during a special evening session at the Manchester Grand Hyatt San Diego, to be followed by the Celebratory Banquet, which is a ticketed event. The Awards Presentation is open

to all conference registrants and their guests, but advance registration is required.

Date: Wednesday, July 12
Time: 18:00 - 19:00
Location: Grand Hall C, Lobby Level
Fee: There is no fee to attend the Awards Presentation, but advance registration is required. If you wish to join the awards recipients during this event, please register to attend.

Celebratory Banquet

This evening's Celebratory Banquet will take place in Grand Hall D at the Manchester Grand Hyatt San Diego, and it is open to all conference registrants and their guests, but requires a separate ticket purchase. A three-course plated dinner and wine will be served.

Date: Wednesday, July 12
Time: Doors open for dinner at 19:00
Location: Grand Hall D, Lobby Level
Fee: $70 (Advance Rate): $90 (On-Site Rate *)
* Please note that a limited number of tickets will be available for sale at the On-Site Rate.

Dinner Sail Aboard the Hornblower Adventure

The Hornblower Adventure sets sail on Wednesday, July 12 from the Marina located at the San Diego Marriott Marquis, just steps away from the Manchester Grand Hyatt San Diego. Enjoy a buffet dinner, while taking advantage of magnificent views of the San Diego skyline either from their extensive sun deck or through the panoramic windows in the dining salons. Both alcoholic and non-alcoholic beverages will be available onboard for purchase.

Date: Thursday, July 13
Time: Boarding time is 18:45, and the boat will sail promptly at 19:00.
Location: The Marina at the San Diego Marriott Marquis. Specific slip location to be advised.
Fee: $100.00 for adults and children 12 and older; $53.00 for children 4-11 years. There is no charge for children under 3 years.

Daily Tours with the Companion Program

Monday - Friday, July 10-14

Check the conference website to see the extensive offering of Companion Program tours, also available to symposium registrants. Note throughout that some of the tours have registration via the symposium site, and for others, attendees are asked to register directly through the tour operator.

Companion Program

Companion Program hosts Sue Stone, Joy Rockway, Judy Long and Joanne Wilton will be onsite in the Companion Suite to welcome registered companions for breakfast each morning. Please note that you must be a registered companion to enjoy morning breakfast in the Marina Room, located immediately adjacent to the Marina and Sally's Restaurant, both located at the back of the Manchester Grand Hyatt San Diego.

For additional information or any questions, please contact either of the co-chairs via e-mail:
Sue Stone - suelstone@hotmail.com or
Joy Rockway - rockway4@gmail.com.

At the AP-S/URSI 2015 symposium in Vancouver, we began to encourage Radio Amateurs to display their callsign on their conference badges and we held the first-ever Amateur Radio breakfast meeting. Given the very favourable response, we continued these initiatives in Puerto Rico in 2016. Our second Amateur Radio breakfast meeting attracted even more attendees and formal expressions of support from the Education and SIGHT committees.

Welcome to San Diego in 2017, and further expansion of this special interest group.

ARRL will be publishing stories about our Amateur Radio activities at IEEE AP-S/URSI 2017. These activities will include:

FCC Amateur Radio License Exam Session - Sunday, July 9

Volunteer Examiners from San Diego will be onsite to administer FCC Amateur Radio License Exams to registered attendees of the 2017 AP-S/URSI Symposium. There are three FCC amateur radio license classes - Technician, General and Extra. On your application, which we recommend you complete in advance, you will be able to make your selection.

Note that there is no longer a Morse code requirement. The web sites http://www.kb6nu.com/study-guides/ and https://hamexam.org are valuable sources of study information.

If you plan to sit for the exam, please note that you will need the following:

An NCVEC Form 605. Do not use the FCC Form 605. The form must have your FCC registration number on the form. The form may be downloaded here - http://www.ncvec.org/downloads/ncvec605.pdf

To obtain a FRN, please go to https://www.fcc.gov/help/getting-fcc-registration-number-frn-universal-licensing-system-uls.

At the exam, please present a legal photo ID (driver's license or a passport). If no photo ID is available, bring two original forms of identification. No photocopies will be accepted. These may include a non-photo ID/driver's license, birth certificate (must be a certified copy), local library card, local utility bill, bank statement or other business correspondence that specifically names you, or a postmarked envelope addressed to you, with your current mailing address, as it appears on your Form 605.

If you are testing for an upgrade, bring either the original and a copy of your current license, or the original and a copy of the certificate of successful completion of an examination from a previous session.

Two (2) #2 pencils, with erasers, and a pen.

A calculator with the memory erased and formulas cleared is allowed. You may not bring any written notes or calculations into the exam session. Slide rules and logarithmic tables are acceptable, as long as they're free of notes and formulas. Cell phone must be silenced or turned off during the exam session and the phones' calculator function may not be used. In addition, iPhones, iPads, Androids, smartphones, Blackberry devices and all similar electronic devices with a calculator capability, may NOT be used.

An advantage to taking the test at the symposium...no fee will be charged.

Date: Sunday, July 9
Time: 09:00 - 10:30
Location: Room to be assigned
Fee: Complimentary, but advance registration is required.

Amateur Radio Operators Breakfast

The Amateur Radio Breakfast Meeting is open to all conference participants who hold an amateur radio call sign, but pre-registration is required. The intent of the gathering is to gather support for AP-S student, outreach, SIGHT and educational activities involving amateur radio.

Date: Monday, July 10
Time: 07:00 - 08:00
Location: Bayview Room, 32nd Floor, Seaport Tower.
Fee: Complimentary, but advance registration is required. An amateur radio license is also required for attendance.

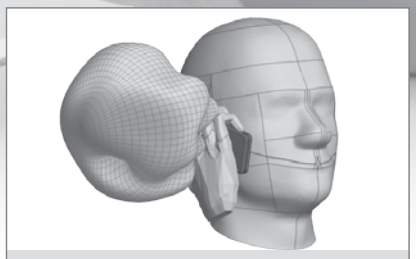
Amateur Radio special event station N6P - Tuesday, July 12 - Thursday, July 14

Amateur Radio special event station N6P will be set up at the Amateur Radio booth in the commercial exhibits area, booth 3. Please drop by and see the station in operation!

Other Amateur Radio demonstrations will be held throughout the week in and around the conference venue.

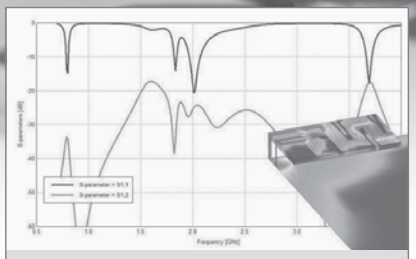
For more information, please contact Dave Michelson, VE7TSX : davem@ece.ubc.ca or Bob Paknys, VE2JBP : robert.paknys@concordia.ca.

FEKO for Integrated Antenna Design



Radiation pattern optimization

Urban scenario



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2017 IEEE Awards

2017 Ieee Electromagnetics Award

Weng Cho Chew

For contributions to electromagnetic solutions of complex multiphysics problems and inverse scattering methods

Antennas and Propagation Society 2017 Field Awards

Distinguished Achievement Award

Ulrich L. Rohde

For pioneering work and contribution to the field of Antennas and Propagation, leading to development of wireless communication systems for industrial, military and space applications

Chen-To Tai Distinguished Educator Award

Yahia M. M. Antar

For dedicating his professional career to the education and training of highly qualified personnel

John Kraus Antenna Award

Kwai-Man Luk

For contributions to the invention of the L-probe fed patch antenna and the magneto-electric dipole antenna for wireless communications

Lot Shafai Mid-Career Distinguished Achievement Award

Francesca Vipiana

For contributions to computational electromagnetics, and in particular to the analysis of multi-scale problems

Harrington-Mittra Award in Computational Electromagnetics

Jian-Ming Jin

For outstanding contributions to the research and development of the finite element method for computational electromagnetics

Antennas and Propagation Society 2016 Paper Awards

Sergei A. Schelkunoff Transactions Prize Paper Award

N. Chahat, R. E. Hodges, J. Sauder, M. Thomson, E. Peral and Y. Rahmat-Samii

"CubeSat Deployable Ka-Band Mesh Reflector Antenna Development for Earth Science Missions," IEEE TAP, vol. 64, no. 6, 2083-2093, 2016

Harold A. Wheeler Applications Prize Paper Award

D. J. Bisharat, S. Liao, and Q. Xue

"High Gain and Low Cost Differentially Fed Circularly Polarized Planar Aperture Antenna for Broadband Millimeter-Wave Applications ," IEEE TAP, vol. 64, no. 1, 33-42, 2016

R. W. P. King Paper Award

L. Liang and S. Victor Hum

"Design of a UWB Reflectarray as an Impedance Surface Using Bessel Filters," IEEE TAP, vol. 64, no. 10, 4242-4255, 2016

Piergiorgio L. E. Uslenghi Letters Prize Paper Award

M. Tamagnone and J. Mosig

"Theoretical Limits on the Efficiency of Reconfigurable and Non-Reciprocal Graphene Antennas," IEEE AWPL, Vol. 15, 1579, 2016

Edward E. Altschuler AP-S Magazine Prize Paper Award

A. Thain, J. P. Estienne, J. Robert, A. Herve, A. Piche, G. Peres, B. Pasquier, A. Jaber, L. Evain, F. Harly, B. Gutierres, H. Lenquette, B. Sinigaglia, and B. Spitz

"Stealth Buildings at Airbus Group Innovations: Low-cost solutions to radio perturbations," IEEE Antennas Propagat. Magazine, issue 58, no. 1, pp. 16-27, February 2016

2017 IEEE AP-S Fellows

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Special Sessions

MO-SP.1A: Additive Manufacturing in Antennas and RF Systems

Organizers: Frederic Gianesello, Cyril Luxey and Yiannis Vardaxoglu

MO-SP.2A: Theoretical, Methodological and Technological Advances in Electromagnetic Inverse Scattering

Organizers: Danilo Erricolo, Giacomo Oliveri, Aria Abubakar

MO-SP.1P: In Memoriam of Per-Simon Kildal

Organizers: Stefano Maci, Eva Rajo and Ahmed Kishk

MO-SP.2P: Benchmarking at the Frontiers of Computational EM

Organizer: Ali Yilmaz

TU-SP.1A: Physical Reconfiguration through Advances In Programmable Materials and Adaptive Mechanics

Organizers: Gregory Huff, Christos Christodoulou, Philip Buskohl and Derek Doyle

TU-SP.2A: Compressive Sensing as Applied to Electromagnetics - Advances, New Trends and Applications

Organizers: Mahta Moghaddam, Andrea Massa and Donald Migliore

TU-SP.1P: History of APS: Early Legends of the Field

Organizer: Stuart Long

TU-SP.2P: Advancement of Metasurfaces and Lenses for Beyond 4G and 5G

Organizers: Jungsuek Oh, Seungtae Ko and Nader Behdad

TU-SP.3P: Higher Symmetries for Flat Meta-lenses

Organizers: Guido Valerio and Oscar Quevedo-Teruel

WE-SP.1A: Emerging Techniques in Imaging at Microwave, mmWave and THz Frequencies

Organizers: Okan Yurduseven, David Smith, Jonah Gollub, Mohamad Imani and Thomas Fromenteze

WE-SP.2A: Automotive Antennas

Organizers: Hyok Song and Timothy Taltry

WE-SP.1P: Loaded Antennas for Next Generation Radar and Antennas

Organizers: Bart Smolders, Diego Caratelli and Ronis Maximidis

WE-SP.2P: Innovative Phased Arrays and Beamforming Technology

Organizers: Paolo Rocca, Robert Mailloux and Jeffrey Herd

TH-SP.1A: Applications of Electromagnetics and RF Techniques in Medicine and Biology

Organizers: Gianluca Lazzi and Jung-Chih Chaio

TH-SP.2A: 3D Printed Antennas and Components

Organizers: Guan-Long Huang and Chow-Yen-Desmond Sim

TH-SP.1P: Wideband Phased Arrays for 5G Wireless and Beyond

Organizers: Johnson J. H. Wang and Andrew Peterson

TH-SP.2P: Modern Longwave Antennas

Organizer: Walter Wall

FR-SP.1A: In-Body Devices for Wireless Biotelemetry: Implants and Ingestibles

Organizers: Asimini Kiourtu and Raed Shubair

FR-SP.2A: Handset LTE Antenna Design and Challenges

Organizer: Hongwei Liu

FR-SP.1P: AMTA Special Session - Advances in RF Measurement Technology

Organizer: Ivan LaHaie

FR-SP.2P: International Standards Development and Applications

Organizer: Vikass Monebhurrun

AP-S Student Paper Competition Interactive Forum

Presentations for finalists will be in the Coronado Foyer on Tuesday, July 11, 08:00–11:40.

Finalists

A Dual-Polarized Dual-Mode Annular Ring Microstrip Antenna for GPS Interference Suppression
Navid Rezazadeh, Lotfollah Shafai, University of Manitoba, Canada

A Novel Feeding Structure for Second Higher Order Mode Excitation of Microstrip Leaky-Wave Antenna
Pengfei Zhang, Sheng Sun, University of Electronic Science and Technology of China, China

Analysis of a Helmet-Based FMCW Radar for Impact Prediction
Hossein Mehrpour Bernety, David Schurig, University of Utah, United States

Antenna Probes for Power Reception from Deep Tissues for Wearable Microwave Thermometry
Parisa Momenroodaki, University of Colorado Boulder, United States; Mojtaba Fallahpour, Stanford University, United States; Zoya Popovic, University of Colorado Boulder, United States

Design of a C-band Beam-scanning Reflectarray Antenna for Satellite Communications
Xiangfei Xu, Fan Yang, Shenheng Xu, Tsinghua National Laboratory of Information Science and Technology, Tsinghua University, China

Diplexer Integration Into a Ka-Band High-Gain Gap Waveguide Corporate-Fed Slot Array Antenna
Abbas Vosoogh, Chalmers University, Sweden; Milad Sharifi Sorkherizi, Concordia University, Canada; Ashraf Uz Zaman, Jian Yang, Chalmers University, Sweden; Ahmed A. Kishk, Concordia University, Canada

Flexible RF Coil Array System Utilizing Electro-textiles for 3T MRI Carotid Artery Imaging
Daisong Zhang, Yahya Rahmat-Samii, University of California, Los Angeles, United States

High-resolution Polarimetric THz Imaging for Biomedical Applications
Nandhini Srinivasan, Cosan Caglayan, Niru Nahar, Kubilay Sertel, The Ohio State University, United States

Invisible Near-Field Probes at Infrared Frequencies based on Impedance Engineering at the Nanoscale
Aobo Chen, Cornell University, United States; Andrea Alu, University of Texas at Austin, United States; Francesco Monticone, Cornell University, United States

Millimeter-Wave Conformal Antenna Array for 5G Wireless Applications
Syeda Fizzah Jilani, Akram Alomainy, Queen Mary University of London, United Kingdom

Range-Dependent Evaporation Duct Height Estimation from a Versatile Ship-Mounted X-band Receiving Array
Qi Wang, Robert Burkholder, Caglar Yardim, The Ohio State University, United States

Ray-Based Reconstruction Algorithm for Multi-Monostatic Radar in Imaging Systems
Kurt Jaisle, Carey Rappaport, Northeastern University, United States

Single-bit Compressive Imaging System for the mmW and THz Bands
Syed An Nazmus Saqueb, Kubilay Sertel, The Ohio State University, United States

Honorable Mentions

"Phasenna" based on a Metasurface System
Guillaume Lavigne, Christophe Caloz, Polytechnique Montréal, Canada

A Self-Powered Harmonic Sensor Based on Simple Graphene Circuit and Hybrid-Fed Antenna
Mehdi Hajizadegan, Pai-Yen Chen, Wayne state university, United States

A Single-Source Surface Integral Equation Formulation for Composite Dielectric Objects
Utkarsh Patel, Piero Triverio, Sean Hum, University of Toronto, Canada

All Directions Through the Wall Imaging Using Omnidirectional Bi-static FMCW Transceivers
Behzad Yektakhah, Kamal Sarabandi, University of Michigan, United States

An Accurate Combined Source Integral Equation for Perfect Electrically Conducting Bodies
Jonas Kornprobst, Thomas F. Eibert, Technical University of Munich, Germany

An Explicit MOT Scheme for Solving the TD-EFVIE on Nonlinear and Dispersive Scatterers
Sadeed Bin Sayed, King Abdullah University of Science and Technology (KAUST), Saudi Arabia; Hüseyin Arda Ülkü, Gebze Technical University, Turkey; Hakan Bagci, King Abdullah University of Science and Technology (KAUST), Saudi Arabia

Circuit-Board Edge-Mount Dual-Polarized Millimeter-Wave Antenna

Zunnurain Ahmad, Jan Hesselbarth, University of Stuttgart, Germany

Circularly Polarized PIFA Array for Simultaneous Transmit and Receive Applications

Andrew Kee, Dejan Filipovic, Mohamed Elmansouri, University of Colorado Boulder, United States

Design of Zero-Phase-Shift-Line (ZPSL) Loop Antennas Using Full Dispersion Characteristics

Yunjia Zeng, Institute for Infocomm Research, Singapore; Zhi Ning Chen, National University of Singapore, Singapore; Xianming Qing, Institute for Infocomm Research, Singapore; Jian-Ming Jin, University of Illinois at Urbana-Champaign, United States

Dual-Band Broadside Slot Array with Corporate-Series-Feed Based on CRLH Microstrip Line

Jen-Kuei Tsai, Shih-Yuan Chen, National Taiwan University, Taiwan

High-Efficiency Microwave Graphene Antenna

Shengjian Jammy Chen, Christophe Fumeaux, Tran Thanh Tung, Dusan Losic, The University of Adelaide, Australia

Improved Design of a Low Sidelobe Pyramidal Horn Antenna Loaded with a Metasurface Lens

Xuxiang Chen, Yuehe Ge, Huaqiao University, China; Trevor Bird, Antengenuity, Australia

Multifunctional Metasurfaces Nanoantennas by Gate-Tunable Materials

Ali Forouzmand, Hossein Mosallaei, Northeastern University, United States

Multi-linear polarization reconfigurable center-fed circular patch antenna with shorting posts

Shu-Lin Chen, Pei-Yuan Qin, Jay Guo, University of Technology Sydney, Australia

Novel 3D-Printing Enabled Antenna Design for Future Wireless Intra-chip Interconnect

Junqiang Wu, Hao Xin, University of Arizona, United States

Novel Technique for Enhancing RCS Reduction Bandwidth of Checkerboard Surfaces

Anuj Y. Modi, Constantine A. Balanis, Craig R. Birtcher, Arizona State University, United States

Plasmonic Nano-Antenna Arrays for High-Sensitivity and Broadband Terahertz Detection

Nezih Tolga Yardimci, University of California - Los Angeles, United States; Mona Jarrahi, University of California, Los Angeles, United States

Printed High Gain End-fire Beam-Steerable Yagi Antenna

Parisa Lotfi Poshtgol, Saber Soltani, Ross Murch, Hong Kong University of Science And Technology, Hong Kong SAR of China

Quantitative Statistical Analysis with Physics-based Surrogate Modeling for Wave Chaotic Systems

Shen Lin, Zhen Peng, University of New Mexico, United States; Thomas Antonsen, University of Maryland, United States

Scattering in Superluminal Space-time (ST) Modulated Electromagnetic Crystals

Zoé-Lise Deck-Léger, Christophe Caloz, Polytechnique Montréal, Canada

Scattering properties of parity-time symmetric nanoparticle dimers

Robert Duggan, Mohammad-Ali Miri, Andrea Alù, University of Texas at Austin, United States

Subwavelength Metamaterial-Lined Apertures as Far-Field Imaging Devices

Elham Baladi, Ashwin K. Iyer, University of Alberta, Canada

Systematic Design of Single-Layer Multi-Stop-Band Frequency Selective Surfaces

Gengyu Xu, Sean Hum, George Eleftheriades, University of Toronto, Canada

Ultrasensitive Telemetric Sensor Based on Adapted Parity-Time Symmetry

Maryam Sakhdari, Pai-Yen Chen, wayne state university, United States

Warpage-free Antenna for Smart Contact Lens

Luyao Chen, George Shaker, Safieddin Safavi-Naeini, University of Waterloo, Canada

Wide Bandwidth Cavity-Backed Dual-Polarized Vivaldi Array Antenna

Elie Tianang, Dejan Filipovic, Mohamed Elmansouri, University of Colorado, Boulder, United States

Axial Mode-Matching Technique for Analysis of Directional Well-Logging Sensor Tools

Guilherme S. Rosa, José R. Bergmann, Pontifical Catholic University of Rio de Janeiro, Brazil; Fernando L. Teixeira, The Ohio State University, United States

Circularly-Polarized Antenna Array for Beam Steering

Bernardo Moscardini Fabiani, Daniel Chagas do Nascimento, Technological Institute of Aeronautics, Brazil

Student Design Contest

The annual IEEE Antennas and Propagation Society (AP-S) Student Design Contest continues to be a popular event each year. This year, there were 30 entries from a diverse set of countries from IEEE regions around the world, including North America (United States and Canada), Europe (Italy, Spain, Sweden, Finland), Asia (China, Taiwan, India, Taiwan, Japan, and Malaysia), the Middle East (Turkey, Iran, and Egypt), and Latin America (Brazil).

This year's topic was designing antennas for cubesats. The goal was to design and build a cubesat antenna for enabling high-performance communications with a ground station. Each team prepared a proposal for the Contest that was evaluated by a college of reviewers to narrow the field to six finalist teams. Each finalist team had just over four months to build their proposed antenna systems with a budget of US $1,500, as well as to write a detailed technical paper and make a YouTube video demonstration. The finalists (in random order) are:

1) GRID, from KTH Royal Institute of Technology
   Project title: A Transparent Dual-Band Cubesat Antenna Based on Stacked Patches
   Members: Fernando Franzen, Harald Hultin and Jonas Olsson
   Mentors: Oscar Quevedo-Teruel, Mykola Nickolay Ivchenko, Fatemeh Ghasemifard
   YouTube video: https://youtu.be/9nnyY0Rrvrc

2) University of Alabama
   Project title: Archimedean Spiral Antenna with a Conical Perturbation for a 3U CubeSat
   Members: Katelyn Isbell, Peyton Morris, Cristion Oliphant-Jerry, Nikolaus Lhurs, Woncheol Lee
   Mentor: Yang-Ki Hong
   YouTube video: https://youtu.be/ES6CVY68Dno

3) Michigan State University
   Project title: Genetic Algorithm-Designed Conical Helix Antenna for Wideband Communications
   Members: John Doroshewitz, Ethan Gros, Sean Ellison, Vincens Gjokaj
   Mentor: Jeffrey Nanzer
   YouTube video: https://www.youtube.com/watch?v=Al-yFeqL7sw

4) Missouri University of Science and Technology
   Members: Matthew Dvorsky, Michael Shariff, Ali Foudazi, Atieh Talebzadeh
   Mentor: Mohammad T. Ghasr
   YouTube video: http://www.youtube.com/watch?v=LkVYxcUr0vQ

5) Polarization Bears, from the Colorado School of Mines
   Members: Robert Jones, Joseph Diener
   Project title: Ku-band Isoflux Phased Array Design
   Mentor: Atef Z. Elsherbeni
   YouTube video: https://www.youtube.com/watch?v=ZJJbFUA7PXQ

6) University of Alberta
   Project title: Solar Panel Integrated Cubesat Antenna
   Members: John Grey, Thomas Jones
   Mentor: Mojgan Daneshmand
   YouTube video: https://youtu.be/iU6eM7ozXQs

The submitted reports and YouTube videos were evaluated based on the criteria of creativity, justification of achieved link performance, completeness of the description in the report, functionality of the system as determined by the video, and quality of written materials.

Each finalist team will received stipends of up to US $2,500 for team representative(s) to attend this Symposium and demonstrate their working designs. Based on the on-site demo and the finalist evaluation results, the first-, second-, and third-prize winners will be selected to receive cash prizes of US $1,500, $750 and $250, respectively. The winners will be announced at the Symposium's Awards Presentation. In addition, the finalist teams may be invited to submit their final reports for publication in the IEEE Antennas and Propagation Magazine, under the Education Column. I highly encourage attendees of the conference to check out the demonstrations in person:

Date: Tuesday, July 11, 2017
Time: 09:30-12:00; 13:00–17:00
Location: Coronado Foyer

Many thanks are due to those who have worked hard to provide careful evaluation of the entries. In particular, I would like to acknowledge the evaluators and judges for the finalists: Jacob Adams (North Carolina State University, USA), Dimitris

Anagnostou (Heriot-Watt University, UK), Marco Antoniades (University of Cyprus), Jorge Costa (University Institute of Lisbon, Portugal), María Garcia Vigueras (INSA de Rennes, France), and Albert Lysko (Council for Scientific and Industrial Research, South Africa). My thanks also go to the IEEE AP-S Education Committee, whose members evaluated the the preliminary designs. I also acknowledge the help and support of Karl Warnick and David Kelley, the co-chairs of the AP-S Education Committee.

Sean Victor Hum
IEEE AP-S Student Design Contest Coordinator
University of Toronto, Canada
sean.hum@utoronto.ca

Patrons

AP-S/URSI 2017 is pleased to welcome our Gold patrons: Altair, Huawei and Qualcomm, and Silver patrons: IMST, MVG and NSI-MI. Thank you for your support of AP-S/URSI 2017!

All attendees are invited to visit the patrons at their booths in the exhibition hall.

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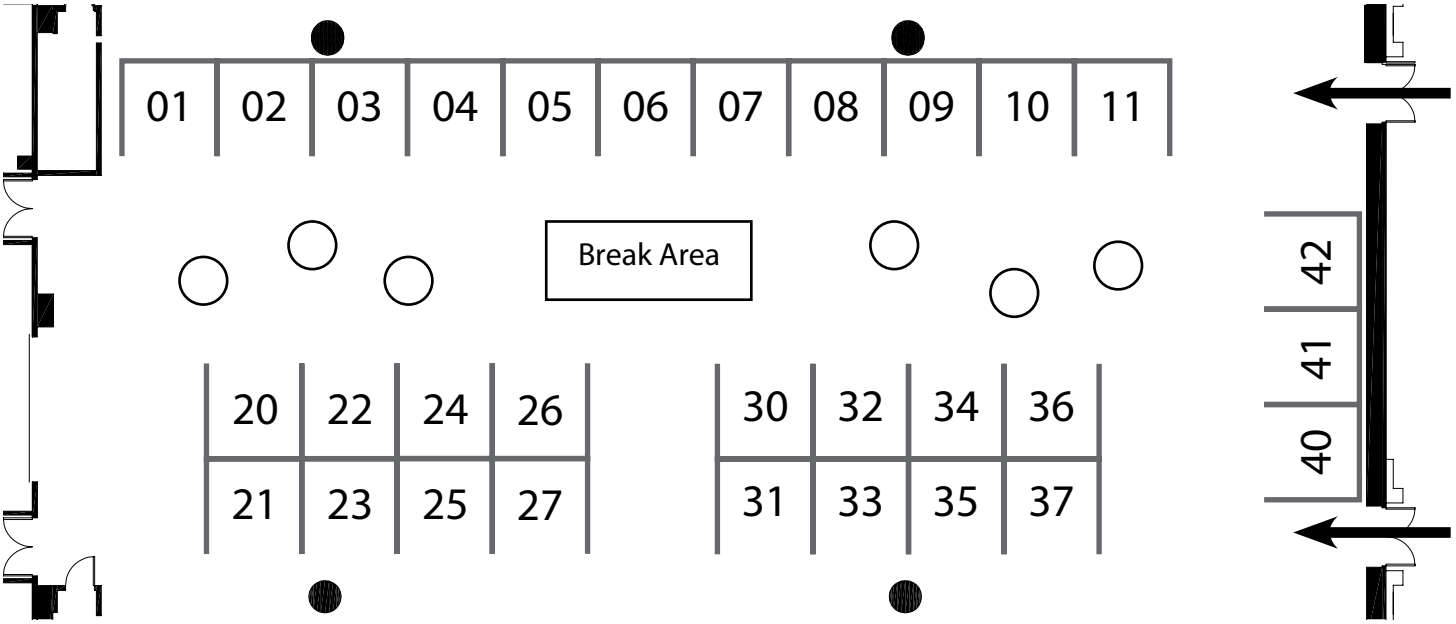
GENERAL ATOMICS AERONAUTICAL

Exhibitors

The Steering Committee of the 2017 IEEE International Symposium on Antennas and Propagation and North American Radio Science Meeting would like to thank the following exhibitors for their participation.



Booth	Exhibitor Name
1	SpaceX
2	IEEE Microwave Theory and Techniques (MTT) Society
3	Amateur Radio Special Event Station N6P
4	CST of America
5	Kyocera International Inc.
6	NSI-MI Technologies
7	WIPL-D d.o.o.
8	Apple
9	Huawei Device USA, Inc.
10	Data Quarry Inc.
11	ETS-lindgren Inc

Booth	Exhibitor Name
20	Anritsu
21	HRL Laboratories, LLC.
22	Qualcomm, Inc.
23	MiG - Microwave Innovation Group
24	Mician, Inc.
25	Wiley
26	Microwave Vision Group (MVG)
27	TICRA
30	REMCOM INC
31 & 33	Altair Engineering, Inc.
32	Dongshin Microwave Co. Ltd.

Booth	Exhibitor Name
34	Virtual EM Inc.
35	Advanced Test Equipment Rentals
36	EMSCAN
37	IMST GmbH
40	Allwave Corporation
41	IEEE Electromagnetic Compatibility (EMC) Society
42	PPG Aerospace / Cuming Microwave Corp
Table	University of Colorado, Boulder
Table	IEEE AP-S/URSI 2018

Exhibition Location and Hours

Exhibits are located in Grand Hall B on the Lobby level of the Manchester Grand Hyatt San Diego, and are open to all attendees according to the following schedule:

Tuesday, July 11.....09:00–18:00
Wednesday, July 12.....09:00–18:00
Thursday, July 13.....09:00–18:00

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Allwave	Allwave Corporation We specialize in satellite antenna communications. And near-field and far-field measurements, as well electro-magnetic design and stimulation software. http://allwavecorp.com
Altair	Altair Engineering, Inc. Altair (www.altair.com) offers state of the art engineering simulation suite -HyperWorks®, widely used in the aerospace, automotive, biomedical, and shipbuilding industries. FEKO (http://www.altairhyperworks.com/product/FEKO), a comprehensive electromagnetic simulation software tool, based on state of the art computational electromagnetics techniques, is included in HyperWorks suite. FEKO has been successfully used in a number of MRI radio frequency (RF) coil designs and magnetic resonance (MR) RF safety analyses. RF coil design in FEKO allows for the accurate prediction of signal-to-noise ratio (SNR), field homogeneity and coil safety. Accurate prediction of coil performance not only helps to optimize the coil design itself, but also reduces the time and cost involved in developing a superior RF coil for a specific application in MR. FEKO modeling and simulation greatly assist in the development of surface coils, volume coils and array coils. For RF safety, FEKO calculates very reliably volume averaged SAR (Specific Absorption Rate) in 1-g, 10-g and whole body of interest for a given power input to coil element. Please Come visit us at booth 31. http://www.altairhyperworks.com/FEKO
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CST	CST of America http://cst.com
Data Quarry Advanced Analysis & Reporting Software	Data Quarry Inc. Data Quarry Inc. provides software solutions for analysis and reporting with a focus on advanced analysis and reporting tools for the wireless device development eco-system enabling engineering to optimize efficiency and communication across teams and with customers while eliminating errors and saving up to 90% of reporting time. http://dataquarryinc.com
	Dongshin Microwave Co. Ltd. Dongshin Microwave, one of the leading manufacturer of microwave absorbers from China, was established in 1996 by Prof. Zhou, a known expert in China of this industry, who has previously worked in the research field in Dalian Institute of Chemical Physics(DICP) for over 40 years. Dongshin Microwave commit herself to research cutting-edge microwave material, produce qualified absorbers and the turn-key anechoic chambers. Dongshin Microwave has built up over 1000 chambers of various scales for the government, the army, aeronautics, astronautics and etc in the past ten years. Dongshin Microwave has also exported the absorber products to Europe, US, Austrlia, almost every part of the world and receive wide acceptance and appraise. Meanwhile, Dongshin Microwave offers a variety of microwave absorbers for the electronic system, antenna and microwave components. http://www.isorb.cn
EMSCAN real-time results	EMSCAN EMSCAN is a world leading developer of fast magnetic very-near-field measurement tools. We provide real-time low-cost desktop chambers that are efficient and cost-effective, eliminate the need for an anechoic chamber for pre-compliance and performance tests and offer accelerated time-to-market. EMSCAN solutions are 1/10th of a chamber's cost and operate 100 times faster. RFxpert is the only real-time, compact, bench-top antenna measurement equipment. In less than a second, unique array of automatically switched probes calculates accurate far-field (FF) patterns and radiated power levels based on very-near-field (NF) measurements. Immediate access to FF data saves time and cost by reducing reliance upon time consuming and costly anechoic chambers. Unique NF data provides insight into the root cause of problems. EMxpert is a real-time, compact, bench-top EMC/EMI diagnostic tool enabling designers to rapidly diagnose & solve EMC/EMI problems in a single design cycle. Gain insights about why designs fail something no chamber can give you. No more waiting for chamber time to redesign & test by trial & error. The EMxpert rapidly diagnoses even intermittent problems, which may go undetected when using handheld and automated probes. http://www.emscan.com

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	IEEE Electromagnetic Compatibility (EMC) Society http://www.emcs.org
	IEEE Microwave Theory and Techniques (MTT) Society http://www.mtt.org
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KYOCERA	Kyocera International Inc. Kyocera International, Inc., Semiconductor Components Group (KII-SCG), formerly known as Kyocera America, has been manufacturing ceramic packages in San Diego, CA since 1971. KII-SCG offers electronic packages and complex modules for the vast majority of semiconductor devices including RF, mmW, EO / silicon photonics, FPGAs / ASICs, power semiconductor (GaN, SiC), and MEMS. Applications include high-rel, phased array radar, automotive, DNA sequencing / bio-sensors, space, medical equipment, undersea cable, and telecom / datacom. Packages manufactured in San Diego are available in HTCC, LTCC-Au, LTCC-Cu, post-fired Al2O3, and BeO. Packages and modules are available with brazed metal heatsinks and high-frequency connectors such as GPPO, G3PO, etc, and seal rings for hermetic sealing with Kyocera metal or ceramic lids. KII-SCG has advanced package engineering and design capability, which includes electrical (analog, high-speed digital), thermo-mechanical, interconnect / filter / transitions library, modeling / simulation and CFD. KII-SCG Assembly Technology Division accepts prototype to volume production orders for flip chip, wirebond, wafer dicing and vacuum soldering. Additional Kyocera products and services available through KII-SCG in San Diego are high-density PCBs, organic packages, assembly materials (epoxies, Ag sinter, resins), wafer bumping, column grid array (CGA), and electrolytic / electroless metal plating. https://americas.kyocera.com/kai-semiparts/
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	Virtual EM Inc. Founded in 2002 by engineers who hungered to solve the most complex problems, Virtual EM develops disruptive technologies in the areas of computational electromagnetics, embedded wireless sensors, conformal antennas, and machine learning. Virtual EM strives to create a nurturing and rewarding environment for its employees and it has a strong record for creating products and licensing its technologies to OEMs. At Virtual EM, we relish the challenge to solve difficult problems with scientifically-sound, reliable, innovative solutions. We listen to your challenges, then provide candid input on the feasibility of project aims, keeping your best interests in mind. Our customers rely on our input and trust our guidance to successfully accomplish their goals. As a small research and development firm, we can flex our size as needed. We bring together academics, researchers, and commercial partners to create a team perfectly suited to tackle your challenge. Our flexibility can also help modify solutions to be more applicable for commercial markets. We deliver what is promised on time and on budget. You can be confident that our budgets and timelines are realistic. Let Virtual EM be your problem-solver when you need a trusted, flexible and reliable partner on tough research challenges. To learn more, contact Virtual EM, Inc. at 734-222-4558 or sales@virtualem.com, or find us online at www.virtualem.com. http://www.virtualem.com
	Wiley Wiley, a global company, helps people and organizations develop the skills and knowledge they need to succeed. Our online scientific, technical, medical, and scholarly journals, combined with our digital learning, assessment and certification solutions help universities, learned societies, businesses, governments, and individuals increase the academic and professional impact of their work. http://www.wiley.com
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The exhibit hall will feature a new program this year: "Interactive Exhibition". The Industrial Initiative Committee (IIC), a standing committee of the IEEE Antennas and Propagation Society chaired by Lars Jacob Foged, created the "Interactive Exhibition" program. The IIC conducted a survey of the attendees of the 2016 APS Symposium/ URSI Meeting in Puerto Rico. The survey results indicated an interest in increased participation from industry in the symposium and exhibition. A majority indicated "increased number of exhibitors" and "hardware demonstrations" as desired features followed by "software demos and tutorials" as a means to improve the exhibition. In response to these suggestions, this year's symposium organizing committee and the IIC are pleased to bring you the "Interactive Exhibition". You will find hardware and software demonstrations in special stations as well as in participating exhibitor booths in the exhibit hall during exhibit hours. Following is the list to date of participating exhibitors. Please check the symposium website and mobile app for schedule information!

Demonstrations — Grand Hall A

Please check the symposium website and mobile app for schedule information!

ALTAIR

Design of High Gain Patch Antennas using Topology Optimization using FEKO and HyperStudy

Patch antennas are still an ongoing topic of interest due to their advantages: low profile, low cost and ease of fabrication. One of the disadvantages of patch antenna is low directivity, which results in low range performance. In this demonstration, we will introduce an efficient and novel way to improve the directivity of patch antenna using topology optimization and design of experiments (DoE). Numerical simulations are done using Method of Moments (MoM) technique in product, FEKO. We use global response surface method (GRSM) for double objectives topology optimization using the product HyperStudy. This product demonstration will show use of topology optimization and DoE techniques for the systematic design of high directivity of low profile single element patch antennas. This demonstration will show the pertinent steps for design of a patch antenna for V2V applications at 5.9GHz using FEKO in conjunction with HyperStudy.

Presenter: Dr. Aseim Elfrgani, Altair

EMSCAN

Antenna Measurements in Seconds with Chambers on Your Desktop

This demonstration will show how very-near-field (VNF) systems can accurately evaluate antenna performance in seconds. VNF measurements of radiated emissions are fast and easy to make. VNF test systems invented by EMSCAN are able to accurately measure radiated power and efficiency for antennas. This allows designers to easily and quickly check antenna and wireless device performance without always needing to resort to chambers and helping them to avoid the delays and set-up needed for far-field measurements in a chamber. When working on small devices like mobile phones or smart meters, a designer can get radiation patterns in "real-time". This speed makes it valuable in all stages of the design cycle including new product integration and quality assurance. The same hardware and technique can also be extended to larger antenna like base station antenna or radar arrays and provide measurements in the lab in minutes. You can bring your antennas for us to test.

Presenter: Eduardo Lopez, EMSCAN

ETS-LINDGREN

5G Performance Measurements

This demonstration shows a simple 2-dimensional antenna pattern measurement for a 5G/millimeter wave (mmWave) antenna. In this demonstration, the antenna under test (AUT) is four (4) element patch antenna array working at 28 GHz. The patch antenna is fed with the 28GHz signal from a signal source and while the device is rotated in azimuth plane, the radiation pattern of the antenna array is measured with measurement antenna. The demonstration presents the challenges in millimeter wave communications and further emphasizes the tasks that lie ahead in order to perform accurate and confident measurements for 5G/ mmWave antennas. Note this demonstration provides an example of this measurement technique in a 2-dimensional test system, but this approach may also be used to measure 3-dimensional antenna performance.

Presenter: Jari Vikstedt, ETS-Lindgren

MICROWAVE INNOVATION GROUP

Efficient Design of Antennas and Arrays including Feeds by Hybrid Multi-Solver Domain Decomposition Methods

The demonstration shows the efficiency of hybrid multi-solver domain decomposition methods using WASP-NET software for the fast design and optimization of antennas and arrays together with feed-networks by live simulations of typical examples on a standard notebook: Corrugated horn together with dual-band/dual-polarization Boifot-OMT, shaped ADE dual-reflector antenna with OMT, shaped offset dual-reflector antenna with OMT, slot-array with feed-network for sum and difference patterns, and a phased Vivaldi-array fed by coax-to-slot-line transitions. Calculation speeds range from a couple of seconds up to a couple of minutes. Design wizards enable the convenient design of these antenna types. An efficient characteristic mode (CM) solver allows pre-investigating exploitable design potentials of antenna structures including feed-point and platform placement effects. CM demonstration examples are a patch array with microstrip feed-network and a mobile phone antenna including housing effects.

Presenter: Fritz Arndt, University of Bremen and MiG – Microwave Innovation Group

MICROWAVE VISION GROUP

Measured Antenna Models for Numerical Simulations in Antenna Placement Scenarios

Electromagnetics solvers are important engineering tools in the characterization and optimization of antenna placement on large and complex platforms. The accuracy of the source representation has a strong influence on the simulation accuracy of the overall system. It is customary to use domain decomposition techniques based on the near-field description of the local domain in such cases. This allows a separate modeling of the antenna with a high level of detail. The source is subsequently used in the numerical simulation of the entire system. Due to the conclusiveness and high data reliability, measured antennas are attractive as accurate antenna models in numerical simulations.

The MVG commercial software INSIGHT, implementing the inverse source method, provides an accurate near-field representation of any radiating device in terms of equivalent electric and magnetic currents. The equivalent model of the measured device can be imported into commercial electromagnetics solvers in the form of a Huygens Box. This demonstration will show the pertinent steps for using real antennas in numerical simulations, and give practical application examples.

Presenter: Lars Jacob Foged, Microwave Vision Group

NSI-MI TECHNOLOGIES

Using a Portable Near-Field System to Measure High Frequency Antennas

The 1x1 Spherical and Planar Near-Field System is beneficial for measuring high frequency, medium and high gain antennas (>15 dBi) with small apertures. This simple design is portable and easy to align. It can be quickly reconfigured to use both mm-Wave modules or traditional coaxially connected antennas, supporting payloads of up to 10 lb. (4.5 kg). The 5-axis test system interfaces with a wide variety of RF equipment and is ideal for characterizing small aperture antennas from 8.2 - 500 GHz. The system software runs on a measurement workstation and provides automatic setup of scans based on measurement parameters and desired output. Measured data can be processed for far-field or holographic back projected patterns, yielding complete characterization of the antenna's performance. A single data set provides complete characterization of the antenna's gain, side lobe structure, beam pointing and cross polarization. The 1x1 Portable Near-Field System can also be integrated with an mm-Wave VNA, providing a compact mm-Wave planar near-field test package. This demonstration will show how a Portable Near-Field System measures a slot array antenna easily, quickly and accurately.

Presenter: Jesus Aguilar, NSI-MI Technologies

WIPL-D

WIPL-D Advanced Higher Order EM Modeling: From Low Frequency to Multiscale Problems and Composite Scenarios

The aim of the presentation is to demonstrate simulation of huge variety of different applications, multiscale problems and composite scenarios in WIPL-D software package. Usage of advanced sophisticated techniques, such as: max-ortho (higher order) basis function over quadrangle patches, independent selection of expansion orders along two major axes of these patches, adaptive choice of expansion orders depending on electrical size of patches (showing for the first time results for polynomial expansion orders from 1 to 128), and advanced matrix equilibration, together with CPU and GPU parallelization of all phases of simulation, enables WIPL-D to solve these problems without any solver hybridization, only by using MoM SIE based solver. Full wave analysis of electrically very large antenna placement and RCS problems of platforms up to 1000 λ long will be demonstrated using standard MoM augmented by Domain Decomposition technique.

Presenter: Branko Mrdakovic, WIPL-D

Please check the symposium website and mobile app for schedule information!

DATA QUARRY

Automating OTA Compliance Reports

In this demonstration, we will show a live example of automating an LTE OTA Compliance Report using Quarry ReportsTM. The report will contain sections for TRP, TIS, ICRS, and 3D Radiation patterns using data automatically extracted from a folder full of raw far field chamber data. This method provides fast, accurate, repeatable results while allowing you to track your data within the report for ease of validation or auditing of report results.

Presenter: Amy Brown, Data Quarry Inc.

IMST

24 GHz Radar Module: Live Simulation, Virtual Reality Experience and Radar Demonstration

The demonstration starts with a live simulation of an antenna system for a 24 GHz radar module using the EMPIRE XPU simulation software. The radar module contains one Tx and two Rx antenna arrays as well as all associated RF electronics. The simulation is followed by a virtual reality experience where the 24 GHz radar module and other 3D EM designs can be inspected using a VR headset. The last part of the demonstration will feature a live demonstration of the functional radar module showing multiple target detection with distance and angular information.

Presenters: Winfried Simon and Marta Martinez Vazquez, IMST GmbH

VIRTUAL EM

Tunable Antenna for LTE (4G) Handsets (Live Demonstration of Recovering from Detuning)

The demonstration features a tunable antenna operating in the 2.43-2.47GHz global roaming band. Antenna uses bare-die SPST solid-state relays controlled by DC voltages and has a total of 16 tuning states. The first act demonstrates how the antenna is tuned by combination of switch states. The second act is a live demonstration of how the antenna recovers from detuning through measurement of VSWR and the control algorithm.

Presenter: Tayfun Özdemir, Virtual EM Inc.

WIPL-D

Title: WIPL-D Advanced Higher Order EM Modeling: From Low Frequency to Multiscale Problems and Composite Scenarios

Abstract: The aim of the presentation is to demonstrate simulation of huge variety of different applications, multiscale problems and composite scenarios in WIPL-D software package. Usage of advanced sophisticated techniques, such as: max-ortho (higher order) basis function over quadrangle patches, independent selection of expansion orders along two major axes of these patches, adaptive choice of expansion orders depending on electrical size of patches (showing for the first time results for polynomial expansion orders from 1 to 128), and advanced matrix equilibration, together with CPU and GPU parallelization of all phases of simulation, enables WIPL-D to solve these problems without any solver hybridization, only by using MoM SIE based solver. Full wave analysis of electrically very large antenna placement and RCS problems of platforms up to 1000 λ long will be demonstrated using standard MoM augmented by Domain Decomposition technique.

Presenter: Branko Mrdakovic, WIPL-D

HUAWEI

MAKE it POSSIBLE

As a leading global information and communications technology (ICT) solutions provider, Huawei is dedicated to customer-centric innovation and strong partnerships. We have established end-to-end advantages in telecom networks, devices and cloud computing, and we have experienced rapid growth in the global smartphone market as well as increased brand recognition. Huawei was ranked third in global smartphone shipments in 2016 with over 29.6% growth worldwide representing 140 million shipments.

WE WANT YOU

Chief RF Systems Architect

Description:
As our Chief RF Systems Architect, you will lead the development of novel RF system architecture to meet the challenges of next generation wireless products. You are expected to work on all stages of product development cycle from concept development/spec drafting, component level development/ validation, and system optimization/ validation to factory production optimization.

Job Specifications:
Lead the development of novel RF system architecture to meet the challenges of next generation wireless products.
Draft concept design and specifications while working with the platform architect.
Collaborate with RF design/ test team and suppliers on component-level development and validation.
Work closely with Antenna/ RF design team on system optimization and validation.
Oversee factory test team on production optimization.

Staff/Principal Engineer - RF/Antenna

Description:
The Staff/Principal Engineer (Antenna/RF) will lead and/or participate in the research, design and development of mobile device antenna and RF activities at Huawei Device USA. The ideal candidate will have a combination of 8 years' experience developing mobile device hardware. Five years of experience at a globally recognized mobile device company is preferred.

Job Specifications:
Participate and/or lead in the research, design and development of mobile device antenna and RF activities.
Debug and optimize OTA system performance to meet customer requirements and ensure compliance with FCC SAR/HAC regulations.
Perform pre-research activities in new antenna and RF subsystem technologies.
Improve and develop antenna/RF R&D tools, software, and testing methods.
Conduct antenna/RF simulation with commercial tools (XFDTD and ADS preferred).
Communicate with engineers globally on R&D projects as needed.
Global travel required (less than 15%).

Visit our careers site to find our current job openings and apply today:
http://bit.ly/1MEhTA6
Or send us an email at:
grace.huiqian.chen@huawei.com

Gennady Shvets, Cornell University

Topological Photonics and its Applications To Microwave Devices

Monday, July 10, 08:00 - 08:40, Coronado B

This talk opens Session MO-A2.2A: New Physics in Guiding Systems I

The 2016 Nobel Prize in Physics was awarded for the pioneering work on counter-intuitive topological states of matter. Half a century later, the area of topological photonics is emerging. I will provide an overview of the field, with special emphasis on how topological approaches can be applied to novel microwave devices such as broadband circulators, reflectionless waveguides, and delay lines.

Gennady Shvets is a Professor of Applied and Engineering Physics at Cornell University. He received his PhD in Physics from MIT in 1995. His research interests include optical and microwave metamaterials and their applications, optoelectronic devices, and topological photonics. He is a Fellow of the American Physical Society (APS) and Optical Society of America (OSA).

J.-C. Chiao, University of Texas at Arlington

Endoscopically-Implantable Wireless Devices for Endoluminal Applications

Monday, July 10, 13:20 - 14:00, Hillcrest CD

This talk opens Session MO-A5.1P: Implantable Antennas and Sensorss

This presentation reviews batteryless wireless implants for endoluminal applications in physiological symptom diagnosis and management. Overall system constraints, antenna and hardware design consideration, implementation configurations and experimental results in animal models will be discussed. Esophagus sensors to detect reflux occurrence and pH, and gastric stimulators to sustain stomach motility are exemplified for their wireless operation by electromagnetic energy transfer.

J.-C. Chiao is Greene endowed professor of Electrical Engineering at University of Texas – Arlington. He received his PhD at Caltech. Dr. Chiao received the 2011 O'Donnell Award by The Academy of Medicine, Engineering and Science of Texas; Tech Titan Technology Innovator award; and IEEE R5 Outstanding Engineering Educator award. His webpage is at http://www.uta.edu/faculty/jcchiao/

Andrea Alú, University of Texas at Austin

Non-Reciprocal Electromagnetics in Time-Varying Systems

Tuesday, July 11, 08:00 - 08:40, Coronado B

This talk opens Session TU-A2.1A: New Physics in Guiding Systems II

Time-varying systems have recently gained significant attention for the realization of nonreciprocal and active devices. In this tutorial, we provide an overview of the recent progress in this area, including different approaches to time-varying systems that break reciprocity and an outlook on their applications for antenna systems, including isolators, circulators, nonreciprocal antennas, metasurfaces and topological insulators for radio-waves and light.

Andrea Alù is the Temple Foundation Endowed Professor at the University of Texas at Austin. He received his Laurea (2001) and PhD (2007) from the University of Roma Tre, Italy. His research focuses on metamaterials and plasmonics, electromagnetics, nanophotonics and acoustics. Dr. Alù is a Fellow of IEEE, OSA, SPIE and APS, and received the NSF Alan T. Waterman award (2015), the URSI Issac Koga Gold Medal (2011), and several other relevant awards and recognitions.

John Smee, Qualcomm Technologies Inc.

The Advent of 5G Mobile

Wednesday, July 12, 08:00 - 09:40, America's Cup AB

This talk opens Session WE-A1.2A: Wideband Antennas for 5G, Full-Duplex, MIMO and AoA

The 5G New Radio is moving closer to commercial reality across design, standardization and implementation. Now that the 3GPP 5G NR Release 14 Study Item has been completed, the Release 15 Work Item is now underway at an accelerated pace to enable 5G NR

enhanced mobile broadband deployments in spectrum bands below 6 GHz and in higher frequency mmWave bands. Key 5G design aspects and performance improvements include low latency frame structures, LDPC and Polar channel coding, massive MIMO, mmWave beam tracking, and improved network architectures. We are now embarking on large scale 5G NR trials with operators worldwide as commercial rollouts in 2019/2020 will set the stage for the next decade of 5G growth.

Dr. John E. Smee is a Vice President of Engineering at Qualcomm Technologies Inc. He joined Qualcomm in 2000, holds 61 US Patents, and has been involved in the system design for a variety of projects focused on the innovation of wireless communications systems such as CDMA EVDO, IEEE 802.11, 4G LTE, and 5G. His work involves taking advanced system designs and signal processing techniques from theory through design, standardization, implementation, and productization. He is currently a 5G project engineering lead in Qualcomm's research and development group. John was chosen to participate in the National Academy of Engineering Frontiers of Engineering program and is a recipient of the Qualcomm Distinguished Contributor Award for Project Leadership. He received his Ph.D. in electrical engineering from Princeton University, and also holds an M.A. from Princeton and an M.Sc. and B.Sc. from Queen's University.

Jian-ming Jin, University of Illinois at Urbana-Champaign

Multiphysics Modeling in Computational Electromagnetics: Technical Challenges and Potential Solutions

Wednesday, July 12, 13:20 - 14:00, Regatta

This talk opens Session WE-A3.1P: Multiphysics Methods and Applications

Electromagnetics-based multiphysics modeling has a wide range of application in science and engineering. However, its development faces a number of technical challenges. By using four examples, which involve electromagnetic, heat, fluid, mechanical, circuit, and plasma analyses, we will illustrate the nature and modeling of multiphysics problems and discuss some of the technical challenges and potential solutions in multiphysics modeling.

Jian-Ming Jin is the Y. T. Lo Chair Professor of Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign. He has authored and co-authored six books, 265 journal papers, 22 book chapters, and 362 conference papers, and presented 142 invited talks. He was elected an ISI most cited author in 2002 and a Fellow of IEEE in 2001. He appeared 23 times in the university's List of Excellent Instructors, and was awarded various professorship by 14 institutions around the world.

Peter Siegel, California Institute of Technology

Millimeter and Submillimeter Wave Applications in Biology Potential and Challenges

Thursday, July 13, 13:20 - 14:00, Coronado D

This talk opens Session TH-A5.1P: Terahertz IR and Optical Applications

The millimeter and submillimeter wave regimes have moved to the forefront of recent expansion and innovative use of the RF spectrum. As we depart the "Space Age" and enter the "Age of Biology" it is appropriate to take a closer look at what we can already do with millimeter and submillimeter-wave technology, by simply refocusing some existing circuits and techniques.

Peter H. Siegel has held appointments as Faculty Associate in Electrical Engineering and Senior Scientist in Biology at the California Institute of Technology, and Senior Research Scientist at the NASA Jet Propulsion Laboratory, both in Pasadena, California. At JPL, he founded and led for 25 years, the Submillimeter Wave Advanced Technology (SWAT) team, a group of 20+ scientists and engineers developing THz technology for NASA's near and long term space missions. This included delivering key components for four major satellite missions and leading more than 75 smaller R&D programs for NASA and the US department of defence. At Caltech, Dr. Siegel has been involved in new biological and medical applications of THz, especially low power effects on neurons and most recently, millimeter-wave monitoring of blood chemistry. Among many other functions, he served as founding Editor-in-Chief of the IEEE Transactions on Terahertz Science and Technology (2010-2015) and founder, and now the General Secretary, of the International Society of Infrared, Millimeter, and Terahertz Waves, the world's largest society devoted exclusively to THz science and technology. He is also an IEEE Fellow, and has served as an IEEE Distinguished lecturer, vice-chair and chair of IEEE MTTS Committee 4 – THz Technology,

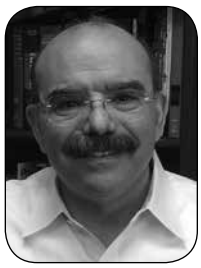
and an ad-hoc member of the MTTS AdCom for more than 10 years. Dr. Siegel has published more than 300 articles on THz components and technology and has given more than 200 invited talks on this subject throughout his career of 40 years in THz. His current appointments include: CEO of THz Global, a small R&D company specializing in RF bio applications; Faculty Associate in Electrical Engineering at Caltech; and Senior Research Scientist Emeritus at the NASA Jet Propulsion Laboratory.

John L. Volakis, The Ohio State University

Ultra Wideband Phased Arrays and Low-cost Beamforming

Friday, July 14, 08:00 - 08:40, Promenade AB

This talk opens Session FR-A1.4A: Phased Array Antenna Designs



UWB arrays with low-power and low-cost beam forming hardware are presented. Key features include: 1) 10:1 bandwidth with high isolation dual-pol antenna arrays, 2) on-site coding to reduce analog to digital and digital to analog converters by more than an order of magnitude, 3) signal spreading to achieve over 25dB of additional gain, and 4) 500MHz bandwidth simultaneous transmit/receive capability.

John L. Volakis has 35 years of experience in all aspects of Electromagnetics and sensing. He is the Roy & Lois Chope Chair Professor of Engineering at The Ohio State Univ. His publications include 8 books, 400 journal papers and ~800 conference papers. He mentored nearly 90 Ph.Ds/ PostDocs with 37 of them having won awards at international conferences.

Stefano Maci, University of Siena

Design of Modulated Metasurface Antennas

Friday, July 14, 13:20 - 14:00, Coronado A

This talk opens Session FR-A2.1P: Metasurfaces for Antenna Applications

In the recent years, metasurfaces (MTSs), i.e. the two-dimensional equivalent of metamaterials, have captured the attention of the AP-S community. In this talk, the recent achievement of the research in MTS will be reviewed with emphasis on antenna design, synthesis and applications in the microwave and millimetre wave range. A roadmap on the future perspectives of such antennas will be presented.

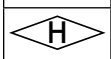
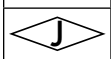
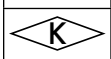
Stefano Maci is Professor at Univ. of Siena, Italy. He is expert in EM theory, high-frequency methods, integral equations, antennas, metamaterials. He is a IEEE Fellow since 2004. He was the founder in 2005 and presently the Director of the "European school of antennas" (35 Universities and 200 instructors, including 20 IEEE Fellow). He was AP-S AdCom member in 2010-12, former member of the Board of Director of EurAAP, IEEE Distinguish Lecturer, Chair of the Award Committee of IEEE AP-S. He was recipient of the EurAAP Career Award 2014, IEEE Chen-To Tai distinguished educator award 2016, and of the Schelkunoff Transaction prize in 2016. He is author of 150 papers in international journals, 10 Book Chapters. His paper got more than 5000 citations.

Presentation Listing Explanation

Session Code Legend

Code	D	–	TT	.	N	M
Explanation	Day	–	Track	.	Ordinal	Time
Possible Values	MO TU WE TH FR (Add P for Interactive Forum)	–	A1-A5: AP-S Tracks UA-UK: URSI Commissions SP: Joint Special Sessions	.	1–5	A: Morning P: Afternoon
Sample	MO	-	A5	.	2	A
	Monday	-	AP-S Track 5	.	2nd Session	AM (Morning)

Session Track Icon Legend

Icon	Code	Track
	A1	AP-S Track 1: Antennas
	A2	AP-S Track 2: Electromagnetics and Materials
	A3	AP-S Track 3: Computational and Numerical Techniques
	A4	AP-S Track 4: Propagation and Scattering
	A5	AP-S Track 5: Antenna Applications and Emerging Technologies
	UA	URSI Commission A: Electromagnetic Metrology
	UB	URSI Commission B: Fields and Waves
	UC	URSI Commission C: Radiocommunication Systems and Signal Processing
	UD	URSI Commission D: Electronics and Photonics
	UE	URSI Commission E: Electromagnetic Environment and Interference
	UF	URSI Commission F: Wave Propagation and Remote Sensing
	UG	URSI Commission G: Ionospheric Radio and Propagation
	UH	URSI Commission H: Waves in Plasma
	UJ	URSI Commission J: Radio Astronomy
	UK	URSI Commission K: Electromagnetics in Biology and Medicine
	SP	AP-S/URSI Joint Special Sessions

Additive Manufacturing in Antennas and RF Systems

Session Co-Chairs: Cyril Luxey, EpOC, Université Nice-Sophia; Yiannis Vardaxoglou, Loughborough University

MO-SP.1A.1 **08:00**

3D Printed Feed-Chain and Antenna Components

Esteban Menargues, LEMA-EPFL, Switzerland; Maria Garcia-Vigueras, INSA-IETR, France; Tomislav Debogovic, SWISSto12, Switzerland; Santiago Capdevila, LEMA-EPFL, Switzerland; Alexandros Dimitriadis, Emile de Rijk, SWISSto12, Switzerland; Juan R. Mosig, LEMA-EPFL, Switzerland

MO-SP.1A.2 **08:20**

Challenges 3D Printing Microwave Components

Karina Hoel, Stein Kristoffersen, FFI, Norway

MO-SP.1A.3 **08:40**

Low-Cost 3D-Printed 240 GHz Plastic Lens fed by Integrated Antenna in Organic Substrate Targeting Sub-THz High Data Rate Wireless Links

Elsa Lacombe, Frédéric Gianesello, Aimeric Bisognin, STMicroelectronics, France; Cyril Luxey, Diane Titz, EpOC - University of Nice Sophia-Antipolis, France; Heiko Gulan, Thomas Zwick, Karlsruhe Institute of Technology, Germany; Jorge R. Costa, Instituto Superior de Ciências do Trabalho e da Empresa - Instituto Universitário de Lisboa, Portugal; Carlos A. Fernandes, Instituto Superior Técnico - Universidade Técnica de Lisboa, Portugal

MO-SP.1A.4 **09:00**

Metasurface Antennas and Packaging at Terahertz Frequencies

Goutam Chattopadhyay, Jet Propulsion Laboratory, California Institute of Technology, United States; David González Ovejero, Université de Rennes, France; Cecile Jung-Kubiak, Theodore Reck, Maria Alonso-delPino, Jet Propulsion Laboratory, California Institute of Technology, United States

MO-SP.1A.5 **09:20**

3D-Printed Lens Antenna

Ravi Kumar Arya, EMC Laboratory, The Pennsylvania State University, USA, United States; Shiyu Zhang, J(Yiannis) Vardaxoglou, William Whittow, Loughborough University, United States; Raj Mittra, University of Central Florida, USA and KAU, Saudi Arabia, United States

Break **09:40**

MO-SP.1A.6 **10:00**

Development and Electromagnetic Characterization of 3D Printable Material with High Dielectric Constant

Junqiang Wu, Min Liang, University of Arizona, United States; Kevin Schnittker, Adriana Ramirez, David Roberson, The University of Texas at El Paso, United States; Eric MacDonald, Youngstown State University, United States; Ryan Wicker, The University of Texas at El Paso, United States; Hao Xin, University of Arizona, United States

MO-SP.1A.7 **10:20**

Microwave Performance of Composite Conductors for Fused Filament Fabrication of Electronics

Christopher Stevens, Ekaterina Shamonina, Son Chu, Andrea Vallecchi, Oxford University, United Kingdom

MO-SP.1A.8 **10:40**

On-Package mm-Wave FSS Integration with 3D-Printed Encapsulation

Bijan Tehrani, Syed Abdullah Nauroze, Ryan Bahr, Manos M. Tentzeris, Georgia Institute of Technology, United States

MO-SP.1A.9 **11:00**

Bowtie Antennas Inkjet Printed on Cylindrical Surfaces

Adam Kaye, Loughborough University, United Kingdom; Sivaprasad-Reddy Kunduru, Neil Chilton, Printed Electronics Ltd, United Kingdom; J(Yiannis) Vardaxoglou, William Whittow, Loughborough University, United Kingdom

MO-SP.1A.10 **11:20**

3D Printed 77 GHz Planar Yagi-Uda Antenna

Lee Harle, Yuxiao He, John Papapolymerou, Michigan State University, United States

Theoretical, Methodological and Technological Advances in Electromagnetic Inverse Scattering

Session Co-Chairs: Giacomo Oliveri, University of Trento; Aria Abubakar, Schlumberger

MO-SP.2A.1 **08:00**

Kolmogorov entropy in linear inverse problems

Raffaele Solimene, Maria Antonia Maisto, Rocco Pierri, Università degli studi della Campania Luigi Vanvitelli, Italy

MO-SP.2A.2 **08:20**

On the Uniqueness of Inverse Electromagnetic Problems for Invisibility Cloaks

Reza Dehbashi, Konstanty S. Bialkowski, Amin Abbosh, University of Queensland, Australia

MO-SP.2A.3 **08:40**

Shape Reconstruction through Sparsity Promotion and properly correlated Inverse Source Problems

Martina Teresa Bevacqua, Università Mediterranea, Italy; Lorenzo Crocco, CNR-IREA, National Research Council of Italy, Italy; Tommaso Isernia, Università Mediterranea, Italy

MO-SP.2A.4 **09:00**

Real-Time Crack Characterization in Conductive Tubes Through an Adaptive Partial Least Squares Approach

Marco Salucci, Shamim Ahmed, Nicola Anselmi, Giacomo Oliveri, University of Trento, Italy; Pierre Calmon, Roberto Miorelli, Christophe Reboud, CEA LIST Institute, France; Andrea Massa, University of Trento, Italy

MO-SP.2A.5 **09:20**

Advanced Techniques for GPR Microwave Imaging: an Experimental Study

Marco Salucci, Lorenzo Poli, Giacomo Oliveri, University of Trento, Italy; Raffaele Persico, Institute for Cultural and Monumental Heritage IBAM-CNR, Italy; Grazia Semeraro, Corrado Notario, University of Salento, Italy; Andrea Massa, University of Trento, Italy

Break **09:40**

MO-SP.2A.6 **10:00**

Electromagnetic Imaging of Grain Storage Bins: Study of Various Targets and Moisture Contents

Mohammad Asefi, Ian Jeffrey, University of Manitoba, Canada; Colin Gilmore, 151 Research Inc., Canada; Jitendra Paliwal, Joe LoVetri, University of Manitoba, Canada

MO-SP.2A.7 **10:20**

A Novel Differential Inverse Scattering Methodology in Biomedical Imaging

Arman Afsari, Amin Abbosh, The University of Queensland, Australia; Yahya Rahmat-Samii, University of California, Los Angeles, United States

MO-SP.2A.8 **10:40**

Application of Multiplicative Regularization for Electrical Impedance Tomography

Ke Zhang, Maokun Li, Fan Yang, Shenheng Xu, Tsinghua University, China; Aria Abubakar, Schlumberger, United States

MO-SP.2A.9 **11:00**

Microwave Tomography for Brain Stroke Imaging

Pierre-Henri Tournier, Frederic Hecht, Frederic Nataf, Université Pierre-et-Marie Curie, CNRS, France; Marcella Bonazzoli, Francesca Rapetti, Victorita Dolean, Ibtissam El Kanfoud, Iannis Aliferis, Claire Migliaccio, Christian Pichot, Université Côte d'Azur, CNRS, France; Serguei Semenov, EmTensor GMbH, Austria

MO-SP.2A.10 **11:20**

3D Microwave Imaging using the Time-Harmonic Discontinuous Galerkin Method – Contrast Source Inversion

Kevin Brown, Nicholas Geddert, Gabriel Faucher, Anastasia Baran, Mohammad Asefi, Kyle Nemez, Joe LoVetri, Ian Jeffrey, University of Manitoba, Canada

Electromagnetic Theory

Session Co-Chairs: Yakir Hadad, Tel Aviv University; Guido Lombardi, Politecnico di Torino

MO-A2.1A.1 **08:00**

Finding 'at-once' all dominantly excited modes in a layered medium by Fourier-Pade approximation of the Green's function

Yakir Hadad, Tel Aviv University, Israel

MO-A2.1A.2 **08:20**

Re-expressing the Solution of Maxwell Equations Using Two New Auxiliary Scalar Potentials

Arman Afsari, Amin Abbosh, The University of Queensland, Australia; Yahya Rahmat-Samii, University of California, Los Angeles, United States

MO-A2.1A.3 **08:40**

Photo-induced Force vs Power in Chiral Scatterrers

Mohammad Albooyeh, Mina Hanifeh, Mohammad Kamandi, Mohsen Rajaei, Jinwei Zeng, H. Kumar Wickramasinghe, Filippo Capolino, University of California, Irvine, United States

MO-A2.1A.4 **09:00**

Uniqueness Theorem for Lossy Anisotropic Inhomogeneous Structures with Diagonal Material Tensors

Reza Dehbashi, Konstanty S. Bialkowski, Amin Abbosh, University of Queensland, Australia

MO-A2.1A.5 **09:20**

On Circuital Modelling of Diffraction Problems in Spectral Domain

Vito Daniele, Guido Lombardi, Rodolfo S. Zich, Politecnico di Torino - ISMB, Italy

Break **09:40**

MO-A2.1A.6 **10:00**

Minimum Energy Storage in Dissipative Electromagnetic Systems

Lukas Jelinek, Czech Technical University in Prague, Czech Republic; Kurt Schab, North Carolina State University, United States; Miloslav Capek, Czech Technical University in Prague, Czech Republic

MO-A2.1A.7 **10:20**

Restoring Characteristic Eigenvalues as Reactive Powers for Simple and Complex Media in Surface Integral Formulations

Zachary Miers, Buon Kiong Lau, Lund University, Sweden

MO-A2.1A.8 **10:40**

Analytical study of the TE–waveguide modes in time-domain

Fatih Erden, Turkish Naval Academy, Turkey; Oleg Tretyakov, Gebze Technical University, Turkey

MO-A2.1A.9 **11:00**

Pedagogical Construction of a Green's Function from Physical Consideration

Thomas Wong, Zhijing Hu, Yanlin Li, Illinois Institute of Technology, United States

MO-A2.1A.10 **11:20**

Nondiffracting Waves: Criteria for Designing X-wave Launchers

Walter Fuscaldo, Sapienza University of Rome, Italy; Santi Concetto Pavone, University of Siena, Italy; Davide Comite, Sapienza University of Rome, Italy; Guido Valerio, Sorbonne Universités, UPMC Univ Paris 06, France; Matteo Albani, University of Siena, Italy; Mauro Ettorre, Université de Rennes 1, UMR CNRS 6164, France; Alessandro Galli, Sapienza University of Rome, Italy

New Physics in Guiding Systems I

Session Co-Chairs: Boubacar Kante, University of California San Diego; Vincenzo Galdi, University of Sannio

MO-A2.2A.1 **08:00**

Topological Photonics and Its Applications to Microwave Devices

Gennady Shvets, Cornell University, United States

MO-A2.2A.3 **08:40**

Electromagnetic Wave Amplification based on Dispersion Engineered Intraband Photonic Transitions

Nima Chamanara, Christophe Caloz, Polytechnique Montréal, Canada

MO-A2.2A.4 **09:00**

Photonic topological edge states in metallic and all-dielectric structures

Alexey Slobozhanyuk, Australian National University, Australia; Yuri Kivshar, The Australian National University, Australia; Alexander Poddubny, ITMO University, Russian Federation; Alexander Khanikaev, The City College of the City University of New York, United States

MO-A2.2A.5 **09:20**

Coupled Transmission Line Array Antennas with Exceptional Points of Degeneracy

Mohamed A. K. Othman, Filipo Capolino, University of California, Irvine, United States

Break **09:40**

MO-A2.2A.6 **10:00**

Coupled Topologically Protected Metawaveguides

Gian Guido Gentili, Politecnico di Milano, Italy; Giuseppe Pelosi, University of Florence, Italy; Francesco Piccioli, Politecnico di Milano, Italy; Stefano Selleri, University of Florence, Italy

MO-A2.2A.7 **10:20**

Topological Approach to the Design of Terahertz Circuits

Babak Bahari, Boubacar Kanté, University of California, San Diego, United States

MO-A2.2A.8 **10:40**

Scattering in Superluminal Space-time (ST) Modulated Electromagnetic Crystals

Zoé-Lise Deck-Léger, Christophe Caloz, Polytechnique Montréal, Canada

MO-A2.2A.9 **11:00**

Composite Floquet Scattering Matrix for the Analysis of Time-Modulated Systems

Mykhailo Tymchenko, Dimitrios Sounas, Andrea Alù, The University of Texas at Austin, United States

Scattering Control through Metasurfaces and Cloaking

Session Co-Chairs: Alexander B. Yakovlev, University of Mississippi; Filiberto Bilotti, RomaTre university

MO-A2.3A.1 **08:00**

Waveform-Selective Scattering Control through Circuit-Based Metasurfaces at the Same Frequency

Hiroki Wakatsuchi, Nagoya Institute of Technology, Japan; Daniel F. Sievenpiper, University of California, San Diego, United States

MO-A2.3A.2 **08:20**

Wideband Elliptical Metasurface Cloaks in Antenna Technology

Gabriel Moreno, Hossein Mehrpour Bernety, Alexander Yakovlev, University of Mississippi, United States

MO-A2.3A.3 **08:40**

Van Atta arrays for realizing angular and frequency wideband carpet cloaks

Antonino Tobia, Davide Ramaccia, Alessandro Toscano, Filiberto Bilotti, Roma Tre University, Italy

MO-A2.3A.4 **09:00**

Spatio-temporal modulated Doppler cloak restores invisibility of moving cloaked objects

Davide Ramaccia, Filiberto Bilotti, Alessandro Toscano, Roma Tre University, Italy; Dimitrios Sounas, Andrea Alù, The University of Texas at Austin, United States

MO-A2.3A.5 **09:20**

A Concept for Cloaking using Electrically-Thin Dielectric Surfaces

Miguel Ruphuy, University of Costa Rica, Costa Rica; Omar Ramahi, University of Waterloo, Canada

Break **09:40**

MO-A2.3A.6 **10:00**

Miniaturizing Electromagnetic Invisibility Cloaks Using Double Near Zero Slabs

Reza Dehbashi, Konstanty S. Bialkowski, Amin Abbosh, University of Queensland, Australia

MO-A2.3A.7 **10:20**

Concealment with Near-Zero Materials and Their Sensitivity to Non-Zero Material Parameters

Reza Dehbashi, Konstanty S. Bialkowski, Amin Abbosh, University of Queensland, Australia

MO-A2.3A.8 **10:40**

Ultra Wideband Epsilon-Near-Zero Metamaterial

Reza Dehbashi, Konstanty S. Bialkowski, Amin Abbosh, University of Queensland, Australia

MO-A2.3A.9 **11:00**

Tai-Chi-Inspired Pancharatnam-Berry Phase Metasurface for Dual-band RCS Reduction

Xia Luo, Qingfeng Zhang, South University of Science and Technology of China, China; Yaqiang Zhuang, Air Force Engineering University, China

MO-A2.3A.10 **11:20**

Radar Cross Section Reduction of Dipole Antenna Using Checkerboard Surface

Longjian Zhou, Min Gao, Xuewu Cui, Feng Yang, Zhipeng Liang, University of Electronic Science and Technology of China, China

Reflectarray with Novel Elements

Session Co-Chairs: Yehuda Leviatan, Technion - Israel Institute of Technology; Adam Mehrabani, Johns Hopkins University

MO-A1.1A.1 **08:00**

C-Band Flexible and Portable Circularly Polarized Textile-Reflectarray (TRA)

Muhammad Mustafa Tahseen, Ahmed A. Kishk, Concordia University, Canada

MO-A1.1A.2 **08:20**

Perfect Reflectarrays Elements Based on Non-local Metasurfaces

Ana Díaz-Rubio, Viktar Asadchy, Do-Hoon Kwon, Sergei Tretyakov, Aalto University, Finland

MO-A1.1A.3 **08:40**

Extending Power-handling of High-power Metamaterial Phase-shifters using Three-dimensional Counter-rotated End-loaded Dipoles

Sawyer D. Campbell, Jeremy A. Bossard, Micah D. Gregory, The Pennsylvania State University, United States; Clinton P. Scarborough, E x H, Inc., United States; Pingjuan L. Werner, Douglas H. Werner, The Pennsylvania State University, United States; Joshua Pompeii, Scott Griffiths, Joint Non-Lethal Weapons Directorate, United States

MO-A1.1A.4 **09:00**

Offset-fed Dielectric Reflectarray Antenna Designs

Ravi Kumar Arya, The Pennsylvania State University, United States; Raj Mittra, University of Central Florida, USA and KAU, Saudi Arabia, United States

MO-A1.1A.5 **09:20**

A Novel Single-Layer Reflectarray Antenna Using Square Spiral Element

Yang Liu, Hongjian Wang, Fei Xue, Xingchao Dong, National Space Science Center, Chinese Academy of Sciences, China

Break **09:40**

MO-A1.1A.6 **10:00**

The Shape Synthesis of Unit Elements for Transmitarray Antennas

Abdullah Aljanah, Derek McNamara, University of Ottawa, Canada

MO-A1.1A.7 **10:20**

GA-Optimized Reflectarray Elements for Broadband Orthogonal-Polarization Conversion

Daichi Higashi, Hiroyuki Deguchi, Mikio Tsuji, Doshisha University, Japan

MO-A1.1A.8 **10:40**

Parametric Analysis of Double-Split Ring Resonator as a Reflectarray Unit Cell

Gülay ÖzsahIn, Tugba SImsek, Mehmet Ünlü, Ankara Yildirim Beyazit University, Turkey; Orçun Kiris, Süleyman Köse, Halid Mustaçoglu, Fahri Öztürk, Volkan Akan, TUBITAK Space Technologies Research Institute, Turkey

Wideband Slot Antennas

Session Co-Chairs: Saeed Latif, University of South Alabama; Hsi-Tseng Chou, National Taiwan University

MO-A1.2A.1 **08:00**

A Wideband, Circularly Polarized Slot Antenna

Zabed Iqbal, Sungkyun Lim, Georgia Southern University, United States

MO-A1.2A.2 **08:20**

The Performance of an Ultra-wideband Elliptical Ring Monopole Antenna with a Humanoid Breast Phantom

F. Mansoor, T. Tan, Saeed Latif, University of South Alabama, United States

MO-A1.2A.3 **08:40**

A Compact Circularly-Polarized Square Slot Antenna with Enhanced Axial-Ratio Bandwidth Using Metasurface

Mehrdad Nosrati, Negar Tavassolian, Stevens Institute of Technology, United States

MO-A1.2A.4 **09:00**

Design of Wideband Circular Polarization for The Open-Slot Antenna

Kuan-Wei Li, Chia-Wei Hsu, Jun-Yu Lai, Wen-Bin Tsai, Chien-Jen Wang, National University of Tainan, Taiwan

MO-A1.2A.5 **09:20**

OLR Based Reconfigurable Two/Four-States UWB Notch Antenna

Ahmed Abdelraheem, Purdue University, Egypt; Mahmoud A. Abdalla, Military Technical College, Egypt

Break **09:40**

MO-A1.2A.6 **10:00**

A Wideband Circularly Polarized Slot-Antenna Array

Sing Wai Cheung, Changfei Zhou, Di Wu, Qinlong Li, Min Li, The University of Hong Kong, China

MO-A1.2A.7 **10:20**

Octagonal Band Notched Superwideband Fractal Antenna

Sarthak Singhal, Amity School of Engineering & Techonology, India; Amit Kumar Singh, Indian Institute of Technology (BHU), India

MO-A1.2A.8 **10:40**

Broadband Circularly Polarized Square Slot Antenna with a G-Shaped Feedline

Kwame Oteng Gyasi, Yongjun Huang, Guangjun Wen, Jian Li, Affum Emmanuel Ampoma, University of Electronic Science and Technology of China, China

MO-A1.2A.9 **11:00**

A Printed UWB Slot Antenna with Bluetooth and Dual Notched-Bands

Guodong Zhao, Peng Gao, University of Electronic Science and Technology of China, China

Integral Equation Applications

Session Co-Chairs: Branislav Notaros, Colorado State University; Kristof Cools, University of Nottingham

MO-A3.1A.1 **08:00**

Using Subdivision Surface Technique to Solve Generalized Debye Sources based EFIE

Xin Fu, University of Hong Kong, Hong Kong SAR of China; Jie Li, Balasubramaniam Shanker, Michigan State University, United States; Lijun Jiang, University of Hong Kong, Hong Kong SAR of China

MO-A3.1A.2 **08:20**

Investigation of Alternative Array Configurations of Nanowires for Maximum Power Transmission at Optical Frequencies

Bariscan Karaosmanoglu, Hasan Aykut Satana, Middle East Technical University, Turkey; Fatih Dikmen, Gebze Technical University, Turkey; Özgür Ergul, Middle East Technical University, Turkey

MO-A3.1A.3 **08:40**

Domain Decomposition Method for Solving Scattering from PEC objects

Kui Han, Zaiping Nie, Dingbang Wen, University of Electronic Science and Technology of China, China

MO-A3.1A.4 **09:00**

Numerical Solution of Electromagnetic Scattering by Very Slim Conducting Structures

Peng Cheng Wang, Hao Sun, Mei Song Tong, Tongji University, China

MO-A3.1A.5 **09:20**

Wideband Frequency Analysis Using Volume Surface Integral Equation and Taylor Series Expansion

Qiang-Ming Cai, Yan-Wen Zhao, Zhi-Peng Zhang, Li Gu, Yu-Teng Zheng, Zai-Ping Nie, University of Electronic Science and Technology of China, China; Qing Huo Liu, Duke University, United States

Break **09:40**

MO-A3.1A.6 **10:00**

Matrix Fill in Analysis of Axially Symmetric Antennas using Very High Expansion Orders

Aleksandra Krneta, Branko Kolundzija, University of Belgrade, Yugoslavia

MO-A3.1A.7 **10:20**

Ground de-Embedded Source Reconstruction Using a Planar Array of H-Field Probes

Ali Kiaee, Rezvan Rafiee Alavi, Mohammad Mahdi Honari, Rashid Mirzavand, Pedram Mousavi, University of Alberta, Canada

MO-A3.1A.8 **10:40**

Computational Demonstration of Multiband Nanoantennas for Power Enhancement

Ugur Meric Gur, Emre Ustun, Omer Eroglu, Middle East Technical University, Turkey; Fatih Dikmen, Gebze Technical University, Turkey; Özgür Ergul, Middle East Technical University, Turkey

MO-A3.1A.9 **11:00**

Efficient Numerical model to analyze the conformal capacitive frequency selective surfaces

Yiling Wang, Zaiping Nie, Dingbang Wen, University of Electronic Science and Technology of China, China

MO-A3.1A.10 **11:20**

Accurate Electromagnetic Analysis for Multilayered Interconnect Structures Based on VSIEs

Guo Chun Wan, Yu Jie Zhang, Mei Song Tong, Tongji University, China

Design Methodologies for Antennas

Session Co-Chairs: Daniel Weile, University of Delaware; Miguel Navarro-Cia, University of Birmingham

MO-A3.2A.1 **08:00**

From Optimization of Near-Field WPT Systems to Far-Field Antenna Arrays

Hans-Dieter Lang, Costas D. Sarris, University of Toronto, Canada

MO-A3.2A.2 **08:20**

Suppression of Sidelobe Level and Sideband of Time-Modulated Linear Antenna Arrays by Using NSDE

Anyong Qing, Cheng Zhang, School of Physical Electronics, University of Electronic Science and Technology of China, China

MO-A3.2A.3 **08:40**

Comparison of Crossover Recombination Operators in GA-Optimized Sparse Linear Array Design

Sean Ellison, Jeffrey Nanzer, Michigan State University, United States

MO-A3.2A.4 **09:00**

Leadership-Based Algorithm for Planar Array Optimization

Francesco Grimaccia, Marco Mussetta, Alessandro Niccolai, Politecnico di Milano, Italy; Paola Pirinoli, Politecnico di Torino, Italy; Riccardo Zich, Politecnico di Milano, Italy

MO-A3.2A.5 **09:20**

The Design of Two-fold Redundancy Linear Arrays in Aperture Synthesis Radiometers

Peiwen Tang, Liang Lang, Fei Hu, Dong Zhu, Huazhong University of Science and Technology, China

Break **09:40**

MO-A3.2A.6 **10:00**

On Q-Factor Bounds for a Given Front-to-Back Ratio

Shuai Shi, Lei Wang, B.L.G. Jonsson, KTH Royal Institute of Technology, Sweden

MO-A3.2A.7 **10:20**

An Improved Procedure for Simulation-Driven Miniaturization of Antenna Structures

David Johanesson, Slawomir Koziel, Adrian Bekasiewicz, Reykjavik University, Iceland

MO-A3.2A.8 **10:40**

Statistical Investigation of a Dual-Band Wearable Patch Antenna

Hulusi Acikgoz, KTO Karatay University, Turkey; Raj Mittra, University of Central Florida, United States

MO-A3.2A.9 **11:00**

Optimization of the Spiral Inductor With EBG Via FDTD and GA

Hongjian Wang, NSSC,CAS, China

MO-A3.2A.10 **11:20**

Artificial Neural Network with Data Mining Techniques for Antenna Design

Li-Ye Xiao, Wei Shao, Tu-Lu Liang, Bing-Zhong Wang, School of Physical Electronics, China

Antenna Theory I

Session Co-Chairs: Constantine Balanis, Arizona State University; Andrea Neto, Delft University of Technology

MO-A1.3A.1 **08:00**

Measurement Sample Reduction for Efficient Antenna Gain Determination in the Near-Field

Ole Neitz, Thomas F. Eibert, Technical University of Munich, Germany

MO-A1.3A.2 **08:20**

On the Evaluation of the Available Power for Antennas in Reception

Andrea Neto, Nuria Llombart, TU Delft, Netherlands; Angelo Freni, University of Florence, Italy; Arturo Fiorellini Bernardis, TU Delft, Netherlands

MO-A1.3A.3 **08:40**

Printed High Gain End-fire Beam-Steerable Yagi Antenna

Parisa Lotfi Poshtgol, Saber Soltani, Ross D. Murch, Hong Kong University of Science and Technology, Hong Kong SAR of China

MO-A1.3A.4 **09:00**

Excitation Shape and Placement Effects on Natural Radiating Modes

Asim Ghalib, Mohammad Said Sharawi, King Fahd University of Petroleum and Minerals, Saudi Arabia

MO-A1.3A.5 **09:20**

Characteristic Modes of Circular Slot Antennas Etched on a Finite Ground Plane

Asim Ghalib, Rifaqat Hussain, Mohammad Said Sharawi, King Fahd University of Petroleum and Minerals, Saudi Arabia

Break **09:40**

MO-A1.3A.6 **10:00**

Investigations on Effects of Finite Ground Plane on Slot Antennas using Characteristic Modes

Arka Bhattacharyya, Bhaskar Gupta, Jadavpur University, India

MO-A1.3A.7 **10:20**

Influence of Amplitude and Phase Errors on Near-Field to Far-Field Transformation

Weijun Chen, Chufeng Hu, Nanjing Li, Shuxia Guo, Lifang Guo, Kai Zheng, Northwestern Polytechnical University, China

MO-A1.3A.8 **10:40**

A Novel Dual-Band Dual-Sense Circulalry Polarized Antenna Based on Simple Printed Dipole Structure

Rui Xu, Jianying Li, Guangwei Yang, Northwestern Polytechnical University, China

MO-A1.3A.9 **11:00**

The Vortical Radio Waves Realized by Helical Antennas

Du-Juan Wei, Jianying Li, Jang-Jun Yang, Northwestern Polytechnical University, China

Advanced Antenna Technologies for User End

Session Co-Chairs: Magdy Iskander, University of Hawaii at Manoa; Thomas Liu, Intel Corp.

MO-A5.1A.1 **08:00**

RF EMF Exposure of Beam-Steering Slot Array in 5G User Equipment at 15 GHz

Bo Xu, Kun Zhao, Sailing He, KTH Royal Institute of Technology, Sweden; Zhinong Ying, Sony Communication AB, Sweden

MO-A5.1A.2 **08:20**

Internal Pattern-Switchable 1.0 Wavelength Loop Antenna Array for Satellite Smartphone Applications

Wei-Yu Li, Wei Chung, Industrial Technology Research Institute (ITRI), Taiwan; Amane Miura, Hiroyuki Tsuji, National Institute of Information and Communications Technology (NICT), Japan; Jui-Hung Chen, Chin-Ya Yi, Industrial Technology Research Institute (ITRI), Taiwan

MO-A5.1A.3 **08:40**

Disc-Slot Antenna With Dielectric Loading and Thick Metal Ground for Wrist-Wron Devices

Huan-sheng Hwang, Aycan Erentok, Rodrigo. Camacho, Thomas Liu, Paul Beaucourt, Intel Corp., United States

MO-A5.1A.4 **09:00**

Design of Broadband Dual-Polarized Oval-Shaped Base Station Antennas for Mobile Systems

Ahmed Alieldin, Yi Huang, University of Liverpool, United Kingdom

MO-A5.1A.5 **09:20**

A Self-Resonant Reconfigurable Diversity Antenna for Mobile Phone with Full Metal Housing

Yixin Li, Xiaojun Tang, Yumei Yu, Lijia Zhu, Guangli Yang, Shanghai University, China

Break **09:40**

MO-A5.1A.6 **10:00**

A Novel technique for RF voltage measurement for Aperture Tuned Antennas.

Abolghasem Zamanifekri, Roberto Gaddi, Paul Tornatta, Cavendish Kinetics, Netherlands

MO-A5.1A.7 **10:20**

Advanced Directional Networking: LTE vs WiFi Radios

Shekh Md Mahmudul Islam, Farhan A. Qazi, Magdy F. Iskander, Zhengqing Yun, Galen Sasaki, University of Hawaii at Manoa, United States

MO-A5.1A.8 **10:40**

Transparent Dual-band Antenna for Smart Watch Applications

Chi-Yuk Chiu, Shanpu Shen, Ross D. Murch, The Hong Kong University of Science and Technology, Hong Kong SAR of China

MO-A5.1A.9 **11:00**

A Compact Monopole Antenna for Smartphones

Min Li, Sing Wai Cheung, Changfei Zhou, Qinlong Li, Di Wu, The University of Hong Kong, China

MO-A5.1A.10 **11:20**

Low-profile and Dual-polarized Distributed Patch Antenna with Wide beamwidth

Xi Chen, Guang Fu, Dan Wu, Xidian University, China

Remote Sensing I

Session Co-Chairs: Matthys Botha; Robert Burkholder, The Ohio State University

MO-A4.1A.1 **08:00**

MASCRAD Events: Observations and Analyses of Cases with Contrasting Hydrometeor Forms

Branislav Notaros, V. N. Bringi, Merhala Thurai, Patrick Kennedy, Gwo-Jong Huang, Colorado State University, United States; Gyuwon Lee, Wonbae Bang, Kwonil Kim, Kyungpook National University, Republic of Korea; Andrew Newman, National Center for Atmospheric Research, United States

MO-A4.1A.2 **08:20**

Range-Dependent Evaporation Duct Height Estimation from a Versatile Ship-Mounted X-band Receiving Array

Qi Wang, Robert Burkholder, Caglar Yardim, The Ohio State University, United States

MO-A4.1A.3 **08:40**

Investigation of spatial resolution enhancement for GCOM-W AMSR2 follow-on mission

Takashi Maeda, Japan Aerospace Exploration Agency, Japan

MO-A4.1A.4 **09:00**

Experimental Verification of a MoM-Based Efficient Design Approach to Direction Finding Antenna Arrays

Luca Scorrano, Libero Dinoi, Elettronica S.p.A., Italy; Lorenzo Bartalucci, Giuseppe Pelosi, Stefano Selleri, University of Florence, Italy

MO-A4.1A.5 **09:20**

Chirp Scaling Algorithms for SAR Imaging under High Squint Angles

Po-Chih Chen, Jean-Fu Kiang, National Taiwan University, Taiwan

Break **09:40**

MO-A4.1A.6 **10:00**

Doppler Radar Phenomenology in Small Commercial Unmanned Aerial Systems

Traian Dogaru, Kyle Gallagher, Calvin Le, U.S. Army Research Laboratory, United States

MO-A4.1A.7 **10:20**

HF Noise Trends in Coastal Southern California

Daniel Gaytan, David Hilton, Kris Buchanan, Lu Xu, Vincent Dinh, Gregory Larson, Chris Dilay, SPAWAR Systems Center Pacific, United States

MO-A4.1A.8 **10:40**

Experimental Study of Antenna Characteristic Effects on Doppler Radar Performance

Mehrdad Nosrati, Negar Tavassolian, Stevens Institute of Technology, United States

MO-A4.1A.9 **11:00**

A 60-Channels ADC Board for Space Borne DBF-SAR Applications

Emilio Arnieri, Luigi Boccia, Giandomenico Amendola, University of Calabria, Italy; Chunxu Mao, Steven Gao, University of Kent, United Kingdom; Tobias Rommel, Microwaves and Radar Institute, German Aerospace Center (DLR), Germany; Srdjan Glisic, Silicon Radar GmbH, Germany; Piotr Penkala, Evatronix, Poland; Milos Krstic, IHP, Germany; Anselm Ho, Innovative Solutions In Space BV, Netherlands; Uroschanit Yodprasit, Silicon Radar GmbH, Germany; Oliver Schrape, IHP, Germany; Marwan Younis, Microwaves and Radar Institute, German Aerospace Center (DLR), Germany

MO-A4.1A.10 **11:20**

Fast back projection algorithm for circular SAR processing

Yi Liao, Wen-Qin Wang, Huaizong Shao, UESTC, China

Electromagnetics in Medicine and Biology

Session Co-Chairs: Amin Abbosh, University of Queensland; Susan Hagness, University of Wisconsin-Madison

MO-A5.2A.1 **08:00**

Power Harvesting for Wearable Electronics Using Fabric Electrochemistry

Ramandeep Vilkhu, Brock DeLong, Piya Das Ghatak, Shomita Mathew-Steiner, Chandan Sen, Asimina Kiourti, The Ohio State University, United States

MO-A5.2A.2 **08:20**

Examination of the Sensing Radius of Open-ended Coaxial Probes in Dielectric Measurements of Biological Tissues

Alessandra La Gioia, Emily Porter, Martin O'Halloran, National University of Ireland, Galway, Ireland

MO-A5.2A.3 **08:40**

Skin Tissue Characterization of Canine at Microwave and Millimeter-Wave Frequencies

Syed Akbar Raza Naqvi, Mohamed Manoufali, Noor Al-Badri, Beadaa Mohammed, Konstanty S. Bialkowski, Amin Abbosh, The University of Queensland, Australia

MO-A5.2A.4 **09:00**

Study of Microwave Energy Localization in Human Tissue

Jang-Yeol Kim, Soon-Ik Jeon, Seong-Ho Son, Electronics and Telecommunications Research Institute (ETRI), Republic of Korea

MO-A5.2A.5 **09:20**

A High-Order SAR Model for Multiple Transmitters in Portable Devices

Jian Li, Su Yan, Yanan Liu, Jian-Ming Jin, University of Illinois at Urbana-Champaign, United States; Bertrand M. Hochwald, University of Notre Dame, United States

Break **09:40**

MO-A5.2A.6 **10:00**

Virtual Humans for Antenna/Implant Modeling

Gregory M Noetscher, NEVA Electromagnetics, LLC, United States; Janakinadh Yanamadala, Woircester Polytechnic Inst., United States; Harshal V Tankaria, Worcester Polytechnic Inst., United States; Sergey N Makarov, NEVA Electromagnetics, LLC, United States; Sara Louie, ANSYS, Inc., United States; Alexander Prokop, CST AG, Germany; Ara Nazarian, Harvard Medical School, United States

MO-A5.2A.7 **10:20**

Intelligent Sensing using a System of Multiple Microwaves Resonators

Ali Albishi, Omar Ramahi, University of Waterloo, Canada

MO-A5.2A.8 **10:40**

Metamaterial Isolator for RFID Based Biomedical Repeater System

Elham Moradi, Muhammad Waqas Ahmad Khan, Lauri Sydänheimo, Tampere University of Technology, Finland; G. Steven Bova, University of Tampere, Finland; Leena Ukkonen, Tampere University of Technology, Finland

MO-A5.2A.9 **11:00**

Unintended RF Energy Coupling during Endoscopy

Satheesh Bojja Venkatakrishnan, The Ohio State University, United States; Edward Jones, The University of Colorado and the Denver VAMC, United States; Asimina Kiourti, The Ohio State University, United States

MO-A5.2A.10 **11:20**

Shaping Transient Fields at Microwave Frequencies by Time Reversal Focusing Method

Deshuang Zhao, Fei Guo, University of Electronic Science and Technology of China, China

Propagation Based on Numerical Weather Prediction Models

Session Co-Chairs: Tracy Haack, Naval Research Laboratory; Katherine Horgan, Naval Surface Warfare Center

MO-UF.1A.1 **08:00**

Making Numerical Weather Predictions Portable, Compression of Weather Data for Use in Radar Propagation Modeling

Vincent van Leijen, Marijn Boone, Defence Materiel Organisation, Netherlands; Katherine Horgan, Naval Surface Warfare Center, United States

MO-UF.1A.2 **08:20**

Sensitivity of RF Propagation Loss to Variations of Environmental Refractivity along the Path

Qing Wang, Kyle Franklin, Ryan Yamaguchi, Naval Postgraduate School, United States; Denny Alappattu, Moss Landing Marine Laboratory, United States; Robert Burkholder, Caglar Yardim, The Ohio State University, United States; Adam Christman, Harindra Joseph S. Fernando, University of Notre Dame, United States

MO-UF.1A.3 **08:40**

A Review of Refractivity Structure Matching as a Pre-Processing Component When Considering its Use with Numerical Weather Prediction

Katherine Horgan, Edward Burgess, William Thornton, Victor Wiss, Naval Surface Warfare Center Dahlgren Division, United States

MO-UF.1A.4 **09:00**

A Technique to Evaluate Numerical Weather Prediction Performance During CASPER-East: An Engineering Perspective

Matt Wilbanks, Stephanie Billingsley, Kate Horgan, William Thornton, Naval Surface Warfare Center Dahlgren Division, United States; Qing Wang, Naval Postgraduate School, United States; Tracy Haack, Naval Research Laboratory, United States

MO-UF.1A.5 **09:20**

Validation of the Navy Atmospheric Vertical Surface Layer Model (NAVSLaM) Using LATPROP-UWB 2-40 GHz Data from CASPER East

Paul Frederickson, Naval Postgraduate School, United States; Caglar Yardim, Luyao Xu, The Ohio State University, United States

Break **09:40**

MO-UF.1A.6 **10:00**

Validation of Simulated Propagation using Measured and Modeled Refractivity Profiles from CASPER-East with LATPROP-UWB EM Propagation Data

Luyao Xu, Caglar Yardim, Robert Burkholder, The Ohio State University, United States; Qing Wang, Naval Postgraduate School, United States; Tracy Haack, Naval Research Laboratory, United States; Harindra Joseph S. Fernando, University of Notre Dame, United States; Djamal Khelif, University of California, Irvine, United States

MO-UF.1A.7 **10:20**

Evaporation duct profiles from the Tropical Air-Sea Propagation Study

George Ford, Martin Veasey, Helen Rance, Met Office, United Kingdom; Sally Garrett, Defence Technology Agency, New Zealand; Jacques Claverie, CREC St-Cyr & IETR, France

MO-UF.1A.8 **10:40**

Assessment of Evaporation Duct Model Performance in a Tropical Littoral Environment

Helen Rance, George Ford, Met Office, United Kingdom; Andy Kulessa, Airborne Research Australia, Australia; Hedley Hansen, Defence Science and Technology Organistaion, Australia; Martin Veasey, Met Office, United Kingdom

MO-UF.1A.9 **11:00**

All Directions Through the Wall Imaging Using Omnidirectional Bi-static FMCW Transceivers

Behzad Yektakhah, Kamal Sarabandi, University of Michigan, United States

MO-UF.1A.10 **11:20**

Investigation of Simulated Ground Penetrating Radar Data for Buried Objects Using Quadratic Time-Frequency Transformations

Mesut Dogan, Gonul Turhan-Sayan, Middle East Technical University, Turkey

Innovative Application and Methods for Detection and Estimation

Session Co-Chairs: Gregory Huff, Texas A&M University; Jonah Gollub, Duke University

MO-UC.A1.1 **08:00**

Enhancing Machine Learning Techniques for Occupancy Estimation and Socio-Physical Graph Reconstruction Using Reconfigurable Antennas

Pranay Eedara, Hai Li, Nagaraj Janakiraman, N. R. Anudeep Tungala Tungala, Jean-Francois Chamberland, Gregory Huff, Texas A&M University, United States

MO-UC.A1.2 **08:20**

Single-Frequency Imaging from Dynamic Metasurface Antennas

Timothy Sleasman, Mohammadreza F. Imani, Michael Boyarsky, Thomas Fromenteze, Jonah N. Gollub, David R. Smith, Duke University, United States

MO-UC.A1.3 **08:40**

How to locate precisely and efficiently the scatterers of a target contributing to its RCS

Jerome Simon, Juan Carlos Castelli, ONERA, France

MO-UC.A1.4 **09:00**

Clock Synchronization Challenges for On-Site Coding Digital Beamformer

Satheesh Bojja Venkatakrishnan, Elias Alwan, John L. Volakis, The Ohio State University, United States

MO-UC.A1.5 **09:20**

Impact of UAV Swarm Density and Heterogeneity on Synthetic Aperture DoA Convergence

Zhong Chen, Jean-Francois Chamberland, Gregory Huff, Texas A&M University, United States

Break **09:40**

MO-UC.A1.6 **10:00**

Full-wave Analysis of Time of Arrival Based Localization with Polarization Diversity

Fikadu Dagefu, Gunjan Verma, Brian Sadler, U.S. Army Research Laboratory, United States; Richard Kozick, Bucknell University, United States; Kamal Sarabandi, University of Michigan, United States

MO-UC.A1.7 **10:20**

Localization via the Received Signal Strength Gradient at Lower VHF

Gunjan Verma, Fikadu Dagefu, Brian Sadler, U.S. Army Research Laboratory, United States; Kamal Sarabandi, University of Michigan, United States

MO-UC.A1.8 **10:40**

Backscattering Assessment of Small Targets in the Radiative Near-Field for Automotive Collision Avoidance Radar

Wen-Jiao Liao, Yuan-Chang Hou, Tai-Heng Hsieh, Hao-Ju Hsieh, National Taiwan University of Science and Technology, Taiwan

In Memoriam of Per-Simon Kildal

Session Co-Chairs: Stefano Maci, University of Siena; Eva Rajo-Iglesias, University Carlos III of Madrid; Ahmed Kishk, Concordia University

MO-SP.1P.1 **13:20**

Per-Simon Kildal - Thoughts From Our 15 Years As Colleagues in Trondheim

Erik Lier, Lockheed Martin, United States

MO-SP.1P.2 **13:40**

Per-Simon Kildal and Design of Electromagnetic Structures: Outstanding Combination of Scientific Concepts and Engineering Intuition

Zvonimir Sipus, Juraj Bartolic, Silvio Hrabar, University of Zagreb, Croatia

MO-SP.1P.3 **14:00**

Reverberating Dreams - the Story of an OTA Chamber

Andres Alayon Glazunov, Chalmers University of Technology, Sweden; Jan Carlsson, Provinn AB, Sweden; Christian Patané Lötbäck, Bluetest AB, Sweden

MO-SP.1P.4 **14:20**

Obtaining Total Isotropic Sensitivity from Average Fading Sensitivity in Reverberation Chamber

Jun Luo, Edwin Mendivil, Michael Christopher, ETS-Lindgren, United States

MO-SP.1P.5 **14:40**

State of the Art and Development of High Gain Planar Gap Waveguide Antennas at Chalmers University of Technology

Jian Yang, Ashraf Uz Zaman, Abbas Vosoogh, Jinlin Liu, Chalmers University of Technology, Sweden; Stefan Carlsson, Lars-Inge Sjoqvist, Gapwaves AB, Sweden

Break **15:00**

MO-SP.1P.6 **15:20**

Continuous Beam Steering Antenna with Large 2D Coverage for 5G Applications

Karim Tekkouk, Jiro Hirokawa, Tokyo Institute of Technology, Japan; Ronan Sauleau, IETR (Institut d'Electronique et de Télécommunications de Rennes) UMR CNRS 6164, France; Makoto Ando, Tokyo Institute of Technology, Japan

MO-SP.1P.7 **15:40**

One Meter Deployable Reflectarray Antenna for Earth Science Radars

Nacer Chahat, Gregory Agnes, Jonathan Sauder, Thomas A Cwik, NASA Jet Propulsion Laboratory / Caltech, United States

MO-SP.1P.8 **16:00**

Analysis of Antenna and Scattering Problems Using a Spectrum of Two-Dimensional Solutions: a Review

Sembiam Rengarajan, California State University, United States

MO-SP.1P.9 **16:20**

Groove Gap Waveguide in metallized 3D-printed plastic and in mechanized aluminium in Ka band

Adrián Tamayo-Domínguez, José-Manuel Fernández-González, Manuel Sierra-Pérez, Technical University of Madrid, Spain

MO-SP.1P.10 **16:40**

Synthesis of 3D-Printed Dielectric Lens Antennas Via Optimization of Geometrical Optics Ray Tracing

Jordan Budhu, Yahya Rahmat-Samii, University of California, Los Angeles, United States

Benchmarking at the Frontiers of Computational EM

Session Chair: Ali Yilmaz, University of Texas at Austin

MO-SP.2P.1 **13:20**

Advancing Computational Electromagnetics Research though Benchmarking

Ali E. Yilmaz, The University of Texas at Austin, United States

MO-SP.2P.2 **13:40**

The benefit of simple benchmarks to highlight problems in CEM codes

Renier Marchand, Johannes van Tonder, Marianne Bingle, Danie le Roux, Mel van Rooyen, Ulrich Jakobus, Altair Development S.A., South Africa

MO-SP.2P.3 **14:00**

Benchmarking Full Wave Analysis of Periodic Structures: Non Perpendicularity at Periodic Boundaries

Vignesh Manohar, Yahya Rahmat-Samii, University of California, Los Angeles, United States

MO-SP.2P.4 **14:20**

Benchmarking computational electromagnetics with exact analytical solutions of canonical electromagnetic scattering problems

Danilo Erricolo, University of Illinois at Chicago, United States

MO-SP.2P.5 **14:40**

On Higher Order Imperative in Computational Electromagnetics Through Benchmarking of Boundary Element Methods for Canonical Scattering Problems

Mohammad Shafieipour, Manitoba HVDC Center, Canada; Jonatan Aronsson, CEMWorks Inc., Canada; Vladimir Okhmatovski, University of Manitoba, Canada

Break **15:00**

MO-SP.2P.6 **15:20**

Benchmarking the Solutions of Billion-Unknown Problems

Levent Gürel, ABAKUS Computing Technologies, Turkey

MO-SP.2P.7 **15:40**

Accurate and Efficient Simulation of Bioelectromagnetic Models

Apra Pandey, Nivedita Parthasarathy, Darryl Kostka, CST of America, United States; Alexander Prokop, Tilmann Wittig, CST AG, Germany

MO-SP.2P.8 **16:00**

On Computational Electromagnetic Code Testing and Benchmarking

Andrew D Greenwood, Air Force Research Laboratory, United States

MO-SP.2P.9 **16:20**

Figure of Merit for Computational Electromagnetics Solvers

Tayfun Ozdemir, Virtual EM Inc., United States; Robert Burkholder, The Ohio State University, United States

MO-SP.2P.10 **16:40**

Austin Benchmark Suite for Computational Bioelectromagnetics: AIM Performance Data

Jackson W. Massey, Ali E. Yilmaz, The University of Texas at Austin, United States

Metamaterial Based Designs

Session Co-Chairs: Shah Nawaz Burokur, Université Paris Nanterre; Ana Diaz-Rubio, Aalto University

MO-UB.1P.1 **13:20**

Metaplatforms for Solving Integral Equations with Waves

Nasim Mohammadi Estakhri, Brian Edwards, Nader Engheta, University of Pennsylvania, United States

MO-UB.1P.2 **13:40**

Metamaterial Absorber for Oblique Incidence of Parallel and Perpendicular Polarization

Toan Trung Nguyen, Sungjoon Lim, Chung - Ang University, Republic of Korea

MO-UB.1P.3 **14:00**

Polarizability Extraction of Meta-Atoms Embedded in Waveguides

Laura Pulido-Mancera, Patrick Bowen, Mohammadreza F. Imani, David R. Smith, Duke University, United States

MO-UB.1P.4 **14:20**

Novel Metamaterial Polarizer

David Mahoney, Alkim Akyurtlu, University of Massachusetts at Lowell, United States

MO-UB.1P.5 **14:40**

Transition metamaterials for local-field enhancement

Yang Li, Philip Camayd-Muñoz, Daryl Vulis, Peter Saeta, Yu Peng, Orad Reshef, Olivia Mello, Haoning Tang, Marko Loncar, Eric Mazur, Harvard University, United States

Break **15:00**

MO-UB.1P.6 **15:20**

K-Space Signatures of Negative-Index Metamaterials

Iman Aghanejad, Kenneth J. Chau, Loïc Markley, The University of British Columbia, Canada

MO-UB.1P.7 **15:40**

Integrated topology optimization of volumetric antenna substrates and conductor surfaces for broadband microstrip patch antennas

Osman Sayginer, Gullu Kiziltas, Sabanci University, Turkey

MO-UB.1P.8 **16:00**

Surface-Wave Tracing by Flat Optics

Cristian Della Giovampaola, Mario Jr. Mencagli, Enrica Martini, Matteo Albani, Stefano Maci, University of Siena, Italy

MO-UB.1P.9 **16:20**

Tailoring Stability Properties of One-dimensional Non-Foster Electromagnetic Structures

Silvio Hrabar, Josip Loncar, Borna Vukadinovic, University of Zagreb, Croatia

MO-UB.1P.10 **16:40**

Split-Ring Resonators (SRR)-based antenna for WLAN applications

Ferran Paredes, Pau Aguilà, Simone Zuffanelli, Gerard Zamora, Ferran Martin, Jordi Bonache, Universitat Autònoma de Barcelona, Spain

Advances in Frequency Selective Surfaces

Session Co-Chairs: Chien-Hao Liu, National Taiwan University; Sean Hum, University of Toronto

MO-A2.1P.1 **13:20**

Plasma-Tunable Electronic Protection for Microwave Applications

Komlan Payne, Syracuse University, United States; Edwin Peters, Daniel Wedding, Carol Wedding, Imaging Systems Technology (IST) Inc., United States; Jun H. Choi, Syracuse University, United States

MO-A2.1P.2 **13:40**

Systematic Design of Single-Layer Multi-Stop-Band Frequency Selective Surfaces

Gengyu Xu, Sean V. Hum, George Eleftheriades, University of Toronto, Canada

MO-A2.1P.3 **14:00**

An Equivalent-Circuit Model of Miniaturized Split-Ring Resonator

Sultan Can, Asim Egemen Yilmaz, Ankara University, Turkey; Kamil Yavuz Kapusuz, Ghent University, Belgium

MO-A2.1P.4 **14:20**

Rotationally Tunable Frequency Selective Surfaces for Large Areas via Linkage Mechanisms

Yih-Dar Chen, Chien-Hao Liu, National Taiwan University, Taiwan

MO-A2.1P.5 **14:40**

Miniaturization of Small Resonant Aperture Using a Modified Ridge Structure and Its Application to FSS Design

Jong-Gyeong Yoo, Kyungpook National University, Republic of Korea; Junho Yeo, Daegu University, Republic of Korea; Young-Ki Cho, Kyungpook National University, Republic of Korea

Break **15:00**

MO-A2.1P.6 **15:20**

A Miniaturized Frequency Selective Surface by Using Vias to Connect Spiral Lines and Square Patches

Muaad Hussein, Jiafeng Zhou, Yi Huang, The University of Liverpool, United Republic of Tanzania

MO-A2.1P.7 **15:40**

Linkage Mechanism for Large-Area Reconfigurable Periodic Structures

Yu-Chieh Hung, Chien-Hao Liu, National Taiwan University, Taiwan

MO-A2.1P.8 **16:00**

An Incident Angle Insensitive Band-Pass Frequency Selective Surface with Flat Top

Zhenzhen Zhao, Wei Li, Ying Yang, Huimin Huo, Jianxing Li, Anxue Zhang, Xi'an Jiaotong University, China

MO-A2.1P.9 **16:20**

A Bandpass Circular Polarization Frequency Selective Surface with Wideband Rejection Properties

Yuheng Liu, Longjian Zhou, Jun Ouyang, University of Electronic Science and Technology of China, China

Leaky Wave Antennas

Session Co-Chairs: David R. Jackson, University of Houston; Ladislau Matekovits, Politecnico di Torino

MO-A1.1P.1 **13:20**

A Planar Leaky-Wave Antenna Offering Well Designed Leakage on the 2D Aperture Using Printed Width Modulated Microstrip Lines

Pasquale Maria Gallo, Politecnico di Torino, Italy; Symon K. Podilchak, Heriot-Watt University, United Kingdom; Ladislau Matekovits, Politecnico di Torino, Italy

MO-A1.1P.2 **13:40**

Axial and Circumferential Modulation on Cylindrical Metasurfaces

Subramanian Ramalingam, Sivaseetharaman Pandi, Constantine A. Balanis, Craig R. Birtcher, Arizona State University, United States

MO-A1.1P.3 **14:00**

Analysis of the Radiating Properties of Endfire 1-D Leaky-Wave Antennas

Walter Fuscaldo, Sapienza University of Rome, Italy; David R. Jackson, University of Houston, United States; Alessandro Galli, Sapienza University of Rome, Italy

MO-A1.1P.4 **14:20**

The Cause of Beam Squint in Planar Holographic Antennas

E'qab Almajali, Postdoctoral Fellow/Carleton University, Canada; Derek McNamara, Professor/University of Ottawa, Canada; Jim Wight, Professor/Carleton University, Canada

MO-A1.1P.5 **14:40**

Dispersive Analysis of a Dual-Layer Planar Structure for Leaky-Wave Antenna Applications

Davide Comite, Sapienza University of Rome, Italy; Symon K. Podilchak, Heriot-Watt University, United Kingdom; Paolo Baccarelli, Paolo Burghignoli, Alessandro Galli, Sapienza University of Rome, Italy; Al P. Freundorfer, Yahia M. M. Antar, Queen's University, Canada

Break **15:00**

MO-A1.1P.6 **15:20**

Bandwidth Analysis of Phase Crossover and Non-phase Crossover Frequency Operations of HAIS

Sivaseetharaman Pandi, Subramanian Ramalingam, Constantine A. Balanis, Craig R. Birtcher, Arizona State University, United States

MO-A1.1P.7 **15:40**

A High Impedance Surface Based Leaky-Wave Antenna Excited by Collimated Surface-Wave

Zi Long Ma, Chi Hou Chan, Kung Bo Ng, City University of Hong Kong, Hong Kong SAR of China; Li Jun Jiang, The University of Hong Kong, Hong Kong SAR of China

MO-A1.1P.8 **16:00**

A Novel Feeding Structure for Second Higher Order Mode Excitation of Microstrip Leaky-Wave Antenna

Pengfei Zhang, Sheng Sun, University of Electronic Science and Technology of China, China

MO-A1.1P.9 **16:20**

Millimeter-Wave Periodic Dielectric Waveguide for Application of Radio-Wave Coverage in Confined Space

Xingying Huo, Junhong Wang, Beijing Jiaotong University, Institute of Lightwave Technology, China

MO-A1.1P.10 **16:40**

A Novel Seamless Scanning Leaky Wave Antenna in Ridge Gap Waveguide Technology

Xingchao Dong, Chinese Academy of Sciences, China; Hongjian Wang, National Space Science Center, China; Fei Xue, Yang Liu, Chinese Academy of Sciences, China; Guang Liu, National Space Science Center, China

Phased Array Antennas: Special Topics I

Session Co-Chairs: Davide Ramaccia, Roma Tre University; Jingni Zhong, Ohio State University

MO-A1.2P.1 **13:20**

Design of Low-cost Phase-Shifters for Circularly Polarized Antenna elements using Partially Transmitting Surfaces

Raj Mittra, Ashwani Kumar, University of Central Florida, United States

MO-A1.2P.2 **13:40**

Interwoven Feeding Networks for Limited-Scan Phased Array Systems

Bilgehan Avser, Gabriel M. Rebeiz, University of California, San Diego, United States

MO-A1.2P.3 **14:00**

Beamspace SMILE Array for Digital Beamforming with a Single RF Receiver

Yikun Huang, Lindsay Light, Yuanxun Ethan Wang, University of California, Los Angeles, United States

MO-A1.2P.4 **14:20**

Design of a Terahertz Beam-Steering Photomixer Array

Suleyman Burak Celik, Kazim Demir, Asaf Behzat Sahin, Mehmet Unlu, Ankara Yildirim Beyazit University, Turkey

MO-A1.2P.5 **14:40**

A Compact Two-Dimensional Multibeam Antenna Fed by Two-Layer SIW Butler Matrix

Xiaoqiang Li, Ming Cai, Huafeng Shen, Guangli Yang, Shanghai University, China

Break **15:00**

MO-A1.2P.6 **15:20**

Cavity-Backed Slot ESPAR Cross Array with Two-Dimensional Beam Steering Control

Wei Ouyang, Xun Gong, University of Central Florida, United States

MO-A1.2P.7 **15:40**

A Dual Polarized All Metal Wideband Vivaldi Array with Wide Scan Ability

Burak Alptug Yilmaz, Doganay Dogan, Aselsan A.S., Turkey

MO-A1.2P.8 **16:00**

Wide-Angle Scanning Microstrip Phased Array Using Wide-Beam Element

Jun Wang, Zengliang Li, Song Wu, Huadong Zhang, Ruofan Li, Kang An, Beijing Electro-Mechanical Engineering Institute, China; Changrong Liu, Xueguan Liu, Lingfeng Mao, Soochow University, China

MO-A1.2P.9 **16:20**

Unequally Spaced Linear Antenna Array Synthesis using Multi-Objective Cauchy Mutated Cat Swarm Optimization

Lakshman Pappula, Debalina Ghosh, Indian Institute of Technology Bombay Bhubaneswar, India

MO-A1.2P.10 **16:40**

Direction Finding by Time Modulated Linear Array

Chong He, Xianling Liang, Weiren Zhu, Gunping Geng, Ronghong Jin, Shanghai Jiao Tong University, China; Anjie Cao, Hui Di, Shanghai Institute of Satellite Engineering, China

Wideband Omni-directional Antennas

Session Co-Chairs: Nahid Rahman, University of Colorado Boulder; Yilong Lu, Nanyang Technological University

MO-A1.3P.1 **13:20**

High-Efficiency Microwave Graphene Antenna

Shengjian Jammy Chen, Christophe Fumeaux, Tran Thanh Tung, Dusan Losic, The University of Adelaide, Australia

MO-A1.3P.2 **13:40**

Novel Ultra-Wideband "Robe" Antenna on High-Loss Paper Substrate

Hong Phuong Phan, Tan-Phu Vuong, Philippe Benech, Pascal Xavier, University Grenoble Alpes, IMEP - LaHC, CNRS, France; Pascal Borel, Anastasia Delattre, Technical Center of Paper (CTP), France

MO-A1.3P.3 **14:00**

Multi-Objective Optimization for Assessment of Topological Modification in UWB Antennas

Adrian Bekasiewicz, Slawomir Koziel, Reykjavik University, Iceland

MO-A1.3P.4 **14:20**

A Low Profile Stepped Wideband Monocone Antenna

Ankang Liu, Yilong Lu, Nanyang Technological University, Singapore

MO-A1.3P.5 **14:40**

Tunable UHF Origami Spring Antenna with Actuation System

Shun Yao, Kun Bao, Xueli Liu, Stavros V. Georgakopoulos, Florida International University, United States

Break **15:00**

MO-A1.3P.6 **15:20**

A Wideband CPW-Fed Monopole Antenna with Linear and Circular Polarizations

Jun-Yu Lai, Wei Hsu Chia, Kuan-Wei Li, Chien-Jen Wang, Department of Electrical Engineering/National University of Tainan, Taiwan

MO-A1.3P.7 **15:40**

Broadband Omnidirectional Antenna for GSM900, GSM1800, 3G, 4G and Wi-Fi Applications

Mahima Arrawatia, Indian Institute of Technology Jodhpur, India; Maryam Shojaei Baghini, Girish Kumar, Indian Institute of Technology Bombay, India

MO-A1.3P.8 **16:00**

Monopole of Decade Bandwidth Realized from A New Metal-Dielectric Hybrid Structure

Debatosh Guha, University of Calcutta, India; Debarati Ganguly, Lourdes Matha College of Science and Technology, India; Sumesh George, St. George's College, India; Yahia M. M. Antar, Royal Military College of Canada, India

MO-A1.3P.9 **16:20**

A Planar Dipole Antenna with Parasitic Elements for Beamwidth Enhancement across a Wide Frequency Band

Wenbin Qiu, Chang Chen, Weidong Chen, University of Science and Technology of China, China; Hualiang Zhang, University of Massachusetts Lowell, United States

MO-A1.3P.10 **16:40**

A Compact and Broadband CPW-Fed Folded-Slot Antenna for C-Band Application

Xiaochuan Fang, Yongjun Huang, Guangjun Wen, University of Electronic Science and Technology of China, China

Materials and Packaging

Session Co-Chairs: Kubilay Sertel, Ohio State University; Alkim Akyurtlu, University of Massachusetts Lowell

MO-UA.1P.1 **13:20**

Dielectric Properties of Low-loss Polymers for mmW and THz Applications

Seckin Sahin, Niru K. Nahar, Kubilay Sertel, The Ohio State University, United States

MO-UA.1P.2 **13:40**

Fabrication of functionally graded ceramic- polymer dielectrics via freeze casting for RF applications

Osman Sayginer, Gullu Kiziltas, Sabanci University, Turkey

MO-UA.1P.3 **14:00**

A Study for RCS Broadband Reduction due to Dielectric Constant of Radar Absorbent Material

Yuka Ishii, Naobumi Michishita, Hisashi Morishita, National Defense Academy, Japan

MO-UA.1P.4 **14:20**

Printed Interconnects between Components for Microwave Applications

Elicia Harper, Craig Armiento, University of Massachusetts Lowell, United States; Susan Trulli, Raytheon IDS, United States; Alkim Akyurtlu, University of Massachusetts Lowell, United States; Christopher Laighton, Raytheon IDS, United States

MO-UA.1P.5 **14:40**

Practical Guidelines for PWB Circuits Using Reactive Field Theory

Carolyn Reistad, University of Massachusetts Lowell, United States; Thomas Sikina, Raytheon-UMass Lowell Research Institute, United States; Alkim Akyurtlu, University of Massachusetts Lowell, United States

Optimization Methods in EM Design

Session Co-Chairs: Douglas Warner, Pennsylvania State University; Daniel Weile, University of Delaware

MO-A3.1P.1 **13:20**

The Shape Optimisation of Closely-Spaced Electrically-Small Antennas

Anas Alakhras, Derek McNamara, University of Ottawa, Canada

MO-A3.1P.2 **13:40**

Multi-objective Surrogate-Assisted Optimization Applied to Patch Antenna Design

John Easum, Jogender Nagar, Douglas H. Werner, The Pennsylvania State University, United States

MO-A3.1P.3 **14:00**

Metamaterial-based Compressive Reflector Antenna Optimization

Richard Obermeier, Jose A. Martinez Lorenzo, Northeastern University, United States

MO-A3.1P.4 **14:20**

A Direct Synthesis Algorithm Having a Broad Range of Validity for Electromagnetic Design

Ping Li, Dan Jiao, Purdue University, United States

MO-A3.1P.5 **14:40**

Efficient Optimization of a Simple Compact Resonant Cavity Antenna

Maria Kovaleva, David Bulger, Karu P. Esselle, Macquarie University, Australia

Break **15:00**

MO-A3.1P.6 **15:20**

Sparse Linear Regression for Optimizing Design Parameters of Double T-shaped Monopole Antennas

Yashika Sharma, Junqiang Wu, Hao Xin, Hao Helen Zhang, University of Arizona, United States

MO-A3.1P.7 **15:40**

Implicit Space Mapping with Substrate Segmentation for Reliable Antenna Optimization

Slawomir Koziel, Adrian Bekasiewicz, Reykjavik University, Iceland

MO-A3.1P.8 **16:00**

Optimization of 2.45-GHz Pixel Rectenna for Wireless Power Transmission using Mixed Integer Linear Programming

Shanpu Shen, Chi-Yuk Chiu, Ross D. Murch, The Hong Kong University of Science and Technology, Hong Kong SAR of China

MO-A3.1P.9 **16:20**

Bioinspired symbiosis algorithm Another focus in multiobjective optimization.

Nieremberg Ramos, Glauco Fontgalland, Federal University of Campina Grande - UFCG, Brazil

MO-A3.1P.10 **16:40**

Analysis and Synthesis of Sierpinski Gasket Fractal Antenna using ANFIS

Aarti Gehani, Prashasti Agnihotri, Dhaval Pujara, Nirma University, India

Antenna Theory II

Session Co-Chairs: Ted Simpson, University of South Carolina; Jeffrey Young, Oklahoma State University

MO-A1.4P.1 **13:20**

Application of Autocorrelation Principles for Evaluating the Performance of Radiating Structures Comprised of Line Source Radiators

Christopher Wilson, Jeffrey Young, Oklahoma State University, United States

MO-A1.4P.2 **13:40**

On the Admitting Area of Slender Antennas

Hamid Shannan, Raphael Kastner, Tel Aviv University, Israel

MO-A1.4P.3 **14:00**

Radiation Pattern Synthesis For A Prolate Spheroidal Antenna

Marco Poort, Piergiorgio L. E. Uslenghi, University of Illinois at Chicago, United States

MO-A1.4P.4 **14:20**

Analytical Evaluation of Superdirective Array Sensitivity Factor

Alexandre Debard, Antonio Clemente, Christophe Delaveaud, Commissariat à l'énergie atomique et aux énergies alternatives, France; Christopher Djoma, Patrick Potier, Philippe Pouliguen, Direction Général de l'Armement, France

MO-A1.4P.5 **14:40**

The Far Field of Antennas in Practical Scenarios

Mohammad Abdallah, Tapan Sarkar, Syracuse University, United States; Magdalena Salazar-Palma, Universidad Carlos III de Madrid, Spain

Break **15:00**

MO-A1.4P.6 **15:20**

Analysis of the Degree of Practically Achievable Superdirectivity using Poynting Streamline Method

Junming Diao, Karl F. Warnick, Brigham Young University, United States

MO-A1.4P.7 **15:40**

Closed Form Expressions for the Realistic Modeling of Weakly Directive Antenna Patterns

Stefano Maddio, Stefano Maurri, Giuseppe Pelosi, Monica Righini, Stefano Selleri, University of Florence, Italy

MO-A1.4P.8 **16:00**

Realizing Orbital Angular Momentum (OAM) Beam with Small Divergence Angle by Luneberg Lens

Yu Yao, Xianling Liang, Weiren Zhu, Jianping Li, Junping Geng, Ronghong Jin, Kaijie Zhuang, Shanghai Jiao Tong University, China

MO-A1.4P.9 **16:20**

On Massive MIMO Antenna Topologies using Total Power in the Azimuth and Zenith Domains

Affum Emmanuel Ampoma, Haobin Zhang, Yongjun Huang, Wen Guangjun, Oteng Gyasi Kwame, University of Electronic Science and Technology of China, China

Frequency Selective Surfaces and Filters

Session Co-Chairs: Ryan Adams, University of North Carolina at Charlotte; David R. Jackson, University of Houston

MO-UB.2P.1 **13:20**

Sleeve Monopole Antenna with Integrated Filter for Base Station Applications

Joshua Shehan, Amphenol Antenna Solutions, United States; Ryan Adams, University of North Carolina at Charlotte, United States

MO-UB.2P.2 **13:40**

Leaky-mode Analysis of Wideband Fabry-Pérot Cavity Antennas

Ahmad Almutawa, Alister Hosseini, Filippo Capolino, University of California, Irvine, United States; David R. Jackson, University of Houston, United States

MO-UB.2P.3 **14:00**

Tunable Dual-band Bandpass Filter Using Piezoelectric Transducer (PET)

Dongjin Jung, Skyworks Solutions, United States; Kai Chang, Texas A&M University, United States

MO-UB.2P.4 **14:20**

Improving Absorption Using Time-Variant Electromagnetic Systems

Hamidreza Kazemi, Mehdi Veysi, Mohamed A. K. Othman, Filippo Capolino, University of California, Irvine, United States

MO-UB.2P.5 **14:40**

Screen Printed Electromagnetic Metamaterial Absorber

Heijun Jeong, Sungjoon Lim, Chung - Ang University, Republic of Korea

Break **15:00**

MO-UB.2P.6 **15:20**

Reconfigurable Band Rejection and Band-Pass Frequency Selective Structures

Jeffrey Kula, John L. Volakis, The Ohio State University, United States

MO-UB.2P.7 **15:40**

Single-Layer Multiband FSS for Wi-Fi Applications

Te-Kao Wu, FSS and Antenna Consulting, United States

MO-UB.2P.8 **16:00**

Frequency Selective Surfaces for Microwave Frequency Band Applications

Khem Poudel, Vijay Koju, William Robertson, Middle Tennessee State University, United States

MO-UB.2P.9 **16:20**

Conformal Dual-Band Frequency Selective Surface on Textile: Design, Prototyping and Expriment

Sultan Can, Asim Egemen Yilmaz, Emrullah Karakaya, Ankara University, Turkey

MO-UB.2P.10 **16:40**

An Empirical Formula for Resonant Frequency Shift due to Jerusalem-Cross FSS with Substrate on One Side

Hsing-Yi Chen, Shu-Huan Wen, Yuan Ze University, Taiwan

Remote Sensing II

Session Co-Chairs: Susan Hagness, University of Wisconsin-Madison; Natalia Nikolova, McMaster University

MO-A4.1P.1 **13:20**

Complex Permittivity Characterization Based on the Matrix-Pencil Method for Objects on the Human Body

Hipolito Gomez-Sousa, Jose A. Martinez-Lorenzo, Northeastern University, United States

MO-A4.1P.2 **13:40**

Effective Noise Antenna Factor FA Estimate at Depth

Nicholas Lumsden, Jack Dea, Sal Serra, Israel Perez, Sara Wheeland, John D. Rockway, SPAWAR Systems Center Pacific, United States

MO-A4.1P.3 **14:00**

Feasibility of Efficient and Accurate Estimation of Cranberry Crop Yield using Microwave Sensing

Alex Haufler, John Booske, Susan Hagness, University of Wisconsin-Madison, United States; Benjamin Tilberg, Lindsay Wells-Hansen, Rodney Serres, Ocean Spray Cranberries Inc., United States

MO-A4.1P.4 **14:20**

Air Core Loop Antenna Calibration Methods

Drew Overturf, Nicholas Lumsden, Jack Dea, Doeg Rodriguez, John D. Rockway, SPAWAR Systems Center Pacific, United States

MO-A4.1P.5 **14:40**

Low Complexity RF Sensor for Multiphase Oil Flow Estimation in Pipelines

Muhammad Tayyab, Mohammad Said Sharawi, Abdelsalam Al-Sarkhi, King Fahd University of Petroleum and Minerals, Saudi Arabia

Break **15:00**

MO-A4.1P.6 **15:20**

Sensitivity of Synthetic Aperture Radar Imaging to Ship Generated Internal Wave Field

Jiakun Wang, Min Zhang, Xidian University, China

MO-A4.1P.7 **15:40**

A Novel Energy Detection Algorithm Based on power distribution difference

Ning Liu, Shuxia Guo, Northwestern Polytechnical University, China

MO-A4.1P.8 **16:00**

3D Image Reconstruction Using a Scanning Configuration and Focused SAR Technique

Saeed Rahimi, Parisa Dehkhoda, Ahad Tavakoli, Amir Hossein Ahamdi, Amirkabir University of Technology, Iran

Implantable Antennas and Sensors

Session Co-Chairs: William Scanlon, Queen's University of Belfast; William Scanlon, Queen's University of Belfast

MO-A5.1P.1 **13:20**

Endoscopically-Implantable Wireless Devices for Endoluminal Applications

J.-C. Chiao, The University of Texas at Arlington, United States

MO-A5.1P.3 **14:00**

Effect of Implant Coating on Wireless Powering for Intracranial Pressure Monitoring System

Muhammad Waqas Ahmad Khan, Muhammad Rizwan, Mohammad H. Behfar, Lauri Sydänheimo, Toni Bjorninen, Leena Ukkonen, Tampere University of Technology, Finland

MO-A5.1P.4 **14:20**

2.4GHz Monopole Antenna on Flexible Substrate for Implanting Sensor

Haruichi Kanaya, Kyohei Yamaguchi, Yasuyuki Matsushita, Kyushu University, Japan; Takahiro Kudo, Takuya Furuichi, Fuji Electric Co., Ltd, Japan

MO-A5.1P.5 **14:40**

Efficiency Comparison of Inductive and Microwave Power Transfer for Biomedical Applications

Reem Shadid, University of North Dakota, United States; Sayeed Sajal, Minot State University, United States; Sima Noghanian, University of North Dakota, United States

Break **15:00**

MO-A5.1P.6 **15:20**

Performance Analysis of Ultra Small Antenna in Body-Air Channel

Joonseong Kang, Jaechun Lee, Junyeub Suh, Sang Joon Kim, Samsung Advanced Institute of Technology, Republic of Korea; Seong-Cheol Kim, Seoul National University, Republic of Korea

MO-A5.1P.7 **15:40**

Effect Of Tumor Tissue On Implant Antenna Performance At 2.38 GHz

Matthew Magill, Gareth Conway, William Scanlon, Queens University Belfast, United Kingdom

MO-A5.1P.8 **16:00**

The Importance of Antenna Near-Field Losses in Intra-Body UHF Communication Applications

Yomna El-Saboni, Gareth Conway, William Scanlon, Queens University Belfast, United Kingdom

MO-A5.1P.9 **16:20**

Implantable Neurostimulator Lead Transfer Function Based on the Transmission Line Model

Sattar Atash-Bahar, Hjalti Sigmarsson, University of Oklahoma, United States; David Thompson, LivaNova, United States

MO-A5.1P.10 **16:40**

Compact Implantable MIMO Antenna with Electro-Magnetic Band Gaps

JinHong Huang, TianHai Chang, XiongYing Liu, South China University of Technology, China

F | Monday, July 10 | 13:20 - 17:00
MO-UF.1P | Golden Hill AB

RF Propagation in Complex Environments

Session Chair: David Michelson, University of British Columbia

MO-UF.1P.1 **13:20**

A Comparative Study of Radiowave Propagation Models for Urban and Suburban Paths

Ozlem Ozgun, Hacettepe University, Turkey

MO-UF.1P.2 **13:40**

Exploitation of LTE Channel Measurements at 450 MHz and Channel Modeling Implementation in a Suburban and Rural Deployment

Charis Stoumpos, Democritus University of Thrace, Greece; Dimitris Anagnostou, Heriot-Watt University, United Kingdom; Michael Chryssomallis, Democritus University of Thrace, Greece

MO-UF.1P.3 **14:00**

Near Earth Propagation Loss Model in Forest for Low Power Wireless Sensor Network

Tatsuki Tokunou, Ryouhei Yamane, Toshihiko Hamasaki, Hiroshima Institute of Technology, Japan

MO-UF.1P.4 **14:20**

Development of Path Loss Models for Low-power and Lossy Wireless Networks in Urban Environments using Data Analytics

Sol Lancashire, BC Hydro, Canada; Parham Zarei, David Michelson, University of British Columbia, Canada

MO-UF.1P.5 **14:40**

Comparison of Propagation Factor in Wireless Mobile Environment in Korea

Soon-Soo Oh, Jae-Won Choi, Chosun University, Republic of Korea; Hwa-Choon Lee, Chodang University, Republic of Korea; Young-Chul Lee, Donggeun Choi, Sung Won Park, Mokpo National Maritime University, Republic of Korea

Break **15:00**

MO-UF.1P.6 **15:20**

Simulation of the Received Power for V2V and V2I Communication Within Radius of 500m

Dong Woo Kim, Chosun University, Republic of Korea; Wook Ki Park, IncheonTechnopark, Republic of Korea; Jin Dae Kim, Jong Wook Kim, Se Woong Na, Carnavicom, Republic of Korea; Soon-Soo Oh, Chosun University, Republic of Korea

MO-UF.1P.7 **15:40**

A new propagation prediction approach based on Ray Launching and Diffusion Equation techniques for complex environments

Leyre Azpilicueta, Tecnologico de Monterrey, Mexico; Francisco Falcone, Public University of Navarre, Spain; Ramakrishna Janaswamy, University of Massachusetts, United States

MO-UF.1P.8 **16:00**

Investigation of 60 GHz Wireless Propagation in an Indoor Environment

Zabed Iqbal, Sungkyun Lim, Georgia Southern University, United States; Carol Ansley, ARRIS Group Inc., United States

MO-UF.1P.9 **16:20**

Ray-Based Reconstruction Algorithm for Multi-Monostatic Radar in Imaging Systems

Kurt Jaisle, Carey Rappaport, Northeastern University, United States

MO-UF.1P.10 **16:40**

Computational Polarimetric Localization with a Radiating Metasurface

Thomas Fromenteze, Xlim Research Institute & CMIP - Duke University, France; Michael Boyarsky, Okan Yurduseven, Jonah N. Gollub, Daniel L. Marks, David R. Smith, CMIP - Duke University, United States

B | Monday, July 10 | 13:20 - 15:00
MO-UB.3P | Torrey Hills AB

RFID and RF Measurements

Session Co-Chairs: Ronald Pogorzelski, California State University, Northridge; Jianming Jin, University of Illinois at Urbana-Champaign

MO-UB.3P.1 **13:20**

A Low-Profile Directional UHF Near-field RFID Reader Antenna

Yunjia Zeng, Institute for Infocomm Research, Singapore; Zhi Ning Chen, National University of Singapore, Singapore; Xianming Qing, Institute for Infocomm Research, Singapore; Jian-Ming Jin, University of Illinois at Urbana-Champaign, United States

MO-UB.3P.2 **13:40**

Optimal impedance matching for power and data transmission in wearable devices

Janghyun Lee, Se Woong Kim, Jong Jin Baek, Youn Tae Kim, Chosun University, Republic of Korea

MO-UB.3P.3 **14:00**

A Mapping for Spectral Filtering in Planar Near-Field Aperture Antenna Measurement

Ronald J. Pogorzelski, California State University, Northridge, United States

MO-UB.3P.4 **14:20**

Analysis of Wireless Power Transfer (WPT) Scheme with Connected Ground Planes

Saeed Khan, Kansas State University, United States

MO-UB.3P.5 **14:40**

Computing the Far Field of an Aperture Antenna in the Plane of the Aperture from its Near Field

Ronald J. Pogorzelski, California State University, Northridge, United States

B | Monday, July 10 | 15:20 - 17:00
MO-UB.4P | Torrey Hills AB

EM Educational Methods and Tools

Session Co-Chairs: Adam Mehrabani, Johns Hopkins University; Jeffery Williams, Sandia National Laboratories

MO-UB.4P.1 **15:20**

Preliminary results on students' study habits and their grades in STEM courses

Muhammad Dawood, John Tapia, Karen Trujillo, Mellisa Guynn, Patti Wojahn, New Mexico State University, United States

MO-UB.4P.2 **15:40**

Electromagnetics at Sandia National Laboratories

Lorena I. Basilio, Jeffery Williams, Lucas Feldner, Sandia National Laboratories, United States

MO-UB.4P.3 **16:00**

THE DISTINCTION BETWEEN ZENNECK WAVES AND SURFACE PLASMON POLARITONS

Mohammad Abdallah, Tapan Sarkar, Syracuse University, United States; Magdalena Salazar-Palma, Universidad Carlos III de Madrid, Spain

MO-UB.4P.4 **16:20**

System normalization of the Taeduk Radio Astronomy Observatory and application plan to the National Youth Space Center in Korea

Hyunwoo Kang, Changhoon Lee, Do-Heung Je, Korea Astronomy and Space Science Institute, Republic of Korea; Ji-Sung Ha, National Youth Space Center, Republic of Korea; Jae Hoon Jung, Il-Gyo Jeong, Young Sik Kim, Korea Astronomy and Space Science Institute, Republic of Korea

MO-UB.4P.5 **16:40**

Application of Single Layer Reduction Technique in Multilayer Transmission Lines

Payal Majumdar, University of Delhi South Campus, United States

Physical Reconfiguration through Advances In Programmable Materials and Adaptive Mechanics

Session Co-Chairs: Gregory Huff, Texas A&M University; Derek Doyle, Air Force Research Laboratory

TU-SP.1A.1 **08:00**

Materials for liquid RF electronics

Christopher Tabor, Michelle Champion, United States Air Force Research Laboratory, United States; Brad Cumby, UES, Inc., United States

TU-SP.1A.2 **08:20**

Frequency Tuning through Physical Reconfiguration of a Corrugated Origami Frequency Selective Surface

Kazuko Fuchi, University of Dayton Research Institute, United States; Giorgio Bazzan, Andrew Gillman, UES, Inc., United States; Gregory Huff, Texas A&M University, United States; Philip Buskohl, Edward Alyanak, Air Force Research Laboratory, United States

TU-SP.1A.3 **08:40**

Mode Reconfigurable Bistable Spiral Antenna Based on Kresling Origami

Xueli Liu, Shun Yao, Stavros V. Georgakopoulos, Florida International University, United States

TU-SP.1A.4 **09:00**

An Inkjet-printed Tunable Origami Frequency Selective Surface on Cellulose Paper

Syed Abdullah Nauroze, Bijan Tehrani, Wenjing Su, Ryan Bahr, Manos M. Tentzeris, Georgia Institute of Technology, United States

TU-SP.1A.5 **09:20**

Polarization Reconfigurable Antennas Using a Liquid Metal Switching Mechanism

Michelle Champion, Air Force Research Laboratory, United States; Brad Cumby, UES, Inc., United States; Emily Belovich, University of Cincinnati, United States; Daniel Jackson, Riverside Research Institute, United States

Break **09:40**

TU-SP.1A.6 **10:00**

Beamforming and Reconfiguration of a Structurally Embedded Vascular Antenna Array (SEVA2) in a Complex Curved Composite

Jeffery Baur, Air Force Research Laboratory, United States; Darren Hartl, Texas A&M University, United States; Geoffrey Frank, Robyn Bradford, Air Force Research Laboratory, United States; David Phillips, University of Dayton, United States; Thao Gibson, Daniel Rapking, Air Force Research Laboratory, United States; Amrita Bal, Hong Pan, Gregory Huff, Texas A&M University, United States

TU-SP.1A.7 **10:20**

Reconfigurable and Time-Varying Metamaterials

Dimitrios Sounas, Younes Radi, Giuseppe D'Aguanno, Andrea Alù, The University of Texas at Austin, United States

TU-SP.1A.8 **10:40**

Soft-Matter Electronics and Multifunctional Materials with Polydisperse Liquid Metal Suspensions

Khalid Jawed, Navid Kazem, Carmel Majidi, Carnegie Mellon University, United States

TU-SP.1A.9 **11:00**

Physically Reconfigurable Antennas: Concepts and Automation

Youssef Tawk, Joseph Costantine, Firas Ayoub, Christos Christodoulou, University of New Mexico, United States; Derek Doyle, Steven Lane, Air Force Research Laboratory, United States

TU-SP.1A.10 **11:20**

Electrically-Shaped Liquid Metals in 1- and 2-D for Reconfigurable Apertures

Meng Wang, Michael Dickey, Jacob Adams, North Carolina State University, United States

Compressive Sensing as Applied to Electromagnetics - Advances, New Trends and Applications

Session Co-Chairs: Mahta Moghaddam, University of Southern California; Migliore Marco Donald, University of Cassino and Southern Lazio

TU-SP.2A.1 **08:00**

Radar target recognition using compressive backscatter

Ismail Jouny, Lafayette College, United States

TU-SP.2A.2 **08:20**

The Minimum Trace Regularization Approach in Electromagnetics: Theory and Perspectives

Marco Donald Migliore, University of Cassino and Southern Lazio, Italy

TU-SP.2A.3 **08:40**

Synthesis of Sparse Linear Array with Multiple Patterns Based on Joint Sparse Recovery

Xiaowen Zhao, Qingshan Yang, Yunhua Zhang, CAS Key Laboratory of Microwave Remote Sensing, China

TU-SP.2A.4 **09:00**

Fast Antenna Testing via Regularization Procedures based on Compressive Sensing

Benjamin Fuchs, Laurent Le Coq, Université de Rennes 1, France

TU-SP.2A.5 **09:20**

Sparse Conformal Array Design for Multiple Patterns Generation through Multi-task Bayesian Compressive Sensing

Giorgio Gottardi, Luca Turrina, Nicola Anselmi, Giacomo Oliveri, Paolo Rocca, University of Trento, Italy

Break **09:40**

TU-SP.2A.6 **10:00**

Sparse Multilayered Subsurface Imaging in MIMO Radar Using Total Variation Minimization

Ahmad Hoorfar, Wenji Zhang, Villanova University, United States

TU-SP.2A.7 **10:20**

Microwave Imaging of Dielectric Targets Using Higher-Order Sparse Processing

Marija Nikolic, Nebojsa Vojnovic, Antonije Djordjevic, Dragan Olcan, University of Belgrade, Yugoslavia; Arye Nehorai, Washington University in St. Louis, United States

TU-SP.2A.8 **10:40**

Inverse Scattering and Compressive Sensing as advanced e.m. design tools

Tommaso Isernia, Roberta Palmeri, Andrea Francesco Morabito, University Mediterranea of Reggio Calabria, Italy; Loreto Di Donato, University of Catania, Italy

TU-SP.2A.9 **11:00**

Matrix Norm Based Method For Recovery of High Contrast and Sparse Objects in Microwave Imaging

Pratik Shah, Mahta Moghaddam, University of Southern California, United States

TU-SP.2A.10 **11:20**

Compressive sensing using approximated total variant transform to reduce the required number of antennas in radar-based medical imaging

Lei Guo, Konstanty S. Bialkowski, Amin Abbosh, The University of Queensland, Australia

New Physics in Guiding Systems II

Session Co-Chairs: Majid Manteghi, Virginia Tech; Fatih Erden, Turkish Naval Academy

TU-A2.1A.1 **08:00**

Non-Reciprocal Electromagnetics in Time-Varying Systems

Dimitrios Sounas, Andrea Alù, The University of Texas at Austin, United States

TU-A2.1A.3 **08:40**

Simulation of Space-Time Varying Metasurface Using Finite-Difference Time-Domain Technique

Yousef Vahabzadeh, Nima Chamanara, Christophe Caloz, École Polytechnique de Montréal, Canada

TU-A2.1A.4 **09:00**

Electromagnetic Nonreciprocity and Perfect Mixing in Space-time Engineered Asymmetric Bandgaps

Nima Chamanara, Sajjad Taravati, Zoé-Lise Deck-Léger, Christophe Caloz, Polytechnique Montréal, Canada

TU-A2.1A.5 **09:20**

Semi-Analytical Finite-Difference Technique for Steady-State Field Characterization of Space-Time Modulated Huygens' Metasurfaces

Scott A. Stewart, Tom J. Smy, Shulabh Gupta, Carleton University, Canada

Break **09:40**

TU-A2.1A.6 **10:00**

Experiminetal Verification of Degenerate Band Edge Dispersion in Metallic Waveguides

Mohamed A. K. Othman, University of California, Irvine, United States; Xuyuan Pan, Georgios Atmatzakis, Christos Christodoulou, University of New Mexico, United States; Filippo Capolino, University of California, Irvine, United States

TU-A2.1A.7 **10:20**

Dispersion Engineering and Mode Control using Multiple Pairs of Non-Identical Coupled Transmission Lines

Muhammed Zuboraj, The Ohio State University, United States; John L. Volakis, ElectroScience Laboratory, United States

TU-A2.1A.8 **10:40**

Non-reciprocal Topologically Protected Meta-waveguide for Routing Circularly Polarized Signals with Opposite Handedness

Davide Ramaccia, Alessandro Toscano, Filiberto Bilotti, Roma Tre University, Italy

TU-A2.1A.9 **11:00**

A Wide Band Polarization Independent Metamaterial Based Electromagnetic Absorber

M. Ismail Khan, Farooq Ahmad Tahir, National University of Sciences & Technology, Pakistan

Guided and Radiating Structures with Metasurfaces and Metamaterials

Session Co-Chairs: Edward Kuester, University of Colorado Boulder; Davide Ramaccia, Roma Tre University

TU-A2.2A.1 **08:00**

Guiding and Radiating Microwave Components with Enhanced Functionalities Enabled by Metamaterials

Mirko Barbuto, Niccolò Cusano university, Italy; Fabrizio Trotta, Elettronica S.p.A., Italy; Davide Ramaccia, Antonino Tobia, Filiberto Bilotti, Alessandro Toscano, Roma Tre University, Italy

TU-A2.2A.2 **08:20**

Dual-Band Wilkinson Power Divider Using Uniplanar Metamaterial-Based EBGs

Braden Smyth, Ashwin K. Iyer, University of Alberta, Canada

TU-A2.2A.3 **08:40**

Effect of Higher-Order Modes on Extraordinary Transmission Through a Dielectric-Loaded Slot in a Thick Metallic Shield

Abdulaziz Haddab, Edward Kuester, University of Colorado Boulder, United States

TU-A2.2A.4 **09:00**

Miniaturized Tunable Artificial Magnetic Conductor for Low LTE Band

Nebil Kristou, Jean-François Pintos, CEA-LETI, France; Kouroch Mahdjoubi, IETR, France

TU-A2.2A.5 **09:20**

Dual-Polarized, Binary-State Metamaterial with Integrated Bias Lines

Scott Rudolph, US Naval Research Laboratory, United States

Break **09:40**

TU-A2.2A.6 **10:00**

A Novel Ultra Compact Four-way Power Divider with Integrated Filtering Function for WLAN Applications

Ahmed M. Hussien, Yasser S. Farag, Ahmed F. Daw, MSA University, Egypt; Mahmoud A. Abdalla, MTC College, Egypt

TU-A2.2A.7 **10:20**

Sharp Fano Resonances in Bi-Layered Symmetric Z-Structures

Elena Bochkova, André de Lustrac, Anatole Lupu, Université Paris-Saclay, France; Thomas Lepetit, ONERA - The French Aerospace Lab, France; Shah Nawaz Burokur, Université Paris Ouest, France

TU-A2.2A.8 **10:40**

A bilayer ELC Metamaterial for Multi-resonant Spectral Coding at mm-Wave Frequencies

Ali Molaei, Juan Heredia Juesas, Northeastern University, United States; Andrew Westwood, Keysight Technologies, United States; Sivasubramanian Somu, Jose A. Martinez-Lorenzo, Northeastern University, United States

TU-A2.2A.9 **11:00**

Wideband Low-Profile Circular Polarization Slot Antenna Based on Metasurface

Yongjun Huang, Jian Li, Guangjun Wen, University of Electronic Science and Technology of China, China

TU-A2.2A.10 **11:20**

Spoof Surface Plasmon (SSP) Transmission Line Transition Design Using Slow-wave Coplanar Waveguide (S-CPW)

Xiao-Lan Tang, Southern University of Science and Technology and Southeast University, China; Qingfeng Zhang, Southern University of Science and Technology, China; Sanming Hu, Southeast University, China; Yifan Chen, Southern University of Science and Technology, China

Phased Array Antennas: Special Topics II

Session Co-Chairs: Paola Pirinoli, Politecnico di Torino; Navid Barani, University of Michigan

TU-A1.1A.1 **08:00**

A Generalized Technique for Conformal Antenna Array Synthesis

Hannah Johnson, G.R. Branner, University of California, Davis, United States; B.P. Kumar, California State University, United States; Gregory Nelson, Matt Chun, University of California, Davis, United States

TU-A1.1A.2 **08:20**

Bandwidth Performance of an Antenna Array with Tapped Delay-Line and Compressive Sensing

Ismail Jouny, Lafayette College, United States

TU-A1.1A.3 **08:40**

Wideband Phased Arrays Synthesis with Maximum Bandwidth through Iterative Convex Optimization

Le Trong Phuoc Bui, Nicola Anselmi, Giorgio Gottardi, Lorenzo Poli, Paolo Rocca, University of Trento, Italy

TU-A1.1A.4 **09:00**

Hierarchical Beamforming Networks for Phased Array of Antennas by Subarray Modularization

Hao-Ju Huang, Yuan Ze University, Taiwan; Hsi-Tseng Chou, National Taiwan University, Taiwan

TU-A1.1A.5 **09:20**

Fabrication and Measurements of a Low-Cost, Dual-Polarized Advanced Planar Array with Wide Scanning Coverage

Matilda Livadaru, John L. Volakis, The Ohio State University, United States

Break **09:40**

TU-A1.1A.6 **10:00**

Analytical Far-field Calculation of Arbitrarily Oriented Antenna Arrays

Hossein Mehrpour Bernety, Suresh Venkatesh, David Schurig, University of Utah, United States

TU-A1.1A.7 **10:20**

Wideband Scanning Array of Spiral Antennas for Simultaneous Transmit and Receive (STAR)

Alexander Hovsepian, Elias Alwan, John L. Volakis, The Ohio State University, United States

TU-A1.1A.8 **10:40**

Coordinately Distributed Smart Antenna Network for WLAN Applications via the Cloud Database Management and Radiation Pattern Reconfiguration

Hsi-Tseng Chou, Dun-Yuan Cheng, Yao-Chiang Kan, Kuang-Min Lin, Yuan-Ze University, Taiwan

TU-A1.1A.9 **11:00**

Study on Wide-Angle Scanning Linear Phased Array

Guangwei Yang, Jianying Li, Northwestern Polytechnical University, China

TU-A1.1A.10 **11:20**

Error Analysis for Time Modulated Arrays

Mohammadreza Amjadian, Mohammad Fakharzadeh, Sharif University of Technology, Iran

Wideband Directional Antennas I

Session Co-Chairs: Muhannad AlTarifi, University of Colorado Boulder; Yahia Antar, Royal Military College of Canada

TU-A1.2A.1 **08:00**

A Compact Cavity-Backed Monopole Antenna For UWB Applications

Eric Merkley, Queen's University, Canada; Brad Jackson, Defence Research and Development Canada, Canada; Carlos Saavedra, Queen's University, Canada; Yahia M. M. Antar, Royal Military College of Canada, Canada

TU-A1.2A.2 **08:20**

Electro-Mechanical Analysis of Flat Radomes for Airborne Antennas at K/Ka/V-band

Ljubodrag Boskovic, Maxim Ignatenko, Conrad Andrews, Roger Hasse, Dejan Filipovic, University of Colorado Boulder, United States

TU-A1.2A.3 **08:40**

Wide-Band Circularly Polarized Antenna using Partially Transmitting Surface

Ashwani Kumar, Raj Mittra, University of Central Florida, United States

TU-A1.2A.4 **09:00**

A Miniaturized UWB Bi-Planar Yagi-Like Antenna

Syed Shahan Jehangir, Mohammad Said Sharawi, King Fahd University of Petroleum and Minerals, Saudi Arabia

TU-A1.2A.5 **09:20**

Loop Antennas with Wideband Circular Polarization

Kazuhide Hirose, Kyosuke Okiyama, Shibaura Institute of Technology, Japan; Hisamatsu Nakano, Hosei University, Japan

Break **09:40**

TU-A1.2A.6 **10:00**

Multi-Layer Dielectric Rod Antenna With Stable Patterns Over Decade Bandwidth

Muhannad Al-Tarifi, Dejan Filipovic, University of Colorado Boulder, United States

TU-A1.2A.7 **10:20**

Wide Band Multi-Beam Cylindrical Lens

Amin Darvazehban, Ahmad Emadeddin, Amirkabir University, Iran; Omid Manoochehri, Danilo Erricolo, University of Illinois at Chicago, United States

TU-A1.2A.8 **10:40**

Broadband Partially Reflective Surface Antenna With Tapered Corrugated Ground

Lu-Yang Ji, Hai-Liang Zhu, Northwestern Polytechnical University, China; Pei-Yuan Qin, Y. Jay Guo, University of Technology Sydney, Australia

TU-A1.2A.9 **11:00**

Broad-Band Cavity-backed and Probe-Fed Microstrip Phased Array Antenna in X-Band

Sen Feng, Mouping Jin, East China Research Institute of Electronic Engineering, China

Advances in Integral Equation Methods I

Session Co-Chairs: Roberto Graglia, Politecnico di Torino; Raj Mittra, University of Central Florida

TU-UB.1A.1 **08:00**

Div-Conforming Entire-Domain Basis Functions for the Analysis of Modulated Metasurface Antennas on Circular Domains

Matteo Alessandro Francavilla, Valentina Sozio, Istituto Superiore Mario Boella, Italy; Giuseppe Vecchi, Politecnico di Torino, Italy

TU-UB.1A.2 **08:20**

Numerical Study of Scalar and Vector Potential Integral Equations for Electromagnetic Scattering

Jie Li, Michigan State University, United States; Xin Fu, Li Jun Jiang, The University of Hong Kong, China; Balasubramaniam Shanker, Michigan State University, United States

TU-UB.1A.3 **08:40**

Application of high-order singular hierarchical divergence-conforming bases functions for quadrilateral elements to solve the flat plate problem

Roberto D Graglia, Politecnico di Torino, Italy; Andrew F Peterson, Georgia Institute of Technology, United States; Paolo Petrini, Politecnico di Torino, Italy

TU-UB.1A.4 **09:00**

Alternative Constraints for Divergence-Conforming Constrained Basis Functions

John Young, Robert Pfeiffer, Robert Adams, University of Kentucky, United States

TU-UB.1A.5 **09:20**

Surface Integral Equation Methods with Reverse Operation Self-consistent Evaluation (ROSE)

Jin-Fa Lee, Xuezhe Tian, Yongpin Chen, Kheng Hwee Lim, The Ohio State University, United States

Break **09:40**

TU-UB.1A.6 **10:00**

Numerical Green's Function Based Augmented Electric Field Integral Equation for Inhomogeneous Media

Hui Gan, Qi Dai, Tian Xia, University of Illinois at Urbana-Champaign, United States; Yanlin Li, The University of Hong Kong, China; Weng Cho Chew, University of Illinois at Urbana-Champaign, United States

TU-UB.1A.7 **10:20**

A Source-Model Technique for Analysis of Scattering by, and Waveguiding across, Chains of Cylinders Partially Buried in a Half-Space Medium

Dana Szafranek, Yehuda Leviatan, Technion, Israel

TU-UB.1A.8 **10:40**

Boundary Integral Spectral Element Method with Periodic Layered Medium Green's Function

Jun Niu, Duke University, United States; Yi Ren, Chongqing University of Posts and Telecommunications, United States; Qing Huo Liu, Duke University, United States

TU-UB.1A.9 **11:00**

A Fast Uniform 3D Near-Field Microwave Imaging Method for Layered Media

Kai Ren, Robert Burkholder, The Ohio State University, United States

Acceleration Rechniques for Integral Equations

Session Co-Chairs: Ali Yilmaz, University of Texas at Austin; Yang Liu, University of Michigan

TU-UB.2A.1 **08:00**

A Butterfly-Based Domain Decomposition SIE Simulator for EM Analysis of Wireless Communication Systems in Mine Environments

Weitian Sheng, Han Guo, Yang Liu, University of Michigan, United States; Abdulkadir Yücel, Massachusetts Institute of Technology, United States; Eric Michielssen, University of Michigan, United States

TU-UB.2A.2 **08:20**

A Linear-Complexity Randomized Butterfly Scheme for Direct Integral Equation Solvers

Yang Liu, Han Guo, Eric Michielssen, University of Michigan, United States

TU-UB.2A.3 **08:40**

Sparse Solution of Integral Equation Formulations of Multiple Scattering Problems in a Directional Plane Wave Basis

Robert Adams, Robert Thomas, John Young, University of Kentucky, United States

TU-UB.2A.4 **09:00**

An H-Matrix Accelerated Solution of a New Single-Source Integral Equation for Scattering on Penetrable Objects

Reza Gholami, Jamiu Mojolagbe, University of Manitoba, Canada; Anton Menshov, The University of Texas at Austin, United States; Farhad Sheikh Hosseini Lori, Vladimir Okhmatovski, University of Manitoba, Canada

TU-UB.2A.5 **09:20**

Matrix Compression in the Method of Moments Code EIGER - Iterative Solver Accuracy and Parallel Efficiency

Joseph Kotulski, Sandia National Laboratories, United States

Break **09:40**

TU-UB.2A.6 **10:00**

Tucker Compressed Muller-SIE for EM Analysis of Mine Communication Systems

Weitian Sheng, University of Michigan, United States; Abdulkadir Yücel, Massachusetts Institute of Technology, United States; Eric Michielssen, University of Michigan, United States

TU-UB.2A.7 **10:20**

A HSS-Type Butterfly-Based Direct Integral Equation Solver for 3D Perfect Electrically Conducting Objects

Yang Liu, Han Guo, Eric Michielssen, University of Michigan, United States

TU-UB.2A.8 **10:40**

Diagonal Localization-based Direct Solver for Volume Integral Equations and Capacitive Extraction

Chee Chang, Tanner Wilkerson, Robert Adams, John Young, University of Kentucky, United States

TU-UB.2A.9 **11:00**

A Direct Domain Decomposition Method (D3M) for Modeling Large Finite Antenna Arrays and FSS

Javad Moshfegh, Marinos N. Vouvakis, University of Massachusetts Amherst, United States

TU-UB.2A.10 **11:20**

A Modified Admissibility Criterion for H-Matrix Based Integral-Equation Solvers

Anton Menshov, The University of Texas at Austin, United States; Vladimir Okhmatovski, University of Manitoba, Canada; Ali E. Yilmaz, The University of Texas at Austin, United States

Antenna Theory III

Session Co-Chairs: Andrea Alu, University of Texas at Austin; Jaehoon Choi, Hanyang University; Leonardo Lizzi, Université Côte d'Azur

TU-A1.3A.1 **08:00**

Applications of Magneto-Dielectric Materials in Wearable Antenna Design

Ala Alemaryeen, Sima Noghanian, University of North Dakota, United States

TU-A1.3A.2 **08:20**

Conformal monopolar antenna for UAV applications

Sungjoon Yoon, Jinpil Tak, Jaehoon Choi, Hanyang University, Republic of Korea; Youngmi Park, Agency for Defense Development, Republic of Korea

TU-A1.3A.3 **08:40**

Design of Circular Array of Circular Subarrays for Scannable Pattern using Rotational Symmetry

Omar Elizarraras, Universidad Autónoma de Tamaulipas, Mexico; Marco A. Panduro, CICESE Research Center, Mexico; Aldo Mendez, Alberto Reyna, Universidad Autónoma de Tamaulipas, Mexico; David Covarrubias, CICESE Research Center, Mexico

TU-A1.3A.4 **09:00**

Calculation of radiation transients in direct antenna modulation systems

Kurt Schab, Jacob Adams, North Carolina State University, United States

TU-A1.3A.5 **09:20**

A High Gain Printed Antenna with Parabolic Metal Grid Reflector Based on SIW Technology

Jun Wang, Shu Lin, Alexander Denisov, Lu Liu, Harbin Institute of Technology, China

Break **09:40**

TU-A1.3A.6 **10:00**

Theory of Electromagnetic Intelligent Agents with Applications to MIMO and DoA Systems

Said Mikki, University of New Haven, United States; Abdelelah Alzahed, Royal Military College of Canada, Canada; Ahmed Hanoon, John Persano, University of New Haven, United States; Jocelyn Aulin, Huawei Technologies Sweden, Sweden; Yahia M. M. Antar, Royal Military College of Canada, Canada

TU-A1.3A.7 **10:20**

Bandwidth-Enhancement of Digital Communication Systems Employing Narrowband Antennas: A Novel Electromagnetic OFDM Approach

Ahmed Hanoon, Said Mikki, University of New Haven, United States

TU-A1.3A.8 **10:40**

A SIW-Based Vivaldi Array Antenna for 5G Wireless Communication Systems

Pengfei Liu, Xiaowei Zhu, Xiang Wang, Ling Tian, Southeast University, China

TU-A1.3A.9 **11:00**

Sidelobe Level and Sideband Suppression in Time-Modulated Linear Arrays by NSGA-II

Cheng Zhang, Anyong Qing, School of Physical Electronics, University of Electronic Science and Technology of China, China

TU-A1.3A.10 **11:20**

A Small RFID Tag Antenna for Metallic Object using Characteristic Mode

Zhipeng Liang, Jun Ouyang, Min Gao, Xuewu Cui, University of Electronic Science and Technology of China, China

Electrically Small Antennas: Metamaterial Inspired

Session Co-Chairs: Richard Ziolkowski, University of Technology Sydney; Mats Gustafsson, Lund University

TU-A1.4A.1 **08:00**

Compact Antenna Using Split-Ring Resonator Integrated with Bent Dipole-Like Metal Pattern

Keishi Kosaka, Hiroshi Toyao, Eiji Hankui, NEC Corporation, Japan

TU-A1.4A.2 **08:20**

Design of an Electrically Small Antenna using a Broadside-coupled Split Ring Resonator

Makoto Sano, Keiju Yamada, Makoto Higaki, Toshiba Corporation, Japan

TU-A1.4A.3 **08:40**

Split Ring Loaded Dielectric Resonator Antenna

Yanxia Liu, Lotfollah Shafai, Cyrus Shafai, University of Manitoba, Canada

TU-A1.4A.4 **09:00**

A New Configuration for Ultra Compact Implantable Antenna Based on SIW L-CRLH Concept

Mahmoud A. Abdalla, MTC College, Egypt; Safieddin Safavi-Naeini, University of Waterloo, Canada

TU-A1.4A.5 **09:20**

Bandwidth and F-B Ratio Enhancements of an Electrically-Small Crossed-Dipole Antenna Using an NFRP Reflector

Son Xuat Ta, Ikmo Park, Ajou University, Republic of Korea; Richard W. Ziolkowski, University of Arizona, United States

Break **09:40**

TU-A1.4A.6 **10:00**

Wideband Dual-Polarized Magneto-Electric Miniaturization using Capacitive Loading

Abdul-Sattar Kaddour, Serge Bories, CEA-LETI, France; Anthony Bellion, CNES, France; Christophe Delaveaud, CEA-LETI, France

TU-A1.4A.7 **10:20**

Electrically-Small, Low-Profile, Dual-Linear and Circularly Polarized Huygens Dipole Antennas with Broadside Radiation Patterns

Wei Lin, Richard W. Ziolkowski, University of Technology Sydney, Australia

TU-A1.4A.8 **10:40**

Super-Directive, Efficient, Electrically Small, Low-Profile Antenna based on Compact Metamaterial

Nebil Kristou, Jean-François Pintos, CEA-LETI, France; Kouroch Mahdjoubi, IETR, France

TU-A1.4A.9 **11:00**

A modified Antennas Based on Fractal Split Ring Resonators

Meng Cao, Zhenghui Xue, Wu Ren, Weiming Li, Beijing Institute of Technology, China

Reflector Feed and Applications

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

TU-A1.5A.1 **08:00**

Broadband Monostatic Simultaneous Transmit and Receive Reflector Antenna System

Prathap Valale Prasannakumar, Mohamed Elmansouri, Dejan Filipovic, University of Colorado Boulder, United States

TU-A1.5A.2 **08:20**

Initial Study of a Pyramidal Sinuous Antenna as a Feed for the SKA Reflector System in Band-1

Dirk de Villiers, Stellenbosch University, South Africa

TU-A1.5A.3 **08:40**

W-Band Feed Horn with Polarizer Structure for an Offset Reflector Antenna for CubeSat Applications

Ghanshyam Mishra, Alejandro Castro, Satish Kumar Sharma, San Diego State University, United States; Jia-Chi S. Chieh, SPAWAR Systems Center Pacific, United States

TU-A1.5A.4 **09:00**

Structural and Electromagnetic Design Considerations for Very Large Space Antennas

Derek Hesser, Lawrence Lee, Lee Burchett, Ronald Marhefka, IEEE, United States; Andrew Terzuoli, institute of Electrical & Electronics Engineers (IEEE), USA, United States; Ray Wasky, IEEE, United States

TU-A1.5A.5 **09:20**

Design of a 94/340GHz Horn Antenna Loaded with Dielectric for Dual-band Operation

Xiannan Wang, Changjiang Deng, Weidong Hu, Yong Liu, Xin Lv, Beijing Institute of Technology, China

Break **09:40**

TU-A1.5A.6 **10:00**

Considerations in the Synthesis of Elevation Patterns in Cylindrical Parallel Plate Antennas

Naftali Herscovici, Air Force Research Laboratory, United States; Anatoliy Boryssenko, A&E Partnership, United States; Carl Carl Pfeiffer, Defense Engineering Corporation, United States

TU-A1.5A.7 **10:20**

Design of a 67-116GHz Corrugated Circular Horn for the ALMA Radio Telescope

Renzo Nesti, National Institute for Astrophysics, Italy; Giuseppe Pelosi, Simone Pilia, Stefano Selleri, University of Florence, Italy

TU-A1.5A.8 **10:40**

A novel method of direction of arrival estimation for large parabolic reflector antenna

Hailin Cao, Zhoujian Chen, Lu Tao, Jing Liu, Chengzhuo Zhu, Yantao Yu, Chongqing University, China; Jin Fan, The National Astronomy Observatory of China, China

TU-A1.5A.9 **11:00**

Gain and Sidelobe Improved Circularly-Polarized Array Using HIS Bowl-Shaped Reflector

Jie Ren, Shanghai Jiao Tong University, China; Lina Zhang, Shanghai Aerospace Electronic Technology Institute, China; Xianling Liang, Weile Yuan, Shanghai Jiao Tong University, China; Qiaoyuan Qian, Shanghai Aerospace Electronic Technology Institute, China; Junping Geng, Weiren Zhu, Ronghong Jin, Shanghai Jiao Tong University, China

TU-A1.5A.10 **11:20**

Full Reconstruction of Focal-Field Distribution Using Compressed Sensing

Decheng Wu, Hailin Cao, Zhoujian Chen, Lu Tao, Jing Liu, Chengzhuo Zhu, Yantao Yu, Chongqing University, China; Jin Fan, Chinese Academy of Sciences, China

Biomedical Applications of Antennas

Session Co-Chairs: Jennifer Bernhard, University of Illinois at Urbana-Champaign; Pai-Yen Chen, Wayne State University

TU-A5.1A.1 **08:00**

Antenna Probes for Power Reception from Deep Tissues for Wearable Microwave Thermometry

Parisa Momenroodaki, University of Colorado Boulder, United States; Mojtaba Fallahpour, Stanford University, United States; Zoya Popovic, University of Colorado Boulder, United States

TU-A5.1A.2 **08:20**

A Wearable and Reconfigurable Folded Slot Antenna for Body-Worn Devices

Saud M. Saeed, Arizona State University and Prince Sattam bin Abdulaziz University, United States; Constantine A. Balanis, Craig R. Birtcher, Arizona State University, United States

TU-A5.1A.3 **08:40**

Antenna System for Radio Wave Type Laparoscope

Takafumi Fujimoto, Naoto Masuda, Takuya Matori, Toshiyuki Tanaka, Nagasaki University, Japan

TU-A5.1A.4 **09:00**

Accuracy Investigation of SFCW Radar in Human Vital Signs Detection for Subject's Relative Position

Tuan Phan, Ozlem Kilic, The Catholic University of America, United States; Sabikun Nahar, Lingyun Ren, Aly E. Fathy, University of Tennessee, United States

TU-A5.1A.5 **09:20**

Ultrasensitive Telemetric Sensor Based on Adapted Parity-Time Symmetry

Maryam Sakhdari, Pai-Yen Chen, wayne state university, United States

Break **09:40**

TU-A5.1A.6 **10:00**

A Self-Powered Harmonic Sensor Based on Simple Graphene Circuit and Hybrid-Fed Antenna

Mehdi Hajizadegan, Pai-Yen Chen, Wayne state university, United States

TU-A5.1A.7 **10:20**

Design of Wide Band High Gain Unidirectional Antenna with Low Profile

Shi Xiang, Yi-Zhi Wu, Sheng Ye, Ming-Da Zhu, Donghua University, China

TU-A5.1A.8 **10:40**

An On-body Watchband Antenna for the Applications of Wearable Systems

Gaosheng Li, Gui Gao, Wei Liu, Jian Su, Yang Bai, National University of Defense Technology, China

TU-A5.1A.9 **11:00**

Flexible and Compact AMC Based Antenna for WBAN Applications

Huan Liu, Junjun Wang, Xiling Luo, Beihang University, China

TU-A5.1A.10 **11:20**

CPW Ring Wearable Antenna on Leather Material for BAN Applications

M. I. Ahmed, Electronics Research Institute, Egypt; M. F. Ahmed, A. A. Shaalan, Zagazig University, Egypt

Wave Propagation in Outdoor and Urban Environments

Session Co-Chairs: Robert Watson, University of Bath; Miguel Navarro-Cia

TU-A4.1A.1 **08:00**

Outdoor-indoor angular power spectrum prediction

Dmitry Chizhik, Reinaldo Valenzuela, Nokia, United States

TU-A4.1A.2 **08:20**

Beamforming Gain Degradation of Array Anntena at 20-GHz Band in Urban Street Canyon

Ngochao Tran, Tetsuro Imai, Koshiro Kitao, Yukihiko Okumura, NTT DOCOMO, INC., Japan

TU-A4.1A.3 **08:40**

UAV-Aided Source Localization in Urban Environments Based on Ray Launching Simulation

Zhuangzhuang Dai, Peter Shepherd, Robert Watson, University of Bath, United Kingdom

TU-A4.1A.4 **09:00**

Physical Layer Security based on Time Reversal Technique for Outdoor Radio Channels

Hassan El-Sallabi, Abdulaziz Aldosari, QAF, Qatar

TU-A4.1A.5 **09:20**

A Comparison of Satellite Signal Simulation in Street Canyon in 2D and 3D Deterministic Methods

Hossein Hadidian Moghadam, Ecole de Technologie Superieure (ETS), Canada; Ali Foudazi, Missouri University of Science and Technology, United States; Ammar Kouki, Ecole de Technologie Superieure (ETS), Canada

Break **09:40**

TU-A4.1A.6 **10:00**

Path Loss Frequency Dependence at 2-26 GHz in an Urban Macro Cell Environment

Motoharu Sasaki, Mitsuki Nakamura, Minoru Inomata, Yasushi Takatori, NTT Corporation, Japan; Koshiro Kitao, Tetsuro Imai, NTT DOCOMO, INC., Japan

TU-A4.1A.7 **10:20**

Assessment of ISM 2.4GHz Wireless Sensor Networks Performance in Urban Infrasctructure Scenarios

Leyre Azpilicueta, Tecnologico de Monterrey, Mexico; Peio Lopez-Iturri, Erik Aguirre, Carlos Martínez, Francisco Falcone, Public University of Navarre, Spain

TU-A4.1A.8 **10:40**

Impact of Propagation Impairments on Outdoor and Indoor Optical Wireless Communications

Kapal Dev, Dario Tagliaferri, Politecnico di Milano, Italy; Roberto Nebuloni, IEIIT, Consiglio Nazionale delle Ricerche (CNR), Italy; Carlo Capsoni, Politecnico di Milano, Italy

TU-A4.1A.9 **11:00**

Selection and Adjustment of Propagation Models to Compute the Electric Field Strength for Exposure Assessment Purposes in Urban Environment

Marlon Patino, Alejandro Rangel, Universidad Nacional de Colombia, Colombia; Juan V Balbastre, Universitat Politècnica de València, Spain; Daniela Alfonso, Zulma Lopez, Félix Vega, John J. Pantoja, Universidad Nacional de Colombia, Colombia

Wave Propagation in Vehicular Environments

Session Co-Chairs: Bilgehan Avser, University of California, San Diego; Matthys Botha

TU-A4.2A.1 **08:00**

Experimental frequency dispersion study of the vehicular-to-vehicular propagation channel

Yousra Chakkour, ENSA, UAE-Tetouan, Morocco; Herman Fernández, Escuela de Ingeniería Electrónica, Universidad Pedagógica y Tecnológica de Colombia, Colombia; Lorenzo Rubio, Juan Reig, Vicent M. Rodrigo-Peñarrocha, Universitat Politècnica de València, Spain; Otman Aghzout, UAE-Tetouan, Morocco

TU-A4.2A.2 **08:20**

Markov Modeling of Spatial Variations in Multipath

Marcia Golmohamadi, Sakil Chowdhury, Jeff Frolik, University of Vermont, United States

TU-A4.2A.3 **08:40**

Characterisation of Radio Wave Propagation in Vehicular Environments Through Deterministic Methods

Leyre Azpilicueta, Cesar Vargas-Rosales, Tecnologico de Monterrey, Mexico; Peio Lopez-Iturri, Erik Aguirre, Francisco Falcone, Public University of Navarre, Spain

TU-A4.2A.4 **09:00**

On the applicability of ray-tracing propagation models to V2V-intersection environments

Rafael P. Torres, Jesús R. Pérez, José Basterrechea, Luis Valle, Marta Domingo, Universidad de Cantabria, Spain; Herman Fernández, Universidad Pedagógica y Tecnológica de Colombia, Colombia; Lorenzo Rubio, Vicent M. Rodrigo-Peñarrocha, Juan Reig, Universitat Politècnica de València, Spain

TU-A4.2A.5 **09:20**

Measurement Based Ray Tracer Calibration and Channel Analysis for High-speed Railway Viaduct Scenario at 93.2 GHz

Xue Lin, Bo Ai, Danping He, Ke Guan, Zhangdui Zhong, Li Tian, Jianwu Dou, State Key Laboratory of Rail Traffic Control and Safety, Beijing Jiaotong University, China

Vehicular Antenna and Electromagnetics

Session Co-Chairs: Claes Beckman, KTH Royal Institute of Technology; Ick-Jae Yoon, Chungnam National University

TU-A5.2A.1 **10:00**

A 3D LTE antenna for vehicular applications

Vittorio Franchina, Andrea Michel, Paolo Nepa, University of Pisa, Italy; Roberto Parolari, Ilenia Moro, Andrea Polo Filisan, Daniel Zamberlan, Calearo Antenne s.p.a., Italy

TU-A5.2A.2 **10:20**

A Compact 3-Port Multiband Antenna for V2X Communication

Yi Hua, Ling Huang, Yilong Lu, Nanyang Technological University, Singapore

TU-A5.2A.3 **10:40**

An Investigation of Geolocation-Aware Beamforming Algorithms for Swarming UAVs

Shihyuan Yeh, Jean-Francois Chamberland, Gregory Huff, Texas A&M University, United States

TU-A5.2A.4 **11:00**

Passive Battery-Free UHF RFID Tag for Athermic Car Windshields

Thi Quynh Van Hoang, Do Hanh Ngan Bui, Truc Phong Nguyen, Tan-Phu Vuong, IMEP – LAHC, University Grenoble Alpes, France; Christian Defay, Multitoll Solutions, France

TU-A5.2A.5 **11:20**

Array of Modified Monopoles for Beam Forming

Hisamatsu Nakano, Yuhei Kameta, Junji Yamauchi, Hosei University, Japan; Toru Kawano, National Defense Academy, Japan

Slot-Array Antennas

Session Co-Chairs: Miao Zhang, Xiamen University; Christos Christodoulou, University of New Mexico

TU-A1.6A.1 **08:00**

Wideband Design of Sub-arrays in a Q-band Partially-Corporate Fed Waveguide Slot Array

Miao Zhang, Dan Chen, Longfang Ye, Xiamen University, China; Qing Huo Liu, Duke University, United States

TU-A1.6A.2 **08:20**

A Spiral Radial Line Slot Array Antenna with Metallic Standoffs for Deep Space Missions

Matthew Bray, Johns Hopkins Applied Physics Laboratory, United States

TU-A1.6A.3 **08:40**

Compact Center-Fed Ridged Waveguide Slot Array for SAR Applications

Ying Chen, Rodney G Vaughan, Simon Fraser University, Canada

TU-A1.6A.4 **09:00**

A High Gain Dual Polarized Omni Antenna

John Sanford, Ubiquiti Networks, United States

TU-A1.6A.5 **09:20**

Cold & Hot Tests of an S-band Antenna for High Power Microwave Systems

Xuyuan Pan, University of New Mexico, United States; Julie Lawrance, Jeremy McConaha, Matthew Landavazo, Air Force Research Laboratory, United States; Christos Christodoulou, University of New Mexico, United States

Break **09:40**

TU-A1.6A.6 **10:00**

Considerations for Resonant Slot Arrays for Microwave Food Drying and Heating

Maryam Razmhosseini, Ying Chen, Rodney G Vaughan, Simon Fraser University, Canada

TU-A1.6A.7 **10:20**

Dual-Polarized Fixed-Beam High-gain Array Antenna for Microwave and mm-Wave Applications

Abhijit Bhattacharya, Rodney G Vaughan, Simon Fraser University, Canada

TU-A1.6A.8 **10:40**

A Novel Dual-Polarized Waveguide Array Antenna for Ku Band Satellite Communications

Hongtao Zhang, Wei Wang, Mouping Jin, Yongqing Zou, The 38th Research Institute of China Electronics Technology Group Corporation, China; Xianling Liang, Shanghai Jiao Tong University, China

TU-A1.6A.9 **11:00**

Ku-Band Wideband Space-borne Waveguide Slot Array Antenna

Hongjian Wang, National Space Science Center, Chinese Academy of Sciences, China; Yang Liu, Xingchao Dong, Xingwei Zhang, University of Chinese Academy of Sciences, China; Min Yi, NSSC, China

History of APS: Early Legends of the Field

Session Co-Chairs: Stuart Long, University of Houston; Kathleen Melde, University of Arizona

TU-SP.1P.1 **13:20**

A Historical Perspective on the IEEE Antennas and Propagation Society Awards for Individual Achievement and Outstanding Papers

Stuart Long, University of Houston, United States

TU-SP.1P.2 **13:40**

A Tribute to John Kraus: A Pioneer in Electromagnetics, Antennas, and Radio Astronomy

Warren Stutzman, Virginia Tech, United States

TU-SP.1P.3 **14:00**

Chen-To Tai: His Life and Contributions to Electromagnetics

Jian-Ming Jin, University of Illinois at Urbana-Champaign, United States

TU-SP.1P.4 **14:20**

1987 IEEE AP Distinguished Achievement Awardee, Prof. Georges A. Deschamps, A True Gentleman and Distinguished Scholar

Richard W. Ziolkowski, University of Arizona, United States

TU-SP.1P.5 **14:40**

Professor Robert S. Elliott: A Role-Model Educator, Writer and Researcher

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

Break **15:00**

TU-SP.1P.6 **15:20**

Roger F. Harrington, 1989 IEEE AP-S Distinguished Achievement Awardee

Donald Wilton, University of Houston (retired), United States; Ercument Arvas, Istanbul Medipol University, Turkey; Chalmers M. Butler, Clemson University (retired), United States; Joseph R. Mautz, Syracuse University (retired), United States

TU-SP.1P.7 **15:40**

James R. Wait: An Electromagnetics Scholar, A Gentleman, and A Man of Many Quests

Jeffery Williams, Sandia National Laboratories, United States; David Hill, NIST, United States; Jeffrey Young, Oklahoma State University, United States

TU-SP.1P.8 **16:00**

Professor R.W.P. King: A Tribute to his Life and Technical Accomplishments

Stuart Long, University of Houston, United States; Glenn S. Smith, Georgia Institute of Technology, United States; D. V. Giri, Pro-Tech, United States; Ted Simpson, University of South Carolina, United States; Robert J. Mailloux, Consultant, United States

TU-SP.1P.9 **16:20**

A Tribute to Harold A. Wheeler: The Ultimate Bridge between Theory and Application

Jennifer T. Bernhard, University of Illinois at Urbana-Champaign, United States

TU-SP.1P.10 **16:40**

Robert E. Collin: A Tribute to his Professional Accomplishments

Ioannis Besieris, Virginia Tech, United States

Tuesday, July 11 13:20 - 15:00
TU-SP.2P Special Session Coronado A

Advancement of Metasurfaces and Lenses for Beyond 4G and 5G

Session Co-Chairs: Jungsuek Oh, Inha University; Seungtae Ko, Samsung Electronics

TU-SP.2P.1 **13:20**

A Study on Design Methodology for Flexible Beam Shaping Lens with Phased Array Antenna and its Application

Seungtae Ko, Yoongeon Kim, Seungku Han, Byungchul Kim, Jungyub Lee, Yeongju Lee, Samsung Electronics, Republic of Korea

TU-SP.2P.2 **13:40**

Spatial Beam Shaping Flat Lens using Phased Array Antenna for 5G Mobile Communication

Seungtae Ko, Yoongeon Kim, Seungku Han, Byungchul Kim, Jungyub Lee, Yeongju Lee, Samsung Electronics, Republic of Korea

TU-SP.2P.3 **14:00**

Design of a Novel 2.5-Dimensional Wideband Frequency Selective Surface with Stable Perfomance for Fifth Generation Communications

Da Li, Tian-Wu Li, Er-Ping Li, Zhejiang University, China

TU-SP.2P.4 **14:20**

Efficiency Optimization of Millimeter Wave FR4- Based Metasurface Using Lossy Spatial Filter Modeling

Yongyeon Kim, Jungsuek Oh, Inha University, Republic of Korea

TU-SP.2P.5 **14:40**

Millimeter Wave Thin Metasurface Enabling Polarization-Controlled Beam Shaping

Inseop Yoon, Jungsuek Oh, Inha University, Republic of Korea

Tuesday, July 11 15:20 - 17:00
TU-SP.3P Special Session Coronado A

Higher Symmetries for Flat Meta-lenses

Session Co-Chairs: Guido Valerio, Sorbonne Universités, UPMC Univ Paris 06; Oscar Quevedo-Teruel, KTH Royal Institute of Technology

TU-SP.3P.1 **15:20**

Higher Symmetries in Periodic Surfaces for Graded-Index and Band-Gap Components

Guido Valerio, Université Pierre et Marie Curie - Sorbonne Universités, France; Oscar Quevedo-Teruel, KTH Royal Institute of Technology, Sweden

TU-SP.3P.2 **15:40**

Application of glide-symmetric holey structures to the design of gap waveguide technology components

Eva Rajo-Iglesias, University Carlos III of Madrid, Spain; Mahsa Ebrahimpouri, KTH Royal Institute of Technology, Sweden; Astrid Algaba-Brazalez, Ericsson Research, Sweden

TU-SP.3P.3 **16:00**

Predicting PT transitions and protected points in 2D periodic materials using an antiunitary group theory

Adam Mock, Central Michigan University, United States

TU-SP.3P.4 **16:20**

Analysis of glide-symmetric metasurface waveguides using Floquet-mode representation

Zvonimir Sipus, Silvio Hrabar, University of Zagreb, Croatia

TU-SP.3P.5 **16:40**

Hexagonal Symmetry Metasurfaces for Broadband Antenna Applications

J.D. de Pineda, R.C. Mitchell-Thomas, Alastair P. Hibbins, J. Roy Sambles, University of Exeter, United Kingdom

Tuesday, July 11 13:20 - 17:00
TU-A2.1P Coronado B

Frequency Selective Surface Applications

Session Co-Chairs: Zhongxiang Shen, Nanyang Technological University; Douglas Werner, Pennsylvania State University

TU-A2.1P.1 **13:20**

A 30GHz Linear-to-Circular Polarization Conversion Using Two-Layer FSS

Hamdan Abo Ghalyon, Mohammad Akbari, Abdel Razik Sebak, Concordia University, Canada

TU-A2.1P.2 **13:40**

Multi-Octave Linear-to-Circular Polarizers

Carl Pfeiffer, Defense Engineering Corporation, United States; Boris Tomasic, Air Force Research Laboratory, United States

TU-A2.1P.3 **14:00**

Active Frequency Selective Surface for Strain Sensing

Mahboobeh Mahmoodi, Kristen M. Donnell, Missouri University of Science and Technology, United States

TU-A2.1P.4 **14:20**

A Frequency Selective Surface with Nano Square Ring Resonators for Enhancing Banknote Security

Abhisit Sripradit, Thorin Theeradejvanichkul, King Mongkut's University of Technology Thonburi, Thailand

TU-A2.1P.5 **14:40**

Novel FSS-Based Sensor for Concurrent Temperature and Strain Sensing

Mahboobeh Mahmoodi, Kristen M. Donnell, Missouri University of Science and Technology, United States

Break **15:00**

TU-A2.1P.6 **15:20**

Wideband 3D Frequency Selective Rasorber Based on Ferrite Absorber

Yufeng Yu, Tianwei Deng, Temasek Laboratories,National University of Singapore, Singapore; Zhongxiang Shen, Nanyang Technological University, Singapore

TU-A2.1P.7 **15:40**

Circuit Model for Single-Layer Single-Resonant Ultra-Thin FSS Absorbers with Wide Bandwidth

Donovan Brocker, Anastasios Panaretos, Douglas H. Werner, The Pennsylvania State University, United States

TU-A2.1P.8 **16:00**

An Absorptive Frequency Selective Surface with Wideband Transmission above Absorption Band

Qiang Chen, Yunqi Fu, National University of Defense Technology, China

TU-A2.1P.9 **16:20**

Broadband Window-type Circular Polariser Based on Frequency Selective Surfaces

Wei Zhang, Jianying Li, Guangwei Yang, Jian Xie, Northwestern Polytechnical University, China

TU-A2.1P.10 **16:40**

An Efficient FSS Absorber For WLAN Security

Shahid Habib, CIIT Islamabad,Pakistan, Pakistan; Ghaffer Iqbal Kiani, King Abdulaziz University, Saudi Arabia; Muhammad Fasih Uddin Butt, CIIT Islamabad,Pakistan, Pakistan

Nano-antennas and Nano-structures

Session Co-Chairs: Andrea Alu, University of Texas at Austin; Ahmed Hassan, University of Missouri-Kansas City

TU-UB.1P.1 **13:20**

PT-symmetric epsilon-near-zero plasmonic waveguides

Ying Li, Christos Argyropoulos, University of Nebraska-Lincoln, United States

TU-UB.1P.2 **13:40**

Understanding Bowtie Nanoantennas Excited by a Localized Emitter

Victor Pacheco-Peña, Miguel Beruete, Universidad Pública de Navarra, Spain; Antonio I. Fernández-Domínguez, Universidad Autónoma de Madrid, Spain; Yu Luo, Nanyang Technological University, Singapore; Miguel Navarro-Cía, University of Birmingham, United Kingdom

TU-UB.1P.3 **14:00**

Free Carriers Photoexcitation as a Platform for Ultrafast Tunable Dielectric and Hybrid Nanoantennas

Alexander Krasnok, The University of Texas at Austin, United States; Denis Baranov, Chalmers University of Technology, Sweden; Roman Savelev, Pavel Belov, ITMO University, Russian Federation; Andrea Alù, The University of Texas at Austin, United States

TU-UB.1P.4 **14:20**

Quantifying the Scattering Characteristics of Plasmonic Nanowires and Microwires using Characteristic Mode Analysis

Daniel S. Kiddle, Ethan Wilcox, Ahmed Hassan, University of Missouri-Kansas City, United States; Edward Garboczi, National Institute of Standards and Technology, United States

TU-UB.1P.5 **14:40**

Electromagnetic Scattering and Characteristic Mode Analysis of Nanowires in Layered Media

Kalyan C. Durbhakula, Daniel S. Kiddle, Deb Chatterjee, Ahmed Hassan, University of Missouri-Kansas City, United States; Edward Garboczi, National Institute of Standards and Technology, United States

Break **15:00**

TU-UB.1P.6 **15:20**

Electromagnetic Analysis of Composites with Realistic Carbon Nanotube Distributions as Determined by 3D Quantitative Electron Tomography

Spencer On, Marjorie Castro, Douglas Heller, Ahmed Hassan, University of Missouri-Kansas City, United States; Bharath Natarajan, National Institute of Standards and Technology, United States; Itai Stein, Estelle Cohen, Brian Wardle, Massachusetts Institute of Technology, United States; Renu Sharma, J. Alexander Liddle, Edward Garboczi, National Institute of Standards and Technology, United States

TU-UB.1P.7 **15:40**

Acceleration of numerical methods for Coherent X-ray Diffractive Imaging

Xueyang Wang, University of California, San Diego, United States; Amir Shlivinski, Ben-Gurion University, Israel; Andrej Singer, Oleg Shpyrko, Vitaliy Lomakin, University of California, San Diego, United States

TU-UB.1P.8 **16:00**

Green's function formalism for near field analysis of planar layered media in nano-photonics

Faezeh Tork Ladani, Eric Potma, University of California, Irvine, United States

TU-UB.1P.9 **16:20**

Polarization Enhancement in a Particle with a Core-Shell Structure

Yanlin Li, Zhijing Hu, Thomas Wong, Illinois Institute of Technology, United States

TU-UB.1P.10 **16:40**

Power deposition of multiple nano-scale multilayer particles excited by plane wave

Yuke Li, Jun Hu, University of Electronic Science and Technology of China, China; Wei-Feng Huang, Duke University, United States; Zaiping Nie, University of Electronic Science and Technology of China, China; Qing Huo Liu, Duke University, United States

Small Antennas

Session Co-Chairs: John Rockway, SPAWAR Systems Center Pacific; Lale Alatan, Middle East Technical University

TU-UB.2P.1 **13:20**

Fundamental limitations on the quality factor and related problems for small antennas

Mats Gustafsson, Lund University, Sweden; Miloslav Capek, Czech Technical University in Prague, Czech Republic; Kurt Schab, North Carolina State University, United States

TU-UB.2P.2 **13:40**

Physical bounds on the MIMO capacity for small antennas

Mats Gustafsson, Lund University, Sweden

TU-UB.2P.3 **14:00**

On Maximum Absorption by a Lossy Antenna – to Conjugate-Match or not to Conjugate-Match?

Ofer Markish, Yehuda Leviatan, Technion, Israel

TU-UB.2P.4 **14:20**

What Actually Limits the Sensitivity of NMR Antenna–Receiver Chain?

Petar Kolar, Silvio Hrabar, Mihael Grbic, University of Zagreb, Croatia

TU-UB.2P.5 **14:40**

Compact Null-steering Antenna System for GPS

Cara Yang Kataria, Grace X. Gao, Jennifer T. Bernhard, University of Illinois at Urbana-Champaign, United States

Break **15:00**

TU-UB.2P.6 **15:20**

A Novel Technique to Tilt Radiation Beams in Bowtie Antennas

William Ake, Maria Pour, University of Alabama in Huntsville, United States

TU-UB.2P.7 **15:40**

A Compact Multi-antenna System with Low Mutual Coupling

Wei Huang, Hongwei Liu, Huawei Device USA, Inc., United States

TU-UB.2P.8 **16:00**

Design of Camera-integrated 2.4-GHz Loop Antenna for Wireless Endoscope

Se Woong Kim, Janghyun Lee, Jong Jin Baek, Youn Tae Kim, Chosun University, Republic of Korea

TU-UB.2P.9 **16:20**

Optimal Receiver for Polarization Based Estimation of Angle of Arrival at HF band

Mani Kashanianfard, Kamal Sarabandi, University of Michigan - Radlab, United States

TU-UB.2P.10 **16:40**

A New Embedded NFC Antenna for Full Metal Mobile Devices

Olivier Pajona, Jaakko Kyllonen, Laurent Desclos, Ethertronics, France

Wideband Directional Antennas II

Session Co-Chairs: Jiro Hirokawa, Tokyo Institute of Technology; Sungkyun Lim, Georgia Southern University

TU-A1.1P.1 **13:20**

Wideband Axial-Mode Helical Antenna with 3D Printed Proliferated Radome

Jiukun Che, Chi-Chih Chen, The Ohio State University, United States

TU-A1.1P.2 **13:40**

HIBiscus, a broadband antenna with matching impedance and uniform radiation pattern

Jose Miguel Jauregui-Garcia, Jeffrey B. Peterson, Carnegie Mellon University, United States; Edgar Castillo-Dominguez, Instituto Nacional de Astrofisica, Optica y Electronica, Mexico; Tabitha C. Voytek, University of Kwazulu-Natal, South Africa

TU-A1.1P.3 **14:00**

Compact Combined Antenna with Slit For Monopolar Input Pulse

Vignesh Shanmugam Bhaskar, Eng Leong Tan, King Ho Holden Li, Man Siu Tse, Nanyang Technological University, Singapore

TU-A1.1P.4 **14:20**

Circularly Polarized Broadband Patch Antenna Using Artificial Ground Structure and Meandered Probe for Low Cross-Polarization

Takeshi Fukusako, Yujiro Kai, Kumamoto University, Japan

TU-A1.1P.5 **14:40**

Combination of Bow-Tie Antenna and Log Periodic Dipole Array for Circular Polarization

Md Rakibul Islam, Sungkyun Lim, Georgia Southern University, United States

Break **15:00**

TU-A1.1P.6 **15:20**

A Broadband Dual-Polarized Antenna with Beamwidth Improvement

Guang Fu, Zhiya Zhang, Xidian University, China

TU-A1.1P.7 **15:40**

Broadband Differentially-Fed Circularly Polarized Antennas

Hui Liu, Yuehui Cui, RongLin Li, South China University of Technology, China

TU-A1.1P.8 **16:00**

A Broadband Low Profile High Gain and Dual Polarization Antenna Element Applied to Mobile Base Station

Shu Lin, Ling Liu, Maorui Zhang, Harbin Institute of Technology, China

TU-A1.1P.9 **16:20**

A 6–18 GHz Wideband SIW H-Plane Dual-Ridged End-Fire Antenna

Jian Li, Yongjun Huang, Guangjun Wen, University of Electronic Science and Technology of China, China; Haobin Zhang, Science and Technology on Electronic Information Control Laboratory, China

TU-A1.1P.10 **16:40**

Design of Wideband Miniaturized Cross Dipole Antennas with Chamfers

Rui Wu, Qing-Xin Chu, South China University of Technology, China

Advances in Integral Equation Methods II

Session Chair: Vladimir Okhmatovski, University of Manitoba

TU-UB.3P.1 **13:20**

Adaptive Generation of Excitation-Independent Characteristic Basis Functions

Xinlei Chen, Chaningqing Gu, Nanjing University of Aeronautics and Astronautics, China; Raj Mittra, University of Central Florida, United States

TU-UB.3P.2 **13:40**

Green's Function Computation Using Lattice Sums for Leaky-Wave Analyses

Paolo Baccarelli, Sapienza Università di Roma, Italy; Vakhtang Jandieri, University of Duisburg-Essen, Germany; Guido Valerio, Université Pierre et Marie Curie - Sorbonne Universités, France; Giuseppe Schettini, Roma Tre University, Italy

TU-UB.3P.3 **14:00**

Efficient Multi-Point Field Focusing Through Highly Diffusive Random Media

Han Guo, Eric Michielssen, Raj Rao Nadakuditi, University of Michigan, United States

TU-UB.3P.4 **14:20**

Efficient Guide-star Enabled Reconstruction of Scattering Matrices Via Alternating Minimization and Proximal Gradient Methods

Han Guo, Eric Michielssen, Raj Rao Nadakuditi, University of Michigan, United States

TU-UB.3P.5 **14:40**

Comparison of Different Schemes for Dealing with Integral Singularities in Method of Moments

Javier Rivero, Universidad de Extremadura, Spain; Francesca Vipiana, Politecnico di Torino, Italy; José Manuel Taboada, Universidad de Extremadura, Spain; Donald R. Wilton, University of Houston, United States; William A. Johnson, New Mexico Institute of Mining and Technology, United States

Break **15:00**

TU-UB.3P.6 **15:20**

Physical and Spectral Properties of the Electrostatic Nullspace in the Augmented Integral Formulations

Qin S. Liu, The University of Hong Kong, Hong Kong SAR of China; Sheng Sun, University of Electronic Science and Technology of China, China; Li Jun Jiang, The University of Hong Kong, Hong Kong SAR of China; Weng Cho Chew, University of Illinois at Urbana-Champaign, United States

TU-UB.3P.7 **15:40**

Solution of Scattering Problems on Penetrable Objects with Higher Order Method of Moments Discretization of Surface-Volume-Surface Electric Field Integral Equation

Farhad Sheikh Hosseini Lori, Mohammad Sikander Hossen, University of Manitoba, Canada; Anton Menshov, The University of Texas at Austin, United States; Vladimir Okhmatovski, University of Manitoba, Canada

TU-UB.3P.8 **16:00**

A Method Combining the Body of Revolution Method and Spectral Integral Method for Solving Scattering Problems

Yuke Li, Jun Hu, University of Electronic Science and Technology of China, China; Wei-Feng Huang, Duke University, United States; Zaiping Nie, University of Electronic Science and Technology of China, China; Qing Huo Liu, Duke University, United States

TU-UB.3P.9 **16:20**

An Element-Diagonal Preconditioner for the Volume Electric-Field Integral Equation

Jackson W. Massey, Anton Menshov, Ali E. Yilmaz, The University of Texas at Austin, United States

TU-UB.3P.10 **16:40**

Revisiting the Modeling of a Two Step Integral Equation Calculation with Primary/ Secondary Problems

Vincent Gobin, André Barka, ONERA, The French Aerospace Lab, France

Fast Solvers and Well-Conditioned Formulations

Session Co-Chairs: Francesco P. Andriulli, Ecole Nationale Superieure Mines-Telecom Atlantique; Ali Yilmaz, University of Texas at Austin

TU-A3.1P.1 **13:20**

Matrix Inversion in Spatial Frequency Analysis of Electromagnetic Scattering and Radiation

Dayalan Kasilingam, Anthony Fascia, University of Massachusetts Dartmouth, United States

TU-A3.1P.2 **13:40**

On a Well-Conditioned Impedance Boundary Condition EFIE

Alexandre Dély, Francesco P. Andriulli, IMT Atlantique, France; Kristof Cools, University of Nottingham, United Kingdom

TU-A3.1P.3 **14:00**

Accuracy Directly Controlled Fast Direct Solutions of General H2-Matrices

Miaomiao Ma, Dan Jiao, Purdue University, United States

TU-A3.1P.4 **14:20**

Accelerated Randomized vs. Deterministic Algorithms for MoM Blocks' Low-Rank Factorization

Yaniv Brick, Ali E. Yilmaz, The University of Texas at Austin, United States

TU-A3.1P.5 **14:40**

Hybrid Cross Approximation for Electric Field Integral Equation Based Scattering Analysis

Yu Zhao, Shanghai Jiao Tong University, China; Dan Jiao, Purdue University, United States; Junfa Mao, Shanghai Jiao Tong University, China

Break **15:00**

TU-A3.1P.6 **15:20**

Primal and Dual Wavelets for Fast Electric Field Integral Equation Solutions on Unstructured Meshes

Simon Adrian, Technical University of Munich, Germany; Francesco P. Andriulli, École Nationale Supérieure Mines-Télécom Atlantique (IMT Atlantique), France; Thomas F. Eibert, Technical University of Munich, Germany

TU-A3.1P.7 **15:40**

On the Low-Frequency and Refinement Regularization of the Reduced Kernel Wire EFIE

Adrien Merlini, Axelle Pillain, IMT Atlantique, France; Kristof Cools, The University of Nottingham, United Kingdom; Francesco P. Andriulli, IMT Atlantique, France

TU-A3.1P.8 **16:00**

Enhancing the Jacobi Method with the CBFM for array antenna analysis

Danie Ludick, Matthys Botha, Stellenbosch University, South Africa; Rob Maaskant, Chalmers University of Technology, Sweden; David Davidson, Stellenbosch University, South Africa

TU-A3.1P.9 **16:20**

Skeletonization Accelerated Multilevel Fast Multipole Algorithm for Volume Integral Equation

Yan-Nan Liu, Xiao-Min Pan, Xin-Qing Sheng, Beijing Institute of Technology, China

TU-A3.1P.10 **16:40**

Fast Solution of Linear Systems With Many Right Hand Sides Using MPI Parallel Skeletonization

Si-Lu Huang, Xiao-Min Pan, Xin-Qing Sheng, Beijing Institute of Technology, China

Impedance Matching Devices, Circuits and Techniques

Session Co-Chairs: Deb Chatterjee, University of Missouri, Kansas city; Muhammed Zuboraj, The Ohio State University

TU-A1.2P.1 **13:20**

Passive and Active Matching of Electrically-Small Helical Antenna for HF-Band Communications

Gitansh Gulati, University of Arizona, United States; Ahmed Abdelrahman, University of Colorado Boulder, United States; Qi Tang, Min Liang, Tamal Bose, Hao Xin, University of Arizona, United States

TU-A1.2P.2 **13:40**

Comparison of S-parameters of Wide-band Planar Baluns

Kuniaki Suto, Akinori Matsui, Saitama Institute of Technology, Japan

TU-A1.2P.3 **14:00**

Measured performances of coaxial-to-circular waveguide transitions

Tetsuya Yamamoto, Kei Urabe, Hiroshi Tsuda, AIST, Japan

TU-A1.2P.4 **14:20**

Planar Sleeve Antenna with Left-handed Choke Structure

Takatsugu Fukushima, Naobumi Michishita, Hisashi Morishita, National Defense Academy, Japan; Naoya Fujimoto, Hitachi Kokusai Electric Inc., Japan

TU-A1.2P.5 **14:40**

A Novel T-junction Waveguide Power Divider with Anti-phases and Broad Bandwidth

Peng Zhao, Qingyuan Wang, Fan Zhang, Xi He, School of Physical Electronics, China

Break **15:00**

TU-A1.2P.6 **15:20**

Characteristic Modes for U-Slot's Feed Placement

Mahrukh Khan, Deb Chatterjee, University of Missouri-Kansas City, United States

TU-A1.2P.7 **15:40**

Compact Single/Multi Bands Frequency Reconfigurable Antenna Using PIN Diode Controlled Meta-surface

Ahmed Zahran, Future University in Egypt, Egypt; Mahmoud A. Abdalla, Military Technical College, Egypt

TU-A1.2P.8 **16:00**

Wideband and Compact Microstrip Tapered Balun with Circular Slot and Double Dielectric Layer

Seung Gook Cha, Chan Ju Park, Young Joong Yoon, Yonsei University, Republic of Korea; Hyungrak Kim, Daelim University College, Republic of Korea

TU-A1.2P.9 **16:20**

A three-port reconfigurable network for muti-polarization antenna applications

Linfeng Yuan, Xianling Liang, Haijun Fan, Maohua Zhu, Weiren Zhu, Junping Geng, Ronghong Jin, Shanghai Jiao Tong University, China

TU-A1.2P.10 **16:40**

The Impact of Introduced Coupling Elements on Characteristic Mode

Zhipeng Liang, Jun Ouyang, Min Gao, Xuewu Cui, University of Electronic Science and Technology of China, China

Electrically Small Antennas for MIMO WLAN and 5G

Session Co-Chairs: Wei Lin, University of Technology Sydney; Francisco Falcone, Universidad Pública de Navarra

TU-A1.3P.1 **13:20**

Ultra-Low Profile Tri-Polarized Antenna for WLAN/MIMO Application

Komlan Payne, Syracuse University, United States; Taehee Jang, JMA Wireless, United States; Jun H. Choi, Syracuse University, United States

TU-A1.3P.2 **13:40**

A New Design System for Low Profile Inverted L Antenna Including a Matching Circuit

Takashi Yamagajo, Yohei Koga, Manabu Kai, Fujitsu Laboratories Limited, Japan

TU-A1.3P.3 **14:00**

Compact Wideband Circularly Polarized Antipodal Curvedly Tapered Slot Antenna

Xiaohe Cheng, Beijing University of Posts and Telecommunications Beijing, China; Yuan Yao, Beijing University of Posts and Telecommunications, China; Xiaoming Liu, Limei Qi, Zhijiao Chen, Junsheng Yu, Beijing University of Posts and Telecommunications Beijing, China; Xiaodong Chen, Queen Mary University of London, United Kingdom

TU-A1.3P.4 **14:20**

A Triple-Band Hybrid-mode GPS/WLAN Antenna for Smart Phone with Full Metal Housing

Yixin Li, Xiaojun Tang, Yumei Yu, Wei Shi, Guangli Yang, Shanghai University, China

Wideband Feeds for Directional Antennas

Session Co-Chairs: Maxim Ignatenko, University of Colorado Boulder; Ming Huang, Southwest China Institute of Electronic Technology

TU-A1.4P.1 **13:20**

Feed Study for a Wideband 18 to 45 GHz Luneburg Lens Antenna

Milica Notaros, Maxim Ignatenko, Dejan Filipovic, University of Colorado Boulder, United States

TU-A1.4P.2 **13:40**

The Modified J-Pole: A Wideband End-Fed Half-Wave Dipole for a VHF Reflector Feed System

Steven Ellingson, Virginia Tech, United States

TU-A1.4P.3 **14:00**

Wideband High Gain Circularly Polarized Fabry-Perot Resonator Antenna with Asymmetric Superstrates

Huy Hung Tran, Korea Advanced Institute of Science and Technology (KAIST), Republic of Korea; Truong Khang Nguyen, Ton Duc Thang University, Viet Nam

TU-A1.4P.4 **14:20**

Integrated calibration noise coupler for room temperature SKA Band 1 feed system

Jonas Flygare, Bhushan Billade, Magnus Dahlgren, Bo Wästberg, Miroslav Pantaleev, Chalmers University of Technology, Sweden

TU-A1.4P.5 **14:40**

A Compact Broadband Switched Beam Antenna With 360º Multibeam Scanning/ Omnidirectional Coverage

Ming Huang, Southwest China Institute of Electronic Technology, China

Sensors, Filters and Polarizers

Session Co-Chairs: Abe Akhiyat, Ohio State University; Mehmet Unlu, Ankara Yildirim Beyazit University

TU-UD.1P.1 **15:20**

Terahertz Slotted Ring Resonator Sensor

Hadi Amarloo, Safieddin Safavi-Naeini, University of Waterloo, Canada

TU-UD.1P.2 **15:40**

Full-wave Analysis and Equivalent Circuit Extraction for Capacitive Touch Panels: Theory and Measurements

Andrea Luettgen, Sameer Sharma, Degen Zhou, University of Toronto, Canada; Darren Leigh, Tactual Labs, Canada; Costas D. Sarris, University of Toronto, Canada

TU-UD.1P.3 **16:00**

Finite-size passive narrow bandpass filters for shortwave infrared (SWIR) region

Umar Hasni, Umit Ozgur, Erdem Topsakal, Virginia Commonwealth University, United States

TU-UD.1P.4 **16:20**

Ultra-compact Broadband TE-pass Polarizer Based on Vanadate-nanowire-integrated SOI Waveguides

Yusheng Bian, Lei Kang, Qiang Ren, Ping Werner, Douglas H. Werner, The Pennsylvania State University, United States

Biomedical Microwave to THz Imaging

Session Chair: Abas Sabouni, Wilkes University

TU-A5.1P.1 **13:20**

A Large-scale Clinical Trial of Radar-based Microwave Breast Imaging for Asian Women: Phase I

Fan Yang, Southern University of Science and Technology, China; Lin Sun, Zhenhua Hu, Huihai Wang, Dan Pan, Rui Wu, Xiaofeng Zhang, Shenzhen ET Medical Technology Co., Ltd., China; Yifan Chen, The University of Waikato; Southern University of Science and Technology, New Zealand; Qingfeng Zhang, Southern University of Science and Technology, China

TU-A5.1P.2 **13:40**

Detection of the Cervical Spondylotic Myelopathy Using Noninvasive Microwave Imaging Technique

Sanad Al Muqatash, Mahsa Khamechi, Abas Sabouni, Wilkes University, United States

TU-A5.1P.3 **14:00**

Permittivity Estimation for Improved Microwave Medical Imaging

Ali Zamani, Amin Abbosh, The University of Queensland, Australia

TU-A5.1P.4 **14:20**

Surface Estimation of Imaged Object in Microwave Medical Imaging

Ali Zamani, Amin Abbosh, The University of Queensland, Australia

TU-A5.1P.5 **14:40**

Stroke Detection Based on an Improved Artificial Fish Swarm Algorithm

Jun-Bin Li, Ming-Da Zhu, Yi-Zhi Wu, Sheng Ye, Donghua University, China

Break **15:00**

TU-A5.1P.6 **15:20**

Microwave time reversal mirror for breast tumor detection

Saptarshi Mukherjee, Yiming Deng, Lalita Udpa, Satish Udpa, Prem Chahal, Edward Rothwell, Michigan State University, United States

TU-A5.1P.7 **15:40**

High-resolution Polarimetric THz Imaging for Biomedical Applications

Nandhini Srinivasan, Cosan Caglayan, Niru K. Nahar, Kubilay Sertel, The Ohio State University, United States

TU-A5.1P.8 **16:00**

Near-Field Tapered Waveguide Probe Operating at Millimeter Waves for Skin Cancer Detection

Umair Khokhar, Syed Akbar Raza Naqvi, Noor Al-Badri, Konstanty S. Bialkowski, Amin Abbosh, The University of Queensland, Australia

TU-A5.1P.9 **16:20**

Compressed thermoacoustic imaging based on stochastic binary amplitude modulation

Zhi Chen, Xiong Wang, ShanghaiTech University, China

Propagation in Indoor, Urban and Terrestrial Environments

Session Co-Chairs: Christophe Caloz, École Polytechnique de Montréal; Reuven Shavit, Ben Gurion University

TU-A4.1P.1 **13:20**

Effects of Ionospheric Scintillation on V and W Band Signals

David R. Smith, Bertus Shelters, Derek Hesser, Peter Collins, IEEE, United States; James Fee, James Petrosky, American Nuclear Society, United States; Andrew Terzuoli, Institute of Electrical & Electronics Engineers (IEEE), USA, United States; Caglar Yardim, IEEE, United States

TU-A4.1P.2 **13:40**

A Review of the Radio Wave Propagation through Vegetation

Maryam Dehghani Estarki, Simon Fraser university, Canada; Chris Hynes, Andrew Lea, Fastback Networks, Canada; Rodney G Vaughan, Simon Fraser university, Canada

TU-A4.1P.3 **14:00**

Radio-Channel Characterization of an Underground Mine using Circularly polorized antennas at 2.4 GHz

Lamia Arabi, Université du Québec en Abitibi-Témiscamingue, Canada; Moulay Elhassan El Azhari, University of quebec in outaouais, Canada; Mourad Nedil, Nahi Kandil, Mohamedlamine Seddiki, Université du Québec en Abitibi-Témiscamingue, Canada; Larbi Talbi, University of quebec in outaouais, Canada

TU-A4.1P.4 **14:20**

On the Shadowing Distribution for Ultra Wideband In-Body Communication Path Loss Modeling

Jan-Christoph Brumm, Gerhard Bauch, Hamburg University of Technology, Germany

TU-A4.1P.5 **14:40**

Quantifying the degradation on radar detection range through vegetation clutter

Paula Gómez-Pérez, Centro Universitario de la Defensa, Spain; Marcos Crego-García, Iñigo Cuiñas, Universidade de Vigo, Spain

Break **15:00**

TU-A4.1P.6 **15:20**

Impact of NLOS on the Path Loss and Channel Capacity of a MIMO Off-body System Inside a Mine

Moulay Elhassan El Azhari, Larbi Talbi, university of quebec in outaouais, Canada; Mourad Nedil, Ismail Benmabrouk, Université du Québec en Abitibi-Témiscamingue, Canada

TU-A4.1P.7 **15:40**

NLOS Capacity and Time dispersion of a Multipath Fading MIMO Channel Using Directive Antennas in an Underground WBAN Application

Moulay Elhassan El Azhari, Larbi Talbi, University of quebec in outaouais, Canada; Mourad Nedil, Ismail Benmabrouk, Université du Québec en Abitibi-Témiscamingue, Canada

TU-A4.1P.8 **16:00**

Sub/Super-Luminal Space-Time Slab: Fundamental Scattering Symmetries

Zoé-Lise Deck-Léger, Christophe Caloz, Polytechnique Montréal, Canada

TU-A4.1P.9 **16:20**

A Novel Ultrawideband FDTD Numerical Modeling of Ground Penetrating Radar on Arbitrary Dispersive Soils

Luciano Mescia, Politecnico di Bari, Italy; Pietro Bia, EmTeSys s.r.l., Italy; Diego Caratelli, The Antenna Company Nederland B.V., Netherlands

TU-A4.1P.10 **16:40**

Troposcatter Transmission Loss Subsectoin Model

Peipei Wei, Xiaoyan Du, Haiyan Yu, National Digital Switching System Engineering & Technology R&D Center (NDSC), China; Jianhui Liu, National Digital Switching System Engineering & Technology R&D Center (NDSC), Aarhus University Aarhus, China

Tuesday, July 11 13:20 - 15:00
TU-UC.1P Torrey Hills AB

Recent Developments in Scattering and Propagation Modeling and Experiments

Session Co-Chairs: David Michelson, University of British Columbia; Muhammad Dawood, new Mexico State University

TU-UC.1P.1 **13:20**

Evaluation of transmission quality of indoor users using low site base station with vertical multi-beams

Tsutomu Mitsui, Kentaro Nishimori, Niigata University, Japan; Takefumi Hiraguri, Nippon Institute of Technology, Japan

TU-UC.1P.2 **13:40**

Phase Error Compensation in Fourier Domain for Fast Autofocus of Spotlight SAR

Jin-Woo Kim, In-June Hwang, Hye-Won Jo, Ghoo Kim, Jong Sang Yoo, Jong-Won Yu, Korea Advanced Institute of Science and Technology (KAIST), Republic of Korea

TU-UC.1P.3 **14:00**

A new propagation model for massive MIMO considering outdoor propagation characteristics at 20GHz band

Ryotaro Taniguchi, Kentaro Nishimori, Niigata University, Japan; Ngochao Tran, Koshiro Kitao, Tetsuro Imai, NTT DOCOMO, INC., Japan

TU-UC.1P.4 **14:20**

Application of Earth-Space Path Loss as a Constraint in the Design of LEO Satellite Constellations

Ibrahim Sanad, David Michelson, University of British Columbia, Canada

TU-UC.1P.5 **14:40**

Target Detection and Classification for Laptop Based SAR Radar using Support Vector Machines

Irving Delgado, Muhammad Dawood, New Mexico State University, United States

Tuesday, July 11 15:20 - 17:00
TU-UC.2P Torrey Hills AB

Advances in Hardware for MM-Wave Communcations and RADAR

Session Co-Chairs: Thomas Fromenteze, University of Limoges; Mahmoud Abdalla, Military Technical College

TU-UC.2P.1 **15:20**

Fully Polarimetric FMCW Instrumentation Radar at 228 GHz

Adib Nashashibi, Badeea Alazem, Kamal Sarabandi, University of Michigan, United States

TU-UC.2P.2 **15:40**

95/190 GHz Push-Push VCO in 90 nm CMOS

Yo-Sheng Lin, Kai-Siang Lan, Yu-Ching Lin, Yun-Wen Lin, National Chi Nan University, Taiwan

TU-UC.2P.3 **16:00**

94 GHz VCO Using Negative Capacitance Technique

Yo-Sheng Lin, Kai-Siang Lan, Yun-Wen Lin, Ming-Yuan Chuang, National Chi Nan University, Taiwan

TU-UC.2P.4 **16:20**

Estimate of Harmonic Loadpull Impedances for RF High Power Devices Using 3D FEM Simulation

Ning Zhu, Damon Holmes, Zackary Cavin, Ebrahim Seragi, Jeffrey Jones, NXP Semiconductors, United States

TU-UC.2P.5 **16:40**

94 GHz CMOS Down-Conversion Micromixer

Yo-Sheng Lin, Kai-Siang Lan, Ching-Hung Peng, Yun-Wen Lin, National Chi Nan University, Taiwan

Tuesday, July 11 13:20 - 15:00
TU-A1.5P Solana Beach

Array, Lens and SIW Antennas

Session Co-Chairs: Xuan Hui Wu, Minnesota State University; Meisong Tong, Tonji University

TU-A1.5P.1 **13:20**

Sectoral H-plane SBFSS-SIW Horn Antenna

Nuria Esparza, Pablo Alcón, Luis Fernando Herrán, Fernando Las-Heras Andres, University of Oviedo, Spain

TU-A1.5P.2 **13:40**

A Novel SMA Fed Substrate Integrated E-plane Horn Antenna

Zhewei Gu, Xuan Hui Wu, Minnesota State University, United States

TU-A1.5P.3 **14:00**

Waveguide-based Monopulse Wideband Travelling-Wave Array

Gokhan Gultepe, Doganay Dogan, Aselsan A.S., Turkey; Ozlem Aydin Civi, Middle East Technical University, Turkey

TU-A1.5P.4 **14:20**

A Compact All-Textile On-Body SIW Antenna for IoT Applications

Hojoo Lee, Jaehoon Choi, Hanyang University, Republic of Korea

TU-A1.5P.5 **14:40**

Broadband Dual-Polarized High Gain Lens Antenna Array for Base Station Applications

Wei-Ji Chen, Joseph Poujiong Wang, Industrial Technology Research Institute (ITRI), Taiwan; Li-Ruei Kuo, Wha Yu Industrial Co. Ltd, Taiwan

Tuesday, July 11 15:20 - 16:40
TU-A1.6P Solana Beach

SIW-Based Leaky-Wave Antennas

Session Co-Chairs: Nghia Nguyen-Trong, University of Adelaide; Meisong Tong, Tonji University

TU-A1.6P.1 **15:20**

Pattern Synthesis of Stub-Loaded Half-Mode Substrate-Integrated Leaky-Wave Antenna

Nghia Nguyen-Trong, University of Adelaide, Australia; Leonard Hall, Defence Science and Technology Group, Australia; Christophe Fumeaux, University of Adelaide, Australia

TU-A1.6P.2 **15:40**

Design of a Periodic Substrate-Integrated-Waveguide Leaky-Wave Antenna

M. A. Shokry, A. M. Allam, German University Cairo, Egypt; Raed Shubair, Khalifa University & MIT, United Arab Emirates

TU-A1.6P.3 **16:00**

A Novel Double-Layer Leaky-Wave Antenna Array for Radiation Efficiency Improvement Based on Substrate Integrated Waveguide

Yunjie Geng, Junhong Wang, Beijing Jiaotong University, China

TU-A1.6P.4 **16:20**

A SIW based Leaky-Wave Antenna for 5 GHz Narrowbeam Applications

Memoona Farooq, Muhammad Umar Khan, Hammad M. Cheema, National University of Sciences & Technology, Pakistan

Emerging Techniques in Imaging at Microwave, mmWave and THz Frequencies

Session Co-Chairs: Okan Yurduseven, CMIP - Duke University; Thomas Fromenteze, University of Limoges; Jonah Gollub, Duke University; Mohammadreza F. Imani, Duke University; David Smith, Duke University

WE-SP.1A.1 **08:00**

Optimized Metasurface Apertures for Human-Scale Millimeter Wave Computational Imaging System

David R. Smith, Okan Yurduseven, Daniel L. Marks, Jonah N. Gollub, Duke University, United States

WE-SP.1A.2 **08:20**

Millimeter wave computational interferometric radiometer

Cyril Decroze, Ettien Lazare Kpre, Moctar Mouhamadou, Thomas Fromenteze, University of Limoges, France; Sebastien Reynaud, CISTEME, France

WE-SP.1A.3 **08:40**

High Transmit Power and High Transmit/Receive Isolation in a 183 GHz FMCW Radar

Ken Cooper, Raquel Monje, Jose Siles, Matthew Lebsock, Jet Propulsion Laboratory, California Institute of Technology, United States

WE-SP.1A.4 **09:00**

Compressive Sensing Based Threat Object Detection using Reconfigurable Reflectarray

Min Liang, University of Arizona, United States; Ahmed Abdelrahman, The University of Colorado Boulder, United States; Mark Neifeld, Hao Xin, University of Arizona, United States

WE-SP.1A.5 **09:20**

Single-bit Compressive Imaging System for the mmW and THz Bands

Syed An Nazmus Saqueb, Kubilay Sertel, The Ohio State University, United States

Break **09:40**

WE-SP.1A.6 **10:00**

Wideband Archimedean Spiral Antenna for Millimeter-wave Imaging Array

Mark Jones, David Sheen, Jonathan Tedeschi, Pacific Northwest National Laboratory, United States

WE-SP.1A.7 **10:20**

Single-pixel mm-Wave Imaging Using 8-bits Metamaterial-based Compressive Reflector Antenna

Ali Molaei, Juan Heredia Juesas, Jose A. Martinez-Lorenzo, Northeastern University, United States

WE-SP.1A.8 **10:40**

Super Resolution For Microwave Imaging: A Deep Learning Approach

Pratik Shah, Mahta Moghaddam, University of Southern California, United States

WE-SP.1A.9 **11:00**

Wavefront shaping of microwaves using tunable reflectarrays for radar, imaging and wireless communications

Philipp del Hougne, Matthieu Dupré, Mathias Fink, Fabrice Lemoult, Geoffroy Lerosey, Institut Langevin - ESPCI ParisTech & CNRS, France

WE-SP.1A.10 **11:20**

Frequency-Domain Interferometric Imaging and Velocity Vector Estimation using Networked Ultra-wideband 80-GHz Array Radar Systems

Takuya Sakamoto, University of Hyogo, Japan; Toru Sato, Kyoto University, Japan; Kenta Iwasa, Hidekuni Yomo, Panasonic Corporation, Japan

Automotive Antennas

Session Co-Chairs: Hyok Song, HRL Laboratories, LLC; Timothy Talty, General Motors

WE-SP.2A.1 **08:00**

Vehicular Roof Antenna Cavity for Coverage at Low Elevation Angles

Gerald Artner, Robert Langwieser, Christoph Mecklenbräuker, Technische Universität Wien, Austria

WE-SP.2A.2 **08:20**

Electromechanical Loading of Frequency Selective Surfaces

Walter Wall, Hyok Song, James Schaffner, HRL Laboratories, LLC, United States

WE-SP.2A.3 **08:40**

Design and Integration of High Precision GPS/GNSS Antennas for Modern Cars

Peter Thimm, Rahul Batra, Martin Kuhn, Hirschmann Car communication GmbH, Germany

WE-SP.2A.4 **09:00**

Cellular Antenna Element Design Impact to Integration on Vehicle (Cellular Antenna Element Performance)

Leo Lanctot, Ford Motor Company, United States

WE-SP.2A.5 **09:20**

Optimal Numerical Analysis of Electronically-Steered Arrays Onboard Electrically-Large Platforms

Derek Campbell, C. J. Reddy, Altair Engineering Inc, United States

Break **09:40**

WE-SP.2A.6 **10:00**

Patterned Textured Fascia for 77 GHz Radar Propagation Variation Reduction

Arthur Bekaryan, Hyok Song, Kevin Geary, HRL Laboratories, LLC, United States; Igal Bilik, Jeremy Gray, General Motors, United States

WE-SP.2A.8 **10:40**

Multi-Coil Wireless Power Transfer System for Electric Vehicles

Manjunath Machnoor, Erik Gamez Rodriguez, Gianluca Lazzi, University of Utah, United States

WE-SP.2A.9 **11:00**

Array Antenna with Uniformly Excited Elements to Realize an Equivalent Arbitrary Field Distribution A key technology for mass-production antenna engineering

Tadashi Takano, Toshihiro Naganawa, Kuniaki Shibata, Kenji Saegusa, Nihon University, Japan

WE-SP.2A.10 **11:20**

Inkjet Printing of Antennas on Glass or Solar Cells

Muhammadeziz Tursunniyaz, Reyhan Baktur, Utah State University, United States

Active and Tunable Meta- and Nano-structures

Session Co-Chairs: Hossein Mosallaei, Northeastern University; Mohammad Albooyeh, University of California Irvine

WE-A2.1A.1 **08:00**

Periodic Structures for Scalable High-Power Microwave Transmitters

Aobo Li, University of California, San Diego, United States; Ebrahim Forati, TDK, United States; Sanghoon Kim, Jiyeon Lee, Yunbo Li, Daniel F. Sievenpiper, University of California, San Diego, United States

WE-A2.1A.2 **08:20**

Significant Efficiency Enhancements in High Power Backward Wave Oscillators using Inhomogeneous Slow Wave Structures

Ushemadzoro Chipengo, Niru K. Nahar, John L. Volakis, The Ohio State University - Electroscience Laboratory, United States

WE-A2.1A.3 **08:40**

A Vanadium Dioxide Integrated Hybird Metamaterial with Electrically Driven Multifunctional Control

Lei Kang, Liu Liu, Sawyer D. Campbell, Taiwei Yue, Qiang Ren, Theresa Mayer, Douglas H. Werner, The Pennsylvania State University, United States

WE-A2.1A.4 **09:00**

Multifunctional Metasurfaces Nanoantennas by Gate-Tunable Materials

Ali Forouzmand, Hossein Mosallaei, Northeastern University, United States

WE-A2.1A.5 **09:20**

Antenna-transmitter based on Non-Foster Source

Silvio Hrabar, Aleksandar Kiricenko, Igor Krois, University of Zagreb, Croatia

Break **09:40**

WE-A2.1A.6 **10:00**

Reconfigurable Nanowire Assembly Enabled Field-Switchable Broadband Polarizers

Lei Kang, Sarah Boehm, Taiwei Yue, Qiang Ren, Christine Keating, Douglas H. Werner, The Pennsylvania State University, United States

WE-A2.1A.7 **10:20**

Manipulating Light in Nanophotonics Devices Using Double-Metasurface Cavity

Luzhou Chen, Karim Achouri, Christophe Caloz, École Polytechnique de Montréal, Canada; Efthymios Kallos, Metamaterial Technologies Inc., Canada

WE-A2.1A.8 **10:40**

Graphene-based terahertz polarization converters

Tianjing Guo, Christos Argyropoulos, University of Nebraska-Lincoln, United States

WE-A2.1A.9 **11:00**

Nonlinear graphene metasurface to enhance third harmonic generation at terahertz frequencies

Boyuan Jin, Christos Argyropoulos, University of Nebraska-Lincoln, United States

WE-A2.1A.10 **11:20**

Design of A Reconfigurable Polarization Converter Based on RF Switches

Wei Li, Song Xia, Hongyu Shi, Guoxiang Dong, Anxue Zhang, Zhenrong Li, Zhuo Xu, Xi'an Jiaotong University, China

Electromagnetic Material Properties: Measurements

Session Co-Chairs: Maria Pour, University of Alabama in Huntsville; Jing Wang, University of South Florida

WE-A2.2A.1 **08:00**

Broadband Complex Permittivity Measurement of Paraffin Films at 26 GHz–1 THz Using Time Domain Spectroscopy

Behnam Ghassemiparvin, Nima Ghalichechian, The Ohio State University, United States

WE-A2.2A.2 **08:20**

Permittivity Measurement of Thin Dielectrics by Using Metamaterial Absorbers Inside a Waveguide

Filippo Costa, Marco Degiorgi, Michele Borgese, Agostino Monorchio, Giuliano Manara, University of Pisa, Italy

WE-A2.2A.3 **08:40**

Permittivity and Loss Characterization of Thin-Film Substrates up to 220 GHz

Patrick Seiler, Dirk Plettemeier, Technische Universität Dresden, Germany

WE-A2.2A.4 **09:00**

Effectiveness of a Dielectric Probe Calibration using Deionized, Distilled and Tap Water

Sajid Asif, Benjamin Braaten, North Dakota State University, United States; Adnan Iftikhar, COMSATS Institute of Information Technology, Pakistan

WE-A2.2A.5 **09:20**

Chiral Media Characterization using both Linear and Circular Polarized Waves

Gregorio J. Molina-Cuberos, María J. Núñez, José Margineda, University of Murcia, Spain; Angel J. García-Collado, Catholic University of San Antonio, Spain; Álvaro Gómez, Oscar Fernandez, University of Cantabria, Spain

Break **09:40**

WE-A2.2A.6 **10:00**

High-k and Low-loss Electromagnetic Composites for Direct Digital Manufacturing of mmWave Devices

Juan Castro, Eduardo A. Rojas-Nastrucci, Thomas Weller, Jing Wang, University of South Florida, United States

WE-A2.2A.7 **10:20**

Wireless System for the Measurement of Passive Electromagnetic Sensors in Laboratories

Gabriel Galindo-Romera, Javier Carnerero-Cano, José Juan Martínez-Martínez, Francisco Javier Herraiz-Martínez, Universidad Carlos III de Madrid, Spain

WE-A2.2A.8 **10:40**

A UWB Near-field Contactless Sensor for Solid and Liquid Material Characterization

Ali Pourghorban Saghati, Kamran Entesari, Texas A&M University, United States

WE-A2.2A.9 **11:00**

Magnetic Induced Heating of Gold-Iron Oxide Nanoparticles

Michael Brown, Kaitlin Coopersmith, Sarah Fulmer, Henry Sessions, Savannah River Nuclear Solutions, United States; Mohammod Ali, University of South Carolina, United States; Simona Murph, Savannah River Nuclear Solutions, United States

WE-A2.2A.10 **11:20**

Monte Carlo approach for investigating the fabrications imperfections for metasurface-lenses

Liyi Hsu, Boubacar Kanté, University of California, San Diego, United States

Novel Materials and Techniques for Reconfigurable Antennas

Session Co-Chairs: Dimitris Anagnostou, Heriot Watt University; Derek Doyle, Air Force Research Laboratory

WE-A1.1A.1 **08:00**

Design of Reconfigurable Meandered Line Dipole Antenna for Printed Graphene Applications

Ting Leng, Kewen Pan, Xianjun Huang, Zhirun Hu, University of Manchester, United Kingdom; Habiba Ouslimani, Université Paris Ouest Nanterre La Défense, France; Mahmoud A. Abdalla, MTC College, Egypt

WE-A1.1A.2 **08:20**

Mm-Wave 2D Beam-Steering Focal Plane Array with Microfluidically Switched Feed Network

Enrique González, Gokhan Mumcu, University of South Florida, United States

WE-A1.1A.3 **08:40**

Continuously Tunable Frequency Reconfigurable Liquid Metal Microstrip Patch Antenna

Khaled Alqurashi, James R. Kelly, University of Surrey, United Kingdom

WE-A1.1A.4 **09:00**

Phase agile BST-loaded dual resonance reflectarray design at K_a-Band

Michael Trampler, Xun Gong, University of Central Florida, United States

WE-A1.1A.5 **09:20**

A Configurable and Repeatable Multipath Channel Emulator

James Jamison, Blake Hewgill, Jeff Frolik, The University of Vermont, United States

Break **09:40**

WE-A1.1A.6 **10:00**

Separation of Overlapped Sources Using Subarray Technique and Independent Component Analysis

Paulo Ixtanio Leite Ferreira, Federal Inst. of Science and Tec. of Paraíba, IFPB, Brazil; Glauco Fontgalland, Federal University of Campina Grande, UFCG, Brazil

WE-A1.1A.7 **10:20**

A Digitally Tuned Reconfigurable Patch Antenna for IoT Devices

Fatima Asadallah, Joseph Costantine, American University of Beirut, Lebanon; Youssef Tawk, Notre Dame University Louaize, Lebanon; Leonardo Lizzi, Fabien Ferrero, University of Cote D'azur, France; Christos Christodoulou, University of New Mexico, United States

WE-A1.1A.8 **10:40**

A Dual Band Reconfigurable 64th Mode SIW- Inspired Antenna

Suvadeep Choudhury, Akhilesh Mohan, Indian Institute of Technology Kharagpur, India; Debatosh Guha, University of Calcutta, India

WE-A1.1A.9 **11:00**

Dual band reconfigurable plasmonic antenna using bilayer graphene

Sasmita Dash, Amalendu Patnaik, Indian Institute of Technology Roorkee, India

WE-A1.1A.10 **11:20**

Generations of radio vortex using circular time modulated arrays

Feng Lin, Yang Wang, Xiaorong Jing, Chongqing University of Posts and Telecommunications, China

Wideband Antennas for 5G, Full-Duplex, MIMO and AoA

Session Co-Chairs: Gabriel Rebeiz, University of California San Diego; Christophe Caloz, Polytechnique Montreal; Steven Ellingson, Virginia Tech

WE-A1.2A.1 **08:00**

The Advent of 5G Mobile

John Smee, Qualcomm Technologies Inc, United States

WE-A1.2A.3 **08:40**

Design of MAW Spiral Antennas for Direction-of-Arrival Sensing Using the Cramér-Rao Bound

Riley Pack, Dejan Filipovic, University of Colorado Boulder, United States

WE-A1.2A.4 **09:00**

A Spiral Antenna for Amplitude-Only Direction Finding

Gregor Lasser, Jake Cazden, Dejan Filipovic, University of Colorado, United States

WE-A1.2A.5 **09:20**

A Wideband Switched Beam Antenna System for 5G Femtocell Applications

Petros Bantavis, ENSTA - Bretagne, France; Christos Kolitsidas, B.L.G. Jonsson, KTH Royal Institute of Technology, Sweden; Tzihat Empliouk, George Kyriacou, Democritus University of Thrace, Greece

Break **09:40**

WE-A1.2A.6 **10:00**

Characterization of Dispersion Code Multiplexing (DCM) in Wireless Indoor Environment

Lianfeng Zou, Christophe Caloz, École Polytechnique de Montréal, Canada

WE-A1.2A.7 **10:20**

Wideband RF and Analog Self-Interference Cancellation Filter for Simultaneous Transmit and Receive System

Satheesh Bojja Venkatakrishnan, Elias Alwan, John L. Volakis, The Ohio State University, United States

WE-A1.2A.8 **10:40**

Processing Gain Using CDMA in Ultra-Wideband Multi-Channel Digital Beam-Formers

Dimitrios Siafarikas, Elias Alwan, John L. Volakis, The Ohio State University, United States

WE-A1.2A.9 **11:00**

Continuous Updating of Radio Environment Maps for Millimeter-Wave Networks with Beamforming

Steven Ellingson, Virginia Tech, United States

WE-A1.2A.10 **11:20**

Compact Wideband MIMO Antenna for 5G Communication

Wang Fei, Zhaoyun Duan, Qian Li, Yanyu Wei, Yubin Gong, University of Electronic Science and Technology of China, China

Applications of Computational Electromagnetics

Session Co-Chairs: Jianming Jin, University of Illinois at Urbana-Champaign; Maokun Li, Tsinghua University

WE-A3.1A.1 **08:00**

Electromagnetic Simulation of Specific Absorption Rate at 5G Frequencies with a Simplified Human Head Model and a Multi-Solver Method

Jian Guan, Su Yan, Jian-Ming Jin, University of Illinois at Urbana-Champaign, United States

WE-A3.1A.2 **08:20**

Quantitative Statistical Analysis with Physics-based Surrogate Modeling for Wave Chaotic Systems

Shen Lin, Zhen Peng, University of New Mexico, United States; Thomas Antonsen, University of Maryland, United States

WE-A3.1A.3 **08:40**

Quasi-static Analysis of Slotted Coaxial Cable

Jaeyul Choo, Hyun Shin Park, Youngsik Cho, Korea Institute of Nuclear Safety, Republic of Korea; Yong-Hwa Kim, Myongji University, Republic of Korea; Ho Joong Choi, Marvell Semiconductor, Inc, United States

WE-A3.1A.4 **09:00**

A Novel Input Impedance Computation Method for Coaxial Probe Fed Microstrip Antennas by Utilizing Characteristic Modes

Metehan Cetin, Aselsan A.S., Turkey; Lale Alatan, Middle East Technical University, Turkey

WE-A3.1A.5 **09:20**

Monostatic RCS Analysis for Armed and Unarmed UAV

Çaglayan Durlu, H. Taha Hayvaci, TOBB University of Economics and Technology, Turkey

Break **09:40**

WE-A3.1A.6 **10:00**

Wiener-Hopf Formulation of the Scattering by a Stepped Wedge

Vito Daniele, Guido Lombardi, Rodolfo S. Zich, Politecnico di Torino - ISMB, Italy

WE-A3.1A.7 **10:20**

An Integral Equation Scheme for Plasma based Thin Sheets

Hasan Abbas, Robert Nevels, Texas A&M University, United States

WE-A3.1A.8 **10:40**

Analysis on the characteristics of the EM wave propagation in the plasma sheath

Xin Yang, Bing Wei, Wei-ke Yin, Xidian University, China

WE-A3.1A.9 **11:00**

The Radial Point Interpolation Method for Plasma Modeling

Yang Wu, University of Electronic Science and Technology of China, China; Zhizhang (David) Chen, Dalhousie University, Canada; Junfeng Wang, University of Electronic Science and Technology of China, China

WE-A3.1A.10 **11:20**

Research on the Electromagnetic Wave Scattering Characteristics of Time and Space Inhomogeneous Plasma Sheath

Wei Chen, Lixin Guo, Jiangting Li, Xidian University, China

Numerical Techniques in Electromagnetics

Session Co-Chairs: Lijun Jiang, Hong Kong University; Kristof Cools, University of Nottingham

WE-A3.2A.1 **08:00**

Paralellization Efficiency of 2D MoM Code with Higher Order Basis Functions

Dragan Olcan, Jovana Perovic, University of Belgrade, Yugoslavia; Jasmin Music, Branko Kolundzija, WIPL-D d.o.o., Yugoslavia

WE-A3.2A.2 **08:20**

2.5D Quasi-Axisymmetric Finite Difference Frequency Domain Modeling

Ann Morgenthaler, Carey Rappaport, Northeastern University, United States

WE-A3.2A.3 **08:40**

Numerical Benchmark Based on Characteristic Modes of a Spherical Shell

Miloslav Capek, Vit Losenicky, Lukas Jelinek, CTU in Prague, Czech Republic; Mats Gustafsson, Doruk Tayli, Lund University, Sweden

WE-A3.2A.4 **09:00**

Antenna Termination Transformations in MoM

Nicholas Buris, NEBENS, United States

WE-A3.2A.5 **09:20**

Comparison of Two Forward Models For Electric Field of Microwave Imaging Systems

Samar Hosseinzadegan, Paul M. Meaney, Andreas Fhager, Mikael Persson, Chalmers University of Technology, Sweden

Break **09:40**

WE-A3.2A.6 **10:00**

Green's function in waveguides with inhomogeneous dielectrics using the method of Broadband Green's functions

Tien-Hao Liao, Jet Propulsion Laboratory, United States; Kung-Hau Ding, Air Force Research Laboratory, Wright-Patterson AFB, United States; Leung Tsang, University of Michigan, United States

WE-A3.2A.7 **10:20**

Machine Learning Based Method of Moments (ML-MoM)

Heming Yao, Lijun Jiang, The University of Hong Kong, Hong Kong SAR of China; Yuwei Qin, Carnegie Mellon University, United States

WE-A3.2A.8 **10:40**

A Fast Algorithm for Quasi-Periodic Array Modeling Using Reduced Basis Method

Xunwang Dang, Maokun Li, Tsinghua University, China

WE-A3.2A.9 **11:00**

An Efficient Preconditioner for Analysis of Composite Dielectric and Thin Conductive Plate Objects

Lu Liu, Zaiping Nie, Dingbang Wen, School of Electronic Engineering University of Electronic Science and Technology of China, China

WE-A3.2A.10 **11:20**

Hierarchical Loop-flower Basis Function for Low Frequency Breakdown Problem

Dingbang Wen, Zaiping Nie, Yiling Wang, Lu Liu, University of Electronic Science and Technology of China, China

Miniature Antennas and Metamaterial Devices

Session Co-Chairs: Sima Noghanian, University of North Dakota; John Volakis, Ohio State University

WE-UB.1A.1 **08:00**

Performance Analysis of Textile AMC Antenna on Body Model

Ala Alemaryeen, Sima Noghanian, University of North Dakota, United States

WE-UB.1A.2 **08:20**

A Multi-Channel Passive Brain Implant for Wireless Neuropotential Monitoring

Wei-Chuan Chen, Cedric W. Lee, Asimina Kiourti, John L. Volakis, The Ohio State University, United States

WE-UB.1A.3 **08:40**

Significant Size-Reduction and Wideband Response of Acoustic Metamaterials with Non-Foster Technologies

Yasushi Horii, Yuki Utoku, Toshiaki Kitamura, Kansai University, Japan

WE-UB.1A.4 **09:00**

Supershaped Complementary Split-Ring Resonators

Enrique Rubio Martínez-Dueñas, University of Granada, Spain; Carlos Moreno de Jong van Coevorden, Diego Caratelli, The Antenna Company, Netherlands

WE-UB.1A.5 **09:20**

A SIW Filter With Square Complementary Split-Ring Resonators (CSRRs)

Xiangou Zhang, Mengxia Yu, University of Electronic Science and Technology of China, China

Antenna Measurements

Session Co-Chairs: John Volakis, Ohio State University; Jennifer Bernhard, University of Illinois at Urbana-Champaign

WE-UB.2A.1 **10:00**

Improved Circuit Models for Wheeler Cap Efficiency Measurements

Elias Wilken-Resman, Jennifer T. Bernhard, University of Illinois at Urbana-Champaign, United States

WE-UB.2A.2 **10:20**

Approximating the Radiation Pattern of an Antenna in Complex Scenarios from Partial Information

Marco Righero, Giorgio Giordanengo, Matteo Alessandro Francavilla, Istituto Superiore Mario Boella, Italy; Francesca Vipiana, Giuseppe Vecchi, Politecnico di Torino, Italy

WE-UB.2A.3 **10:40**

Measurements and De-embedding Techniques for 5G Millimeter-wave Arrays

Brock DeLong, Elias Alwan, John L. Volakis, The Ohio State University, United States

WE-UB.2A.4 **11:00**

Polarization Ratio Determination with Two Identical Linearly Polarized Antennas

Herbert Aumann, University of Maine, United States; Francis Willwerth, Kristan Tuttle, Massachusetts Institute of Technology Lincoln Laboratory, United States

WE-UB.2A.5 **11:20**

Fiber-coupled Probe for Atom-based RF Electric Field Metrology

Matt Simons, Joshua Gordon, Christopher Holloway, National Institute of Standards and Technology, United States

Antenna Theory and Design

Session Co-Chairs: Amir I. Zaghloul, Army Research Laboratory; Kubilay Sertel, Ohio State University

WE-UB.3A.1 **08:00**

Using Machine Learning Techniques to Analyze Characteristic Mode Data of Electrically Large Structures

John Outwater, Jennifer T. Bernhard, University of Illinois at Urbana-Champaign, United States

WE-UB.3A.2 **08:20**

Modeling Printed Slot Antenna Properties Versus Slot Thickness Using a Signal Flow Graph Model

Brian Gibbons, Jennifer T. Bernhard, University of Illinois at Urbana-Champaign, United States

WE-UB.3A.3 **08:40**

An Investigation of Radiation from Slot Antennas Etched on Finite Ground Planes using Characteristic Mode Theory

Pallavi Sharma, Jennifer T. Bernhard, University of Illinois at Urbana-Champaign, United States

WE-UB.3A.4 **09:00**

5:1 Bandwidth, Dual-Polarized Dielectric Rod Antenna Using a Novel Feed Structure

Anas Abumunshar, Kubilay Sertel, The Ohio State University, United States

WE-UB.3A.5 **09:20**

Increased Bandwidth of a Dual Band and Dual Polarization Probe-fed Microstrip Antenna

Gregory Mitchell, Amir Zaghloul, U.S. Army Research Laboratory, United States

Break **09:40**

WE-UB.3A.6 **10:00**

On the Modelling of Antenna Pattern Performance Using Equivalent Source Distributions for Vehicle Antenna Placement Engineering

Richard Trembinski, University of Ottawa / Royal Canadian Navy, Canada; Derek McNamara, University of Ottawa, Canada

WE-UB.3A.7 **10:20**

Compact Expressions for Efficiency and Bandwidth of Modulated Metasurface Antennas

Gabriele Minatti, Marco Faenzi, Enrica Martini, University of Siena, Italy; Marco Sabbadini, European Space Agency, Netherlands; Stefano Maci, University of Siena, Italy

WE-UB.3A.8 **10:40**

Design and Comparison of Backward Helical and Spiral Antennas

Ali Mehrabani, Lotfollah Shafai, University of Manitoba, Canada

WE-UB.3A.9 **11:00**

Tri-Band Circularly Polarized Single Layer Patch Antenna for GPS Receivers

Aseim Elfrgani, C. J. Reddy, Altair Engineering Inc, United States

WE-UB.3A.10 **11:20**

A New Active Steering Antenna for IoT Devices

Jaakko Kyllonen, Olivier Pajona, Laurent Desclos, Alexandre Pradeau, Ethertronics, France

Reflector Analysis and Design

Session Co-Chairs: Erik Jorgensen, TICRA; Dirk De Villiers, Stellenbosch University; Yehuda Leviatan, Technion - Israel Institute of Technology

WE-A1.3A.1 **08:00**

An End-to-End Optimization Approach to Drastically Reduce Cross-polarization in Offset mmWave Reflector Antennas

Joshua Kovitz, Vignesh Manohar, Yahya Rahmat-Samii, University of California, Los Angeles, United States

WE-A1.3A.2 **08:20**

An Exact, Closed Form Solution to Reflector Shaping

George Cheng, Yong Zhu, Jan Grzesik, Allwave Corporation, United States

WE-A1.3A.3 **08:40**

Multi-Objective Optimization of Reflector Antennas using Kriging and Probability of Improvement

Dirk de Villiers, Stellenbosch University, South Africa; Ivo Couckuyt, Tom Dhaene, Ghent University, Belgium

WE-A1.3A.4 **09:00**

Computation of Reflector Contours for Gaussian Beam Shaping Phased Array Antenna Elements

Christian Koenen, Uwe Siart, Thomas F. Eibert, Technical University of Munich, Germany

WE-A1.3A.5 **09:20**

Aperture Efficiency Performance Limits of the SKA Reflector System

Robert Lehmensiek, EMSS Antennas, South Africa; Dirk de Villiers, Stellenbosch University, South Africa

Break **09:40**

WE-A1.3A.6 **10:00**

Efficient Surface Optimization of Large Dual Reflector Systems

Oscar Borries, Erik Jørgensen, Stig Busk Sørensen, Hans-Henrik Viskum, TICRA, Denmark

WE-A1.3A.7 **10:20**

Advanced Techniques for Grating Lobe Reduction for Large Deployable Mesh Reflector Antennas

Jakob Rosenkrantz de Lasson, Cecilia Cappellin, Rolf Jørgensen, TICRA, Denmark; Leri Datashvili, LSS, Germany; Jean-Christophe Angevain, ESTEC, Netherlands

WE-A1.3A.8 **10:40**

Development of a Circularly Polarized L-Band SAR Deployable Mesh Reflector Antenna for Microsat Earth Observation

Katia Nagamine Urata, Josaphat Tetuko Sri Sumantyo, Nobuyoshi Imura, Koichi Ito, Chiba University, Japan; Steven Gao, University of Kent, United Kingdom

WE-A1.3A.9 **11:00**

L Band Circularly Polarized Synthetic Aperture Radar onboard Microsatellite using Parabolic Mesh Antenna

Josaphat Tetuko Sri Sumantyo, Katia Nagamine Urata, Nobuyoshi Imura, Koichi Ito, Chiba University, Japan; Steven Gao, University of Kent, United Kingdom

Antenna and EM Interactions with the Human Body

Session Co-Chairs: Gianluca Lazzi, University of Utah; Asimina Kiourti, Ohio State University

WE-UK.1A.1 **08:00**

Safe and Efficient Powering of Biomedical Implants through Multi-coil Wireless Power Transfer

Erik Gamez Rodriguez, Manjunath Machnoor, Pragya Kosta, Gianluca Lazzi, University of Utah, United States

WE-UK.1A.2 **08:20**

Communication System Design for Magnetic Induction-Based Wireless Body Area Network

Negar Golestani, Mahta Moghaddam, University of Southern California, United States

WE-UK.1A.3 **08:40**

Classification of Human Motions Using a Single On-Body Antenna

Yang Li, Baylor University, United States; Youngwook Kim, California State University, Fresno, United States

WE-UK.1A.4 **09:00**

60 GHz SIW horn antenna : off-body performance comparison with 4 GHz UWB monopole antenna

Solofo Razafimahatratra, Julien Sarrazin, University Pierre and Marie Curie, France; Theodoros Mavridis, Luca Petrillo, Philippe De Doncker, Université Libre de Bruxelles, Belgium; Aziz Benlarbi-Delaï, University Pierre and Marie Curie, France

WE-UK.1A.5 **09:20**

Optically Transparent ISM Band Antenna for Wearable Medical Sensors

Ryan Green, Md Ullah, Vitaliy Avrutin, Umit Ozgur, Hadis Morkoc, Erdem Topsakal, Virginia Commonwealth University, United States

Break **09:40**

WE-UK.1A.6 **10:00**

Body-Worn 67:1 Bandwidth Antenna Using 3 Overlapping Dipole Elements

Cedric W. Lee, Dimitrios Papantonis, Asimina Kiourti, John L. Volakis, The Ohio State University, United States

WE-UK.1A.7 **10:20**

A Comparison of Solid, Mesh, and Segmented Broad Dipoles in Biological Environments

Kaitlin Hall, Andrew Chrysler, Cindy Furse, University of Utah, United States

WE-UK.1A.8 **10:40**

A Modified Bow-Tie Antenna for Contact-Based Heartbeats Detection Applications

Yingsong Li, Songjie Bi, Xiaoguang "leo" Liu, University of California, Davis, United States

WE-UK.1A.9 **11:00**

A Low Profile Circular Patch Loaded Monopole Antenna Embedded in a Manhole Cover

Eun-Suk Yang, Jung-Woong Yoo, Hae-Won Son, Chonbuk National University, Republic of Korea; Eun-Hee Kim, In-Hwan Lee, Electronics and Telecommunications Research Institute (ETRI), Republic of Korea

Random and Complex Media I

Session Co-Chairs: Saba Mudaliar, Air Force Research Laboratory; Akira Ishimaru, University of Washington

WE-UF.1A.1 **08:00**

Excitation of Seismic Pulse Coda Waves in Random Heterogeneous Earth

Akira Ishimaru, Yasuo Kuga, University of Washington, United States

WE-UF.1A.2 **08:20**

Truncation Effects in the Single Scatter Subtraction Approach

Kevin Diomedi, Gary Brown, Virginia Tech, United States

WE-UF.1A.3 **08:40**

Scattering of Electromagnetic Waves by Ocean Surfaces at L Band Based on Numerical 3D Solutions of Maxwell Equations

Tai Qiao, University of Michigan, Ann Arbor, United States; Tien-Hao Liao, Jet Propulsion Laboratory, United States; Leung Tsang, University of Michigan, Ann Arbor, United States; Simon Yueh, Jet Propulsion Laboratory, United States; Douglas Vandemark, University of New Hampshire, United States

WE-UF.1A.4 **09:00**

Brightness Temperature of Layered Media with Rough Surface via FDTD Method

Zhi-Hong Lai, Jean-Fu Kiang, National Taiwan University, Taiwan

Break **09:40**

WE-UF.1A.6 **10:00**

A Rayleigh-Ritz Approach to Green's Function of an Inhomogeneous Layer

Saba Mudaliar, Air Force Research Laboratory, United States; C. P. Vendhan, Indian Institute of Technology Madras, India; C. Prabavathi, Research Professional, United States

WE-UF.1A.7 **10:20**

Terrain Clutter Simulation Using Rough Surface Scattering Models with Digital Elevation Data and National Land Cover Data

James Park, Air Force Research Laboratory, United States; Ryan Shaver, Michael Saville, Wright State University, United States; Scott Gabert, Panos Tzanos, Kristopher Kim, Air Force Research Laboratory, United States; Joel Johnson, The Ohio State University, United States; Kung-Hau Ding, Air Force Research Laboratory, United States

WE-UF.1A.9 **11:00**

Micro-Doppler Study of an Array of Rotating Spheres

Sara Wheeland, Oren Sternberg, Drew Overturf, John Meloling, SPAWAR Systems Center Pacific, United States

WE-UF.1A.10 **11:20**

Parametric Inversion of 3D Anisotropic Permittivities from Scattered Electromagnetic Fields

Lin Sun, Youngstown State University, China

Magnetic Resonance Imaging

Session Co-Chairs: Ji Chen, University of Houston; Gregory Noetscher, Worcester Polytechnic Inst.

WE-A5.1A.1 **08:00**

Impacts of RF Shimming on Local SAR Caused by MRI 3T Birdcage Coil near Femoral Plate Implants

Qi Zeng, Ran Guo, Jianfeng Zheng, Ji Chen, University of Houston, United States

WE-A5.1A.2 **08:20**

Metamaterial Loop Body Coil Element for 10.5T MRI

Vijayaraghavan Panda, Gregor Adriany, University of Minnesota, United States; Thomas Vaughan, Columbia University, United States; Anand Gopinath, University of Minnesota, Twin Cities, United States

WE-A5.1A.3 **08:40**

A New Medical Implant Lead for 1.5 T, 3 T, and 7 T MRI Systems

Rupam Das, Hyoungsuk Yoo, University of Ulsan, Republic of Korea

WE-A5.1A.4 **09:00**

Fast Prediction of MRI RF-induced Heating For Implantable Plate Devices Using Neural Network

Jianfeng Zheng, Rui Yang, Ji Chen, University of Houston, United States

WE-A5.1A.5 **09:20**

RF-induced Heating Comparison between TEM and Birdcage Coils for Circular External Fixator

Rui Yang, Jianfeng Zheng, Xin Huang, Ji Chen, University of Houston, United States

Break **09:40**

WE-A5.1A.6 **10:00**

Flexible RF Coil Array System Utilizing Electro-textiles for 3T MRI Carotid Artery Imaging

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

WE-A5.1A.7 **10:20**

Numerical evaluation of RF-induced heating for gap and pitch variation of helical stent under MRI

Xiaohe Ji, Jianfeng Zheng, Ji Chen, University of Houston, United States

WE-A5.1A.8 **10:40**

Comparison of in-vivo and in-vitro MRI RF Heating for Orthopedic Implant at 3 Tesla

Ran Guo, Jianfeng Zheng, Ji Chen, University of Houston, United States

Electromagnetic Metasurfaces

Session Co-Chairs: Valentina Sozio, Istituto Superiore Mario Boella; Muhammed Zuboraj, Los Alamos National Laboratory

WE-UB.4A.1 **08:00**

Magnet-free Non-reciprocal Graphene Metasurfaces at THz Frequencies

Dimitrios Sounas, The University of Texas at Austin, United States; Tianjing Guo, Christos Argyropoulos, The University of Nebraska-Lincoln, United States; Andrea Alù, The University of Texas at Austin, United States

WE-UB.4A.2 **08:20**

Coding Metasurfaces for Diffuse Scattering: Theoretical Bounds and Sub-Optimal Design

Massimo Moccia, University of Sannio, Italy; Shuo Liu, Rui Yuan Wu, Southeast University, China; Giuseppe Castaldi, University of Sannio, Italy; Antonello Andreone, University of Naples, Italy; Tie Jun Cui, Southeast University, China; Vincenzo Galdi, University of Sannio, Italy

WE-UB.4A.3 **08:40**

Demonstration of Negative-Index Metasurface Composed of Concentric Copper-Dielectric Spheres

Boris Tomasic, Kasandra Maxwell, Air Force Research Laboratory, United States; Thomas Steffen, Defense Engineering Co., United States; Justin Wheatcroft, BerrieHill Co, United States

WE-UB.4A.4 **09:00**

Losses Estimation in Liquid-Crystal-Based Reconfigurable Slotted Metasurfaces

Santi Concetto Pavone, Enrica Martini, Francesco Caminita, Matteo Albani, Stefano Maci, University of Siena, Italy

WE-UB.4A.5 **09:20**

Metasurface Waveguide for Wireless Information Transfer from Sensors inside High-power Motors

Qingbi Liao, Mats Bengtsson, Nathaniel Taylor, Mallikarjun Kande, Oscar Quevedo-Teruel, KTH Royal Institute of Technology, Sweden

Break **09:40**

WE-UB.4A.6 **10:00**

Dual-band modulated metasurface antennas

Marco Faenzi, University of Siena, Italy; David González Ovejero, Institut d'Électronique et de Télécommunications de Rennes - UMR CNRS 6164, France; Gabriele Minatti, University of Siena, Italy; Enrica Martini, Francesco Caminita, Wave Up Srl, Italy; Marco Sabbadini, European Space Agency, Netherlands; Stefano Maci, University of Siena, Italy

WE-UB.4A.7 **10:20**

Electrically Tunable Metasurfaces Based on Transparent Conducting Al-doped ZnO

Jun Ding, The University of Massachusetts Lowell, United States; David George, The University of North Texas, United States; Sensong An, Bowen Zheng, The University of Massachusetts Lowell, United States; Yuankun Lin, The University of North Texas, United States; Hualiang Zhang, The University of Massachusetts Lowell, United States

WE-UB.4A.8 **10:40**

Towards Addressable and Reconfigurable Metasurfaces: Utilizing Active and Passive Variants of the Capacitive-Loaded Loop (CLL) Element for the Design of Modulated Metasurface Antennas

John Hodge, Virginia Tech, United States; Amir Zaghloul, U.S. Army Research Laboratory, United States

WE-UB.4A.9 **11:00**

Metasurfaces with Engineered Reflection and Transmission Properties Based on Asymmetric Resonators

Hamidreza Chalabi, Dimitrios Sounas, Andrea Alù, The University of Texas at Austin, United States

WE-UB.4A.10 **11:20**

Adiabatic Mode Formulation for Conical Metahorn

Valentina Sozio, Istituto Superiore Mario Boella, Italy; Marco Faenzi, University of Siena, Italy; Matteo Alessandro Francavilla, Istituto Superiore Mario Boella, Italy; Enrica Martini, Francesco Caminita, University of Siena; Wave Up s.r.l., Italy; Marco Sabbadini, European Space Agency, Netherlands; Stefano Maci, University of Siena, Italy; Giuseppe Vecchi, Politecnico di Torino, Italy

Loaded Antennas for Next Generation Radar and Communications

Session Co-Chairs: Diego Caratelli, The Antenna Company; A.Bart Smolders, Eindhoven University of Technology

WE-SP.1P.1 **13:20**

Frequency Selective Surface for Spatial Filtering of Wide-Angle Scanning Phased Arrays

Cristina Yepes, Daniele Cavallo, Andrea Neto, Delft University of Technology, Netherlands; Erio Gandini, Stefania Monni, Frank van Vliet, TNO Defense, Safety and Security, Netherlands

WE-SP.1P.2 **13:40**

Tunable Piezo-actuated High Impedance Surfaces for Beam Steered Millimeter Wave Antennas

Alexandros Feresidis, University of Birmingham, United Kingdom

WE-SP.1P.3 **14:00**

Deflecting superstrate solutions for wide-scanning array

Fabrizio Silvestri, Giampiero Gerini, Erio Gandini, Stefania Monni, Netherlands Organisation for applied scientific research, Netherlands; Alice Benini, Enrica Martini, Stefano Maci, Maria Carolina Viganò, Giovanni Toso, University of Siena, Italy

WE-SP.1P.4 **14:20**

Reactively Loaded Arrays Based on Overlapping Sub-Arrays with Flat-Top Radiation Pattern

Ronis Maximidis, Bart Smolders, Eindhoven University of Technology, Netherlands; Giovanni Toso, European Space Agency, ESA/ESTEC, Netherlands; Diego Caratelli, The Antenna Company, Eindhoven, The Netherlands and Tomsk Polytechnic University, Tomsk, Russia, Netherlands

WE-SP.1P.5 **14:40**

Analysis and Measurements of a Conformal Log Periodic Folded Slot Array Antenna with Water Filled Cavity Backing for use in an Endfire SAR

Omkar Pradhan, Srikumar Sandeep, Albin Gasiewski, University of Colorado, United States

Break **15:00**

WE-SP.1P.6 **15:20**

Utilizing Periodic Structure Loading on Wideband Antenna Arrays for Next Generation Base Station Applications

Christos Kolitsidas, KTH Royal Institute of Technology, Sweden; Petros Bantavis, ENSTA - Bretagne, France; George Kyriacou, Democritus University of Thrace, Greece; B.L.G. Jonsson, KTH Royal Institute of Technology, Sweden

WE-SP.1P.7 **15:40**

Study of Reactive Loading for the Miniaturization of Folded Dipole Antennas

Sanghamitro Das, Ashwin K. Iyer, University of Alberta, Canada; A. Peter Annan, Nectaria Diamanti, Sensors & Software Inc, Canada

WE-SP.1P.8 **16:00**

A Power Dependent Frequency Selective Surface

Chen Zhao, Chao-Fu Wang, Temasek Lab, Singapore

WE-SP.1P.9 **16:20**

Electrically Tunable Behavior of Graphene on High-Resistivity Silicon Substrate

Rong Wang, Li Jun Jiang, The University of Hong Kong, Hong Kong SAR of China

WE-SP.1P.10 **16:40**

Deep Integration: A Paradigm Shift in the Synthesis of Active Antenna Systems

Rob Maaskant, Chalmers | TU/e, Sweden

Innovative Phased Arrays and Beamforming Technology

Session Co-Chairs: Jeffrey Herd, Massachusetts Institute of Technology Lincoln Laboratory; Paolo Rocca, University of Trento; Robert Mailloux, University of Trento

WE-SP.2P.1 **13:20**

Advances in Low-Cost Phased Arrays Using Silicon Technologies

Gabriel M. Rebeiz, University of California, San Diego, United States; Lee M. Paulsen, Rockwell Collins, United States

WE-SP.2P.2 **13:40**

High Power Metasurface Reflectarray Antennas Using Switched Shorted Circular Elements

Micah Gregory, Jason Daniel Binion, Danny Zhu, John Easum, Pingjuan Werner, Douglas H. Werner, The Pennsylvania State University, United States; Clinton P. Scarborough, E x H, Inc., United States; Scott Griffiths, Joshua Pompeii, Joint Non-Lethal Weapons Directorate, United States

WE-SP.2P.3 **14:00**

Polarization Reconfigurable Sequentially-Rotated-Element Subarrays for Multifunctional Array Systems

Joshua Kovitz, Yahya Rahmat-Samii, University of California, Los Angeles, United States

WE-SP.2P.4 **14:20**

Multistatic Imaging Radar for Standoff Concealed Threat Detection

William Moulder, Janusz Majewski, Charles Coldwell, James Krieger, Huy Nguyen, Amanda Savage, Sean Tobin, Jeffrey Herd, Massachusetts Institute of Technology Lincoln Laboratory, United States

WE-SP.2P.5 **14:40**

Generation of Orbital Angular Momentum Modes by Four Dimensional Antenna Arrays

Chao Sun, Shiwen Yang, Yikai Chen, Shiwei Qu, University of Electronic Science and Technology of China, China

Break **15:00**

WE-SP.2P.6 **15:20**

Frequency-Domain Synthesis of Time-Modulated Arrays

Roberto Maneiro-Catoira, Julio Brégains, José A. García-Naya, Luis Castedo, University of A Coruna, Spain

WE-SP.2P.7 **15:40**

Simultaneous Transmit and Receive Performance of an 8-channel Digital Phased Array

Jonathan Doane, Kenneth Kolodziej, Bradley Perry, Massachusetts Institute of Technology Lincoln Laboratory, United States

WE-SP.2P.8 **16:00**

A Mask Matching Tiling Optimization Method for Clustered Phased Arrays

Nicola Anselmi, Paolo Rocca, Marco Salucci, Giorgio Gottardi, Andrea Massa, University of Trento, Italy

WE-SP.2P.9 **16:20**

Concentric Ring Array of Connecting Spirals with WAVES

Pedro Mendes Ruiz, Israel Hinostroza, Régis Guinvarc'h, CentraleSupélec, France; Randy Haupt, Colorado School of Mines, France

WE-SP.2P.10 **16:40**

Radio Array of Portable Interferometric Detectors (RAPID) : Design and Applications

Frank Lind, Colin Lonsdale, Ryan Volz, Anthea Coster, Chris Eckert, Russ McWhirter, Jim Marchese, Robert Schaefer, William Rideout, Reggie Wilcox, Massachusetts Institute of Technology, United States; Andrew Faulkner, Eloy de Lera Acedo, Nima Razavi-Ghods, University of Cambridge, United Kingdom; Chris Mattmann, Paul Ramirez, Jet Propulsion Laboratory, United States

Nanostructures and Materials

Session Co-Chairs: Brian Lail, Florida Institute of Technology; Juan Sebastian Gomez-Diaz, University of California Davis

WE-A2.1P.1 **13:20**

Quantum Light Rectification in Nano-Rectennas

Gregory Slepyan, Timor Gilad, Amir Boag, Tel Aviv University, Israel

WE-A2.1P.2 **13:40**

Radiation properties of THz photomixing antennas loaded with nanoplasmonic periodic structures in the gap

S. Mohsen Raeis-Zadeh, Safieddin Safavi-Naeini, Terahertz research lab, School of Electrical and Computer Engineering, University of Waterloo, Waterloo, ON, Canada., Canada

WE-A2.1P.3 **14:00**

Invisible Near-Field Probes at Infrared Frequencies based on Impedance Engineering at the Nanoscale

Aobo Chen, Cornell University, United States; Andrea Alù, The University of Texas at Austin, United States; Francesco Monticone, Cornell University, United States

WE-A2.1P.4 **14:20**

Metasurface Solar Sail

Karim Achouri, Christophe Caloz, École Polytechnique de Montréal, Canada

WE-A2.1P.5 **14:40**

An Efficient Wideband Numerical Simulation Technique for Nanostructures Comprised of DCP Media

Qiang Ren, Jogender Nagar, Lei Kang, Yusheng Bian, Ping Werner, Douglas H. Werner, The Pennsylvania State University, United States

Break **15:00**

WE-A2.1P.6 **15:20**

Ultraslow Backward Propagating Hybrid Hyperbolic Phonon Polariton Waveguide Mode Characterization

Michael Finch, Brian Lail, Florida Institute of Technology, United States

WE-A2.1P.7 **15:40**

Tuning Simple Light Absorber of Fabry-Perot-Like Resonator

Ahmed Mekawy, Zewail City for Science and Technology, Egypt; Tamer A. Ali, Zewail City for Science and Technology, Cairo University, Egypt; Ashraf H. Badawi, Zewail City for Science and Technology, Egypt

WE-A2.1P.8 **16:00**

Modelling of the Effective Dielectric Constant of Corrugated Planar Goubau Lines for Terahertz Band

Muhammed Abdullah Unutmaz, Mehmet Unlu, Yildirim Beyazit University, Turkey

WE-A2.1P.9 **16:20**

Scattering properties of parity-time symmetric nanoparticle dimers

Robert Duggan, Mohammad-Ali Miri, Andrea Alù, The University of Texas at Austin, United States

WE-A2.1P.10 **16:40**

Mid-Infrared Plasmon Canalization over Black Phosphorus Metasurfaces

Diego Correas-Serrano, University of California, Davis, United States; Andrea Alù, The University of Texas at Austin, United States; Juan Sebastian Gomez-Diaz, University of California, Davis, United States

Wednesday, July 12 13:20 - 14:40
WE-A2.2P Coronado D

Frequency Selective Surfaces: Antenna Applications

Session Co-Chairs: Tayeb Denidni, Institut National de la Recherche Scientifique (INRS); Jorge Costa, Instituto de Telecomunicacoes, Instituto Superior Tecnico

WE-A2.2P.1 **13:20**

Antenna-Filter-Antenna-Based Cell for Linear–to–Circular Polarizer Transmit-Array

Parinaz Naseri, Carlos A. Fernandes, Sérgio A. Matos, Jorge R. Costa, Instituto de Telecomunicações, Portugal

WE-A2.2P.2 **13:40**

Wideband FSS Superstrate for Millimeter-wave Antenna Gain Enhancement

Arun Kesavan, Jamal Zaid, Tayeb A. Denidni, Institut National de la Recherche Scientifique (INRS), Canada

WE-A2.2P.3 **14:00**

Simple Beam Control of End-Fire Antenna Using FSS for MM-Wave Applications

Mohamad Mantash, Tayeb A. Denidni, Institut National de la Recherche Scientifique (INRS), Canada

WE-A2.2P.4 **14:20**

Subwavelength Metamaterial-Lined Apertures as Far-Field Imaging Devices

Elham Baladi, Ashwin K. Iyer, University of Alberta, Canada

Wednesday, July 12 15:20 - 17:00
WE-A2.3P Coronado D

Electromagnetic Material Properties: Modelling

Session Co-Chairs: Roberto Graglia, Politecnico di Torino; Nathan Jastram, University of Colorado Boulder

WE-A2.3P.1 **15:20**

A High-Q Annular Ring Antenna as a Microwave Near-Field Material Sensor

Ali Albishi, Omar Ramahi, University of Waterloo, Canada

WE-A2.3P.2 **15:40**

On the Use of Radome Materials for a High-Power, Wideband, Millimeter Wave Antenna

Conrad Andrews, Roger Hasse, Ljubodrag Boskovic, Nathan Jastram, Dejan Filipovic, University of Colorado Boulder, United States

WE-A2.3P.3 **16:00**

Recent Developments in Liquid Crystals for Microwave Applications

Carsten Fritzsch, Michael Wittek, Merck KGaA, Germany

WE-A2.3P.4 **16:20**

Metallic Nanoparticles in Dielectrics: A Comparative Study

Agamyrat Agambayev, Mohamed Farhat, Hakan Bagci, Khaled Nabil Salama, King Abdullah University of Science and Technology, Saudi Arabia

WE-A2.3P.5 **16:40**

Morphological Structure Optimization for 3D Nano ZnOw Microwave Absorbing Material

Yu-Chen Zhao, Yan-Ning Yuan, Yu-Rong Pu, Jiang-Fan Liu, Xiao-Li Xi, Xi'an University of Technology, China

Wednesday, July 12 13:20 - 17:00
WE-A5.1P Coronado E

Wireless Power Transfer and Harvesting Involving Antenna Arrays and Metamaterials

Session Co-Chairs: Payam Nayeri, Colorado School of Mines; John Pantoja, Universidad Nacional de Colombia

WE-A5.1P.1 **13:20**

Balanced Full-wave Rectenna for Electromagnetic Energy Harvesting

Faruk Erkmen, Thamer Almoneef, Omar Ramahi, University of Waterloo, Canada

WE-A5.1P.2 **13:40**

Exploiting Antenna Array Configurations for Efficient Simultaneous Wireless Information and Power Transfer

Gustaf Silver, Christos Kolitsidas, Oskar Björkqvist, Martin Matsson, Oskar Dahlberg, Lars Jonsson, KTH Royal Institute of Technology, Sweden

WE-A5.1P.3 **14:00**

A Smart Wireless Energy Harvesting System with Adaptive Beamforming and Power Management

Daniel Schemmel, Payam Nayeri, Colorado School of Mines, United States

WE-A5.1P.4 **14:20**

A Planar Transmitting Array System with a Single Tuning Capacitor for uniform Power Transfer Coverage

Zhu Liu, Yiqiang Yu, University of Electronic Science and Technology of China, China; Zhizhang (David) Chen, Dalhousie University, China

WE-A5.1P.5 **14:40**

Design of a High Gain Quasi-Yagi Antenna and Array for Rectenna

Yuting Song, Junjun Wang, Xiling Luo, Beihang University, China

Break **15:00**

WE-A5.1P.6 **15:20**

A Multi-Resonant Meta-Absorber as an Electromagnetic Energy Harvester

Safiullah Khan, Thomas F. Eibert, Technical University of Munich, Germany

WE-A5.1P.7 **15:40**

Investigation of Hybrid Metamaterial for Enhancing Efficiency of Wireless Power Transfer Systems

Yi-Chen Chen, Ming-Lung Kung, Ken-Huang Lin, National Sun Yat-sen University, Taiwan

WE-A5.1P.8 **16:00**

Preliminary Investigations into a Simple and Effective Rectenna for RF Energy Harvesting

Joseph J. Trad, Basit A. Zeb, Karu P. Esselle, Muhammad U. Afzal, Macquarie University, Australia

WE-A5.1P.9 **16:20**

Antenna Array Assessment for RF Energy Harvesting

Carlos Rivera, John J. Pantoja, Francisco Roman, Universidad Nacional de Colombia, Colombia

WE-A5.1P.10 **16:40**

A Model for 3D-Printed Microstrip Transmission Lines using Conductive Electrifi Filament

Sayan Roy, Muhammad Bilal Qureshi, Sajid Asif, Benjamin Braaten, North Dakota State University, United States

Ultra Wideband Antennas and Systems

Session Co-Chairs: Sudhakar Rao, Northrop Grumman; Debatosh Guha, Institute of Radio Physics & Electronics

WE-A5.2P.1 **13:20**

Wideband Monostatic Spiral Array for Full-Duplex Applications

Ehab Etellisi, Mohamed Elmansouri, Dejan Filipovic, University of Colorado Boulder, United States

WE-A5.2P.2 **13:40**

Wideband Amplitude-Only Direction Finding Subsystem with Conical Spirals

Jake Cazden, Dejan Filipovic, University of Colorado Boulder, United States

WE-A5.2P.3 **14:00**

Single and Dual-Polarized Wideband Simultaneous Transmit and Receive Antenna System

Mohamed Elmansouri, Prathap Valale Prasannakumar, Elie Tianang, Ehab Etellisi, Dejan Filipovic, University of Colorado, United States

WE-A5.2P.4 **14:20**

4.8-Gbit/s Broadband Orbital Angular Momentum and Polarization Multiplexing at Radio Frequency

Baiyang Liu, Yuehui Cui, RongLin Li, South China University of Technology, China

WE-A5.2P.5 **14:40**

Development of GPR Using 16 Channel Impulse UWB Radar Array

Jihoon Kwon, Nojun Kwak, Seoul National University, Republic of Korea; Yeosun Yoon, Hanwha Systems, Republic of Korea; Dongwon Yang, Agency for Defense-Development, Republic of Korea

Break **15:00**

WE-A5.2P.6 **15:20**

Broadband Spiral diversityAntenna with Dielectric Loading

Shilpa Kharche, Pragati Patel, Jayanta Mukherjee, Indian Institute of Technology Bombay, India; Pummy Ratna, Usha Verma, Advanced Systems Laboratory (ASL), Hyderabad, India

WE-A5.2P.7 **15:40**

Vector Channel-Sounder Using Fiber Delay Lines to Separate the Channels

Saad Mahboob, Simon Fraser University, Canada; Siamak Bonyadi Ram, University of British Columbia, Canada

WE-A5.2P.8 **16:00**

An Ultra-Wideband Low-Phase Noise Local Oscillator for Phased Array Antenna System

Jingjing Ye, Wenxun Li, Xiaohong Tang, Xin Xu, Ying Jiang Guo, University of Electronic Science and Technology of China, China

Multiphysics Methods and Applications

Session Co-Chairs: Vitaliy Lomakin, University of California, San Diego; Joseph Kotulski, Sandia National Labs

WE-A3.1P.1 **13:20**

Multiphysics Modeling in Computational Electromagnetics: Technical Challenges and Potential Solutions

Jian-Ming Jin, University of Illinois at Urbana-Champaign, United States

WE-A3.1P.3 **14:00**

Electromagnetic-Micromagnetic Simulator for Magnetization-Eddy Current Dynamics in Magnetic Materials and Devices

Simon Couture, Vitaliy Lomakin, University of California, San Diego, United States

WE-A3.1P.4 **14:20**

Magnetic-Thermal Co-Simulation of Nonlinear Magnetic Materials at High Frequencies

Su Yan, University of Illinois at Urbana-Champaign, United States; Joseph Kotulski, Sandia National Laboratories, United States; Jian-Ming Jin, University of Illinois at Urbana-Champaign, United States

WE-A3.1P.5 **14:40**

A Novel Spin Wave Based Antenna Using Magnetic Materials

Ying Jiang Guo, Xiaohong Tang, Ke Fan Hou, Wen Xun Li, University of Electronic Science and Technology of China, China; Kai Da Xu, Xiamen University, China

Break **15:00**

WE-A3.1P.6 **15:20**

Multiphysics Simulation of Microstructure Formation by Self-Propagating Photopolymer Waveguides

Adour Kabakian, Sophia Yang, Shuoqin Wang, Alan Jacobsen, HRL Laboratories, LLC, United States

WE-A3.1P.7 **15:40**

Coupling of Electromagnetic and Elastic Waves: Modeling of Anisotropic Elastic Wave Propagation in Acoustic Well Logging Excited by a Piezoelectric Transducer

Mingwei Zhuang, Yuanguo Zhou, Xiamen University, China; Qiwei Zhan, Duke University, United States; Na Liu, Xiamen University, China; William Thomas Joines, Qing Huo Liu, Duke University, United States

WE-A3.1P.8 **16:00**

3D Modeling of BAW-based Multiferroic Antennas

Zhi Yao, Yuanxun Wang, University of California, Los Angeles, United States

WE-A3.1P.9 **16:20**

Full-wave-Hydrodynamic Modeling of 2DEG Graphene Channels for Terahertz Devices using ADI-FDTD Algorithm

Shubhendu Bhardwaj, Fernando Teixeira, John L. Volakis, The Ohio State University, United States

WE-A3.1P.10 **16:40**

DGTD Simulation of HPM Air Breakdown Using a 5-Moment Fluid Model and Non-Maxwellian EEDF

Su Yan, University of Illinois at Urbana-Champaign, United States; Andrew D Greenwood, Air Force Research Laboratory, United States; Jian-Ming Jin, University of Illinois at Urbana-Champaign, United States

Wednesday, July 12 13:20 - 15:00
WE-A3.2P Mission Beach AB

Time Domain Integral Equations

Session Co-Chairs: Su Yan, University of Illinois at Urbana-Champaign; Zhen Peng, University of New Mexico

WE-A3.2P.1 **13:20**

A Full Wave Analysis of a Propagator Method for Electromagnetic Fields

Jongchul Shin, Robert Nevels, Texas A&M University, United States

WE-A3.2P.2 **13:40**

Integration Rules and Time Domain Integral Equation Stability

Daniel Weile, Jielin Li, Ismail Uluer, University of Delaware, United States; David Hopkins, U.S. Army Research Laboratory, United States

WE-A3.2P.3 **14:00**

A Novel Method of Moments Technique to Analyze Scattering from Arbitrary Shaped Wire Structures in the Time-Domain

Kapil Sharma, The Pennsylvania State University, United States; Kadappan Panayappan, Peregrine Semiconductor, United States

WE-A3.2P.4 **14:20**

An Explicit MOT Scheme for Solving the TD-EFVIE on Nonlinear and Dispersive Scatterers

Sadeed Bin Sayed, King Abdullah University of Science and Technology, Saudi Arabia; Hüseyin Arda Ülkü, Gebze Technical University, Turkey; Hakan Bagci, King Abdullah University of Science and Technology, Saudi Arabia

WE-A3.2P.5 **14:40**

Investigation of Stability Issue in Marching-on-in-Degree Scheme for TD-EFIE

Ming-Da Zhu, Donghua University, China

Wednesday, July 12 15:20 - 17:00
WE-UB.1P Mission Beach AB

Fast Methods and Parallelization Techniques

Session Co-Chairs: Branislav Notaros, Colorado State University; Michal Mrozowski, Gdansk University of Technology

WE-UB.1P.1 **15:20**

Algorithms for Adaptive Trees Within a Parallel MLFMA

Stephen Hughey, Hasan Metin Aktulga, Balasubramaniam Shanker, Michigan State University, United States

WE-UB.1P.2 **15:40**

A Space-Time Parallel Domain Decomposition Method for High Fidelity Electromagnetic Analysis

Shu Wang, Zhen Peng, University of New Mexico, United States

WE-UB.1P.3 **16:00**

Accelerating Elecromagnetic FEM Computations Using CUDA

Adam Dziekonski, Piotr Sypek, Adam Lamecki, Michal Mrozowski, Gdansk University of Technology, Poland

WE-UB.1P.4 **16:20**

Efficient Parallelization of MLFMA with a Hybrid Global Interpolation/Anterpolation Scheme

Stephen Hughey, Hasan Metin Aktulga, Balasubramaniam Shanker, Michigan State University, United States

WE-UB.1P.5 **16:40**

Numerical Analysis of Convergence of Sommerfeld Integrals in Layered Media Green's Functions

Kalyan C. Durbhakula, Daniel S. Kiddle, Deb Chatterjee, Ahmed Hassan, University of Missouri-Kansas City, United States; Michael Kluskens, Naval Research Laboratory, United States

Wednesday, July 12 13:20 - 17:00
WE-A1.1P Promenade AB

Reconfigurable Antennas and Techniques

Session Co-Chairs: Majid Manteghi, Virginia Tech; Alexandros Feresidis, University of Birmingham; David Kelly, Bucknell University

WE-A1.1P.1 **13:20**

Multi-band Reconfigurable Quasi-Yagi Antanna

Abdurahman Hmouda, Tayeb A. Denidni, INRS-EMT, Quebec University, Canada

WE-A1.1P.2 **13:40**

Multiple Parameter Reconfigurable Microstrip Patch Antenna

Marion Allayioti, James R. Kelly, University of Surrey, United Kingdom

WE-A1.1P.3 **14:00**

Wideband to Multi Sub-band Antenna with Different Bandwiths

Mohamedlamine Seddiki, Abdessalem Talbi, Mourad Nedil, Engineering School, LRTCS University of Quebec, UQATQuebec, Canada; Farid Ghanem, Telecom Product Direction R&D&I, Brandt Group, Cevital Industry Pole, Algeria

WE-A1.1P.4 **14:20**

Circular Polarization Agile Microstrip Antenna With Double Balanced Multiplier on Ring Slot

Eisuke Nishiyama, Hiroki Matsui, Ichihiko Toyoda, Saga University, Japan

WE-A1.1P.5 **14:40**

Reconfigurable Multiband Bowtie Antenna for WiFi, WiMax, and WLAN Applications

Ali Mansoul, CDTA, Algeria

Break **15:00**

WE-A1.1P.6 **15:20**

Inverted F Antennas with Hexagonal Patches

Hisamatsu Nakano, Tomoki Abe, Yuhei Kameta, Junji Yamauchi, Hosei University, Japan

WE-A1.1P.7 **15:40**

A Mast Mounted Directional Antenna

Shuguang Chen, Mahmoud Khalil, Steven Goodall, US Army, United States

WE-A1.1P.8 **16:00**

Reconfigurable Pentagonal Slot Based 4-Element MIMO Antennas

Rifaqat Hussain, Mohammad Said Sharawi, King Fahd University of Petroleum and Minerals, Saudi Arabia

WE-A1.1P.9 **16:20**

Energy Efficient Reconfigurable Antenna for Ultra-Low Power IoT Devices

Thomas Houret, Leonardo Lizzi, Fabien Ferrero, Université Côte d'Azur, CNRS, LEAT, France; Christophe Danchesi, Stephane Boudaud, Abeeway, France

WE-A1.1P.10 **16:40**

A Reconfigurable Monopole Antenna for GPS and SDAR Applications

Chia-Wei Hsu, Kuan-Wei Li, Jun-Yu Lai, ChienJen Wang, National University of Tainan, Taiwan

Application Driven Antenna Design

Session Co-Chairs: Gregor Lasser, University of Colorado Boulder; Jie Xu, Loyola Marymount University

WE-A1.2P.1 **13:20**

Degrees of Freedom of OAM-Based Communication Systems

Jie Xu, Loyola Marymount University, United States

WE-A1.2P.2 **13:40**

Study of Antenna Systems located on Complex Platforms by using Characteristic Mode Analysis and Related Techniques

Raj Mittra, Ashwani Kumar, University of Central Florida, United States

WE-A1.2P.3 **14:00**

Underdetermined DOA Estimation in the Presence of Mutual Coupling for Sparse Circular Array

Thomas Basikolo, Koichi Ichige, Hiroyuki Arai, Yokohama National University, Japan

WE-A1.2P.4 **14:20**

A Flexible Circular Polarized Wide Band Slot Antenna for Indoor IoT Applications

Sherif Zahran, Arab Academy for Science, Technology & Maritime Transport, Egypt; Mahmoud A. Abdalla, MTC College, Egypt; Zhirun Hu, University of Manchester, United Kingdom

WE-A1.2P.5 **14:40**

Antenna Design Methodology for Ear-to-ear/Ear-to-remote Communications

Zhichao Li, George Shaker, Mohammad-Reza Nezhad-Ahmadi, Safieddin Safavi-Naeini, University of Waterloo, Canada

Break **15:00**

WE-A1.2P.6 **15:20**

Dual Band Multi-beam Base Station Antennas

Lin-Ping Shen, Hua Wang, Sadegh Farzaneh, Willi Lotz, Nasrin Hojjat, Minya Gavrilovic, Communication Components Antenna Inc, Canada

WE-A1.2P.7 **15:40**

Metallization of LCE Helical Antenna used for Potential RFID

John Gibson, Stavros V. Georgakopoulos, Florida International University, United States

WE-A1.2P.8 **16:00**

Planar Antenna for RF Energy Harvesting Applications

Dalia Elsheakh, National Research Center, Egypt

WE-A1.2P.9 **16:20**

Hybrid Precoding for DL Massive MU-MIMO Systems with Distributed Antenna Deployments

Widad Belaoura, Ecole Nationale Polytechnique, Algeria; Khalida Ghanem, Center of development of advanced techniques (CDTA), Algeria; Hicham Bousbia-Salah, Ecole Nationale Polytechnique, Algeria

WE-A1.2P.10 **16:40**

High Performance CRLH Waveguide Leaky-Wave Antenna with Optimized Sidelobe Level

Qingshan Yang, Xiaowen Zhao, Yunhua Zhang, CAS Key Laboratory of Microwave Remote Sensing, China

Reflectarray Analysis and Synthesis

Session Co-Chairs: Sean Hum, University of Toronto; Manuel Arrebola, Universidad de Oviedo

WE-A1.3P.1 **13:20**

Circuit-based synthesis of a reflectarray

Alexandre Grossetete, Erwan Fourn, Raphael Gillard, Maria Garcia-Vigueras, Institut of Electronics and Telecommunications of Rennes, France

WE-A1.3P.2 **13:40**

Synthesis of a Multi-beam Dual Reflectarray Antenna Using Genetic Algorithms

Ciaran Geaney, Jianwei Sun, University of Toronto, Canada; Eduardo Martinez-de-Rioja, José A. Encinar, Technical University of Madrid, Spain; Sean V. Hum, University of Toronto, Canada

WE-A1.3P.3 **14:00**

Efficient Computation of the Reflectarray Far Fields in Adaptive Grids for Speed Improvement

Daniel R. Prado, Manuel Arrebola, Marcos R. Pino, Fernando Las-Heras Andres, Universidad de Oviedo, Spain; José A. Encinar, Universidad Politécnica de Madrid, Spain

WE-A1.3P.4 **14:20**

Study of Bifocal Dual Reflectarray Configurations for Multi-Beam Antennas in Ka-band

Eduardo Martinez-de-Rioja, José A. Encinar, Technical University of Madrid, Spain; Ciaran Geaney, Sean V. Hum, University of Toronto, Canada; Antonio Pino, University of Vigo, Spain

WE-A1.3P.5 **14:40**

Reflectarray Antenna Simplification through Non-Radiating Currents Synthesis

Marco Salucci, Giacomo Oliveri, Angelo Gelmini, University of Trento, Italy; Daniele Bresciani, Thales Alenia Space, France; Andrea Massa, University of Trento, Italy

Break **15:00**

WE-A1.3P.6 **15:20**

Advances on High-Performance Curved Reflectarrays for Telecommunication Applications

Min Zhou, Stig Busk Sørensen, Jakob Rosenkrantz de Lasson, Niels Vesterdal, Rolf Jørgensen, Erik Jørgensen, TICRA, Denmark; Giovanni Toso, European Space Agency, Netherlands

WE-A1.3P.7 **15:40**

Feed system optimization for Convex Conformal Reflectarray Antennas

Michele Beccaria, Politecnico di Torino, Italy; Giuseppe Addamo, CNR-IEIIT, Italy; Paola Pirinoli, Mario Orefice, Politecnico di Torino, Italy; Oscar Antonio Peverini, Giuseppe Virone, CNR-IEIIT, Italy; Diego Manfredi, Flaviana Calignano, IIT- Center for Sustainable Futures CSF@PoliTo, Italy

WE-A1.3P.8 **16:00**

Optimal Element Arrangement of Folded Reflectarray for High Aperture Efficiency

Jun Gi Jeong, Young Joong Yoon, Yonsei University, Republic of Korea; Hyungrak Kim, Daelim University College, Republic of Korea

WE-A1.3P.9 **16:20**

Generation of an Orbital Angular Momentum Mode based on a Cassegrain Reflectarray Antenna

Woo Jin Byun, Electronics and Telecommunications Research Institute (ETRI), Republic of Korea; Yong Heui Cho, Mokwon University, Republic of Korea

WE-A1.3P.10 **16:40**

Dual Orbital Angular Momentum Mode Antenna by Combination of Transmitarray and Reflectarray

Peng Kai Li, Chang Jiang You, Hong Fang Yu, Quan Wang, School of Communication and Information Engineering, China; Yu Jian Cheng, School of Electronic Engineering, China

Therapeutic Applications of EM and Dosimetry

Session Co-Chairs: Kazuyuki Saito, Chiba University; Takuji Arima, Tokyo University of Agriculture and Technology

WE-UK.1P.1 **13:20**

Electrosurgical scalpel by combining RF current and microwave

Kazuyuki Saito, Sho Suzuki, Chiba University, Japan

WE-UK.1P.2 **13:40**

Optimization of Orientation and Positioning of Magnetic Coils for Implantable Neural Stimulation

Pragya Kosta, Kyle Loizos, Gianluca Lazzi, University of Utah, United States

WE-UK.1P.3 **14:00**

Designing Electrical Stimulation in Hippocampal Prosthetic Devices Using a Closed-Loop Multi-Scale Simulation Strategy

Javad Paknahad, Kyle Loizos, Gianluca Lazzi, University of Utah, United States

WE-UK.1P.4 **14:20**

Development of Wideband Local Exposure Antenna for Laboratory Small Animal Study

Takuji Arima, Toru Uno, Tokyo University of Agriculture and Technology, Japan

Electromagnetics for Therapeutic Applications

Session Chair: J.-C. Chiao, University of Texas at Arlington

WE-A5.3P.1 **15:20**

A novel coil for highly focused magnetic hyperthermia with nanoparticles

Danilo Brizi, University of Pisa, Italy; Nunzia Fontana, Consorzio Nazionale Interuniversitario per le Telecomunicazioni (CNIT), Italy; Agostino Monorchio, University of Pisa, Italy

WE-A5.3P.2 **15:40**

Electroquasistatic Model of RF Capacitive Hyperthermia with Heat Convection Mechanism

Chien-Chang Chen, Jean-Fu Kiang, National Taiwan University, Taiwan

WE-A5.3P.3 **16:00**

Auto-Phase Calibration Loop of a Transmission Array for Focused Microwave Thermotherapy

Soon-Ik Jeon, Jang-Yeol Kim, Seong-Ho Son, Electronics and Telecommunications Research Institute (ETRI), Republic of Korea

Random and Complex Media II

Session Co-Chairs: Akira Ishimaru, University of Washington; Saba Mudaliar, Air Force Research Laboratory

WE-UF.1P.1 **13:20**

Modeling Snowpack Scattering and Emission Using a Fully Coherent Model

Shurun Tan, Jiyue Zhu, Leung Tsang, University of Michigan, United States; Son Nghiem, Jet Propulsion Laboratory, United States

WE-UF.1P.2 **13:40**

Efficient calculation of CBFs for the modeling of scattering by complex-shaped snow aggregates

Ines Fenni, Ziad S. Haddad, Jet Propulsion Laboratory, United States; Hélène Roussel, L2E UPMC, France; Raj Mittra, University of Central Florida, United States

WE-UF.1P.3 **14:00**

CASPER East Campaign LES-based RF Scintillation Study

Swagato Mukherjee, Caglar Yardim, The Ohio State University, United States; Tao Cao, Lian Shen, University of Minnesota, United States

WE-UF.1P.4 **14:20**

Small Scale Surface Roughness Effects on Enhanced Backscatter from a Layer of Vegetation

Avinash Sharma, The Johns Hopkins University Applied Physics Laboratory, United States; Roger Lang, The George Washington University, United States

WE-UF.1P.5 **14:40**

Designing sources for enhancement of early-time diffusion in short pulse propagation through random particulate media

Elizabeth Bleszynski, Marek Bleszynski, Thomas Jaroszewicz, Monopole Research, United States

Break **15:00**

WE-UF.1P.6 **15:20**

An Operational Approach to Scattering of Objects in Complex Environment

Saba Mudaliar, Air Force Research Laboratory, United States

WE-UF.1P.7 **15:40**

Scattering of Electromagnetic Waves by Vegetation Based on Numerical 3D Solutions of Maxwell Equations

Huanting Huang, Leung Tsang, University of Michigan, United States; Tien-Hao Liao, Eni Njoku, Andreas Colliander, Jet Propulsion Laboratory, California Institute of Technology, United States; Kung-Hau Ding, Air Force Research Laboratory, Wright-Patterson AFB, United States

WE-UF.1P.8 **16:00**

SAR images simulation of tropical forests at P and L band

Jean-Pascal Monvoisin, Pierre Borderies, Vincent Gobin, Pascale Dubois-Fernandez, ONERA, France; Dominique Dubucq, Cedric Taillandier, TOTAL, France

WE-UF.1P.9 **16:20**

A new convenient tool for ice sheets exploration The fractal dimension

Gerardo Di Martino, Alessio Di Simone, Giorgio Franceschetti, Daniele Riccio, Università di Napoli Federico II, Italy; Stephen Wall, Jet Propulsion Laboratory, California Institute of Technology, Italy

WE-UF.1P.10 **16:40**

Monte Carlo Simulation of Underwater Wireless Optical Communications in Turbulent Environments

Zahra Vali, Asghar Gholami, Isfahan University of Technology, Iran; David Michelson, University of British Columbia, Canada; Zabih Ghassemlooy, Northumbria University, United Kingdom; Masood Omoomi, Isfahan University of Technology, Iran; Hamed Noori, University of British Columbia, Canada

Remote Sensing Applications

Session Chair: Yee Hui Lee, Nanyang Technological University

WE-UF.2P.1 **13:20**

Radar Backscatter Modeling of Road Surfaces Near Grazing incidence at 77GHz

Xiuzhang Cai, Kamal Sarabandi, University of Michigan, United States; Douglas Blue, Ford Motor Company, United States

WE-UF.2P.2 **13:40**

Statistical Backscatter RCS Model for Vehicles and Pedestrians at 77GHz

Xiuzhang Cai, Kamal Sarabandi, University of Michigan, United States; Douglas Blue, Ford Motor Company, United States

WE-UF.2P.3 **14:00**

A Constant Conversion Factor for Retrieval of PWV from GPS Signals in Tropical Region

*Shilpa Manandhar, Feng Yuan, Yee Hui Lee, Nanyang Technological University, Singapore; Yu Song Meng, Agency for Science, Technology and Research (A*STAR), Singapore*

WE-UF.2P.4 **14:20**

Cloud Radiative Effect Study Using Sky Camera

Soumyabrata Dev, Shilpa Manandhar, Feng Yuan, Yee Hui Lee, Nanyang Technological University, Singapore; Stefan Winkler, Advanced Digital Sciences Center (ADSC), Singapore, Singapore

WE-UF.2P.5 **14:40**

Investigation on Traffic Flow Control by Using A Millimeter Wave Radiometric Imaging System

Shengchang Lan, Haoyu Tang, Caitian Yang, Jinghui Qiu, Nannan Wang, Hua Zong, Alexander Denisov, Harbin Institute of Technology, China

Subsurface Remote Sensing

Session Co-Chairs: Jiefu Chen, University of Houston; Jaideva Goswami, C&J Research and Technology

WE-UF.3P.1 **15:20**

FDTD Modeling of Scattered Electromagnetic Waves at Ultra Low-Frequencies from Objects in Ocean Water

Dallin Smith, Sean Burns, University of Utah, United States; Stephen Potashnik, Office of Naval Research, United States; Jamesina Simpson, University of Utah, United States

WE-UF.3P.2 **15:40**

Algorithm and Experimental System for Arbitrary 3D Fracture Network Detection and Mapping in Tri-axial Through-Casing Induction Measurement

Yuan Fang, Yunyun Hu, Dezhi Wang, Qing Huo Liu, Duke University, United States

WE-UF.3P.3 **16:00**

Hydraulic fracture imaging with galvanic measurements

Yunyun Hu, Yuan Fang, Dezhi Wang, Qing Huo Liu, Duke University, United States

WE-UF.3P.4 **16:20**

Geosteering Benchmark Models for Standardization of Directional Electromagnetic Logging-While-Drilling

Jiefu Chen, Ji Chen, University of Houston, United States

WE-UF.3P.5 **16:40**

Solving Subsurface Inverse Problem on the MapReduce Platform: A Langevin Dynamics Approach for Geosteering Inversion

Qiuyang Shen, Xuqing Wu, Jiefu Chen, University of Houston, United States; Yueqin Huang, Cyentech Consulting LLC, United States; Zhu Han, University of Houston, United States

Electrically Small Antenna Characteristics

Session Co-Chairs: Ted Simpson, University of South Carolina; Peder Hansen, Independent Consultant

WE-A1.4P.1 **13:20**

On Hertz and the Speed of Light

Ted Simpson, University of South Carolina, United States

WE-A1.4P.2 **13:40**

Upper Bounds on the Radiation Efficiency of Electrically Small Antennas

Carl Pfeiffer, Defense Engineering Corporation, United States

WE-A1.4P.3 **14:00**

Antenna G/T Degradation with Inefficient Receive Antennas at HF (2-30 MHz)

Marcus Walden, Plextek, United Kingdom

WE-A1.4P.4 **14:20**

Electrically Small Antenna with Switchless Pattern Reconfiguration

Adam Narbudowicz, Max Ammann, Dublin Institute of Technology, Ireland; Dirk Heberling, RWTH Aachen University, Germany

WE-A1.4P.5 **14:40**

Frequency Shift Keying for Direct Antenna Modulation (DAM) with Electrically Small Antenna

Rui Zhu, Skyler Selvin, University of California, Los Angeles, United States; Nian Guo, The University of Hong Kong, Hong Kong SAR of China; Yuanxun Wang, University of California, Los Angeles, United States

Break **15:00**

WE-A1.4P.6 **15:20**

Broadband Electrically Short Transmitters via Hi-Speed Time-Varying Antenna Properties

Morris Cohen, Lee Thompson, Nathan Opalinski, Parker Singletary, Mitchell Walker, Cheong Chan, Georgia Institute of Technology, United States; Mark Golkowski, University of Colorado Boulder, United States

WE-A1.4P.7 **15:40**

Design of Miniaturizated Multiple U-Slots antenna using Theory of Characteristic Modes

Mahrukh Khan, Deb Chatterjee, University of Missouri-Kansas City, United States

WE-A1.4P.8 **16:00**

Highly Scalable Slotted Small Antennas

Altan Ferendeci, University of CIncinnati, United States

WE-A1.4P.9 **16:20**

C-band Self-oscillating Active Integrated Antenna

Ming Cai, Xiaoqiang Li, Guangli Yang, Shanghai University, China

WE-A1.4P.10 **16:40**

A Single-fed Circularly Polarized Using Water Substrate Patch Antenna with Small Size Low-Profile and Broadband

Dong Wang, Junping Geng, Ronghong Jin, Xianling Liang, Weiren Zhu, Liang Liu, He Qi, Yunxiao Xu, Department of Electronics Engineering, China

Applications of Electromagnetics and RF Techniques in Medicine and Biology

Session Co-Chairs: J.-C. Chiao, University of Texas at Arlington; Gianluca Lazzi, University of Utah

TH-SP.1A.1 **08:00**

Towards a Minimally Invasive Integrated Microwave Approach for Image-Guided Thermal Ablation of Cancer

Luz Maria Neira, James Sawicki, Hung Luyen, Yahya Mohtashami, Barry Van Veen, Nader Behdad, Susan Hagness, University of Wisconsin-Madison, United States

TH-SP.1A.2 **08:20**

Study of Practical Limitations of Real-Time Microwave Imaging of Tissue

Denys Shumakov, Daniel Tajik, Alex Beaverstone, Natalia Nikolova, McMaster University, Canada

TH-SP.1A.3 **08:40**

Overview of Human Vital Signs Detection Using Radar Techniques

Aly E. Fathy, Lingyun Ren, Sabikun Nahar, University of Tennessee, United States; Ozlem Kilic, The Catholic University of America, United States

TH-SP.1A.4 **09:00**

Electrical Stimulation Waveform Design Towards Increasing the Effectiveness of Retina Prosthetic Devices

Kyle Loizos, Robert Marc, Gianluca Lazzi, University of Utah, United States

TH-SP.1A.5 **09:20**

An Approach for Cardiovascular Monitoring Based on Electromagnetic Induction

Gregory Karageorgos, Christos Manopoulos, Sokrates Tsangaris, Konstantina Nikita, National Technical University of Athens, Greece

Break **09:40**

TH-SP.1A.6 **10:00**

Development of an Unobtrusive Patch to Acquire EEG in the Home Setting for Studies of Alzheimer's Disease

Peter Ritchie, Daniel Schossow, Victor Ho, Manuja Sharma, University of Washington, United States; Yo-El Ju, Washington University at St. Louis, United States; Miranda Lim, Portlan VA Hospital, United States; J.-C. Chiao, The University of Texas at Arlington, United States; Hung Cao, University of Washington, United States

TH-SP.1A.7 **10:20**

Novel On-Body Microwave Antenna Array Testbed for Highly-Sensitive Measurements of Wrist Bone Signature

Sergey N Makarov, NEVA Electromagnetics, LLC, United States; William Appleyard, Patrick D. Carberry, Harshal V Tankaria, Worcester Polytechnic Inst., United States; Gregory M Noetscher, NEVA Elevctromagnetics, LLC, United States; Ara Nazarian, Harvard Medical School, United States

TH-SP.1A.8 **10:40**

Efficiency Analysis of a Conformal SCMR System for Wearable Devices

Yonathan Bonan, Kun Bao, Carlos Flores, Kevin Baza, Stavros V. Georgakopoulos, Florida International University, United States

TH-SP.1A.9 **11:00**

On Pneumothorax Detection in Microwave Frequencies Region

Maria Christopoulou, Sofia Bakogianni, Stavros Koulouridis, University of Patras, Greece

TH-SP.1A.10 **11:20**

Wireless Power Transfer to High-Voltage Subcutaneous Implants using Near-Field Capacitive Coupling

Kush Agarwal, Rangarajan Jegadeesan, Yongxin Guo, Nitish Thakor, National University of Singapore, Singapore

3D Printed Antennas and Components

Session Chair: Guan-Long Huang, Shenzhen University

TH-SP.2A.1 **08:00**

A Triple Mode Waveguide Corrugated Horn Antenna Using 3D Printing Technology

Alejandro Castro, Satish Kumar Sharma, San Diego State University, United States

TH-SP.2A.2 **08:20**

Novel 3D-Printing Enabled Antenna Design for Future Wireless Intra-chip Interconnect

Junqiang Wu, Hao Xin, University of Arizona, United States

TH-SP.2A.3 **08:40**

Additively Manufactured Ultrawideband, Wide Scan, Monolithic Vivaldi Arrays

Thomas Spence, Roddy Rodriguez, Northrop Grumman Mission Systems, United States

TH-SP.2A.4 **09:00**

Application of 3-D Printing to Fabrication of Highly-Efficient Waveguide-Based Antenna Array with Integrated Monopulse Comparator

Guan-Long Huang, Shenzhen University, China; Shi-Gang Zhou, Northwestern Polytechnical University, China

TH-SP.2A.5 **09:20**

Wideband Ku-Band Antennas using Multi-Layer Direct Digital Manufacturing

Merve Kacar, University of South Florida, United States; Casey Perkowski, Paul Deffenbaugh, Sciperio Inc., United States; Janice Booth, US Army, United States; Gokhan Mumcu, Thomas Weller, University of South Florida, United States

Break **09:40**

TH-SP.2A.6 **10:00**

Novel 3D-Printed "Chinese Fan" Bow-Tie Antennas for Origami/Shape-Changing Configurations

Wenjing Su, Ryan Bahr, Syed Abdullah Nauroze, Manos M. Tentzeris, Georgia Institute of Technology, United States

TH-SP.2A.7 **10:20**

3D Printed Multilayer mm-Wave Dielectric Rod Antenna with Enhanced Gain

Denise Lugo, Ramiro Ramirez, Juan Castro, Jing Wang, Thomas Weller, University of South Florida, United States

TH-SP.2A.8 **10:40**

A Novel 3D Printed Half-Width Microstrip Leaky-Wave Antenna

Vincens Gjokaj, Premjeet Chahal, Leo Kempel, Edward Rothwell, Michigan State University, United States

TH-SP.2A.9 **11:00**

A 3D Printed Dual GSM Band Near Isotropic On-Package Antenna

Zhen Su, Atif Shamim, King Abdullah University of Science and Technology, Saudi Arabia

TH-SP.2A.10 **11:20**

A Novel 3D Printed Vivaldi Antenna Utilizing a Substrate Integrated Waveguide Transition

Vincens Gjokaj, Premjeet Chahal, John Papapolymerou, John Albrecht, Michigan State University, United States

Applications of Metamaterials

Session Co-Chairs: Reuven Shavit, Ben-Gurion University; Ferran Paredes, Universitat Autònoma de Barcelona

TH-A2.1A.1 **08:00**

A Smart Mobile Handset Plastic Case With Integrated Split Ring Resonators to Reduce SAR

Hengyi Zhou, Arpan Pal, Amit Mehta, Swansea University, United Kingdom; Dariush Mirshekar-Syahkal, University of Essex, United Kingdom

TH-A2.1A.2 **08:20**

2D Flat Lens Design Made of Dielectric Cylinders Using the Array Scattering Method

Eran Falek, Reuven Shavit, Ben-Gurion University, Israel

TH-A2.1A.3 **08:40**

Broadband Metamaterial Absorber for both Normal and Oblique Incidence

Toan Trung Nguyen, Sungjoon Lim, Chung - Ang University, Republic of Korea

TH-A2.1A.4 **09:00**

A Phenomenological Electromagnetic Theory of CNT-DNA Metabiomaterials for Applications to Biosensing and DNA Sequencing

Said Mikki, Saion Sinha, University of New Haven, United States; Gangadhar Behera, Royal Military College of Canada, Canada; Christopher Morris, University of New Haven, United States; Yahia M. M. Antar, Royal Military College of Canada, Canada

TH-A2.1A.5 **09:20**

Mutual Coupling Reduction in Millimeter-Wave MIMO Dielectric Resonator Antenna Using Metamaterial Polarization Rotator Wall

Mohammadmahdi Farahani, Jamal Zaid, Tayeb A. Denidni, Institute of National Research and Scientific (INRS), Canada; Mohammad Akbari, Abdel Razik Sebak, Concordia University, Canada; Mourad Nedil, University of Quebec, Canada

Break **09:40**

TH-A2.1A.6 **10:00**

Planar Fan-Beam Reflective Array Antenna based on Non-Bianisotropic Complementary Split-Ring Resonators (NB-CSRRs)

Pau Aguilà, Gerard Zamora, Ferran Paredes, Ferran Martín, Jordi Bonache, Universitat Autònoma de Barcelona, Spain

TH-A2.1A.7 **10:20**

Ultra Compact Quad Band Resonator Based on Novel D-CRLH Configuration

Ahmed F. Daw, Omar T. Hussein, Hania S. Abdelhamid, MSA University, Egypt; Mahmoud A. Abdalla, MTC College, Egypt

TH-A2.1A.8 **10:40**

Coherent control of absorption in water based metamaterial

Weiren Zhu, Chong He, Xianling Liang, Junping Geng, Ronghong Jin, Shanghai Jiao Tong University, China

TH-A2.1A.9 **11:00**

A novel circular patch antenna of generating vortex beams based on complex transformation optics

Xiang Liao, Zhan Zhang, Beijing Jiaotong University, China

TH-A2.1A.10 **11:20**

Frequency-Controlled Beam Scanning Array Fed by Spoof Surface Plasmon Polaritons

Jia Yuan Yin, Tie Jun Cui, Southeast University, China

Terahertz Devices

Session Co-Chairs: Nuria Llombart, Delft University of Technology; Giorgio Carluccio, Delft University

TH-A5.1A.1 **08:00**

Terahertz Field Localization Using Slot Dielectric Waveguide Implemented in Si-On-Glass (SOG) Technology

Hadi Amarloo, Safieddin Safavi-Naeini, University of Waterloo, Canada

TH-A5.1A.2 **08:20**

Optical Leaky Waveguide Antenna Using Shallow Etched Circular Waffled Waveguide

Hiroshi Hashiguchi, Toshihiko Baba, Hiroyuki Arai, Yokohama National University, Japan

TH-A5.1A.3 **08:40**

Study of free-space coupling into mm-wave whispering-gallery mode resonators for a radioastronomy receiver

Gabriel Santamaria-Botello, Kerlos Atia Abdalmalak, Universidad Carlos III de Madrid, Spain; Maria-Theresa Schlecht, Friedrich-Alexander Erlangen-Nurnberg University, Germany; David González-Ovejero, California Institute of Technology, United States; Florian Sedlmeir, Harald G. L. Schwefel, University of Otago, New Zealand; Stefan Malzer, Heiko Weber, Friedrich-Alexander Erlangen-Nurnberg University, Germany; Daniel Segovia-Vargas, Universidad Carlos III de Madrid, Spain; Darragh McCarthy, John Anthony Murphy, Gottfried Dohler, Maynooth University, Ireland; Luis Enrique García Muñoz, Universidad Carlos III de Madrid, Spain

TH-A5.1A.4 **09:00**

Modelling of Photonic Band Gap Filters for Terahertz Photoconductive Antennas and Photomixers

Kazim Demir, Asaf Behzat Sahin, Mehmet Unlu, Yildirim Beyazit University, Turkey

TH-A5.1A.5 **09:20**

Design of a Phase Shifting Impedance Tuner for Terahertz Photomixers Arrays

Suleyman Burak Celik, Kazim Demir, Asaf Behzat Sahin, Mehmet Unlu, Ankara Yildirim Beyazit University, Turkey

Break **09:40**

TH-A5.1A.6 **10:00**

Analysis of Absorbers under Quasi-Optical Systems: Distributed Incoherent Sources

Shahab Oddin Dabironezare, Andrea Neto, Nuria Llombart, Delft University of Technology, Netherlands

TH-A5.1A.7 **10:20**

Efficiency Enhancement of Bowtie Photomixer Antenna by Using Resistively Loaded Line

Adem Yilmaz, KTO Karatay University, Turkey; Mehmet Unlu, Ankara Yildirim Beyazit University, Turkey

TH-A5.1A.8 **10:40**

Design of Spoof Surface Plasmon Polariton Based Terahertz Delay Lines

Muhammed Abdullah Unutmaz, Mehmet Unlu, Yildirim Beyazit University, Turkey

TH-A5.1A.9 **11:00**

Performance Analysis of Next-generation Passive Optical Network (XG - PON)

Prasant Kumar Sahu, Debalina Ghosh, Indian Institute of Technology Bombay Bhubaneswar, India

TH-A5.1A.10 **11:20**

Terahertz Metamaterial to Demonstrate Extremely Wide Range of Effective Refractive Indices in the 0.3-THz Band

Kazuhisa Watai, Koki Ishihara, Satoshi Kondoh, Tatsuya Sato, Makoto Shijo, Takehito Suzuki, Ibaraki University, Japan

Wireless Power Transfer

Session Co-Chairs: Joseph Costantine, American University of Beirut; Mauro Ettorre, CNRS, University of Rennes

TH-A5.2A.1 **08:00**

Long Slot Van Atta Array for Far-Field Wireless Power Transfer

Mauro Ettorre, CNRS UMR 6164, University of Rennes 1, France; Waleed A. Alomar, Communication and Information Technology Research Institute (CITRI), KACST, Saudi Arabia; Anthony Grbic, University of Michigan, United States

TH-A5.2A.2 **08:20**

Warpage-free Antenna for Smart Contact Lens

Luyao Chen, George Shaker, Safieddin Safavi-Naeini, University of Waterloo, Canada

TH-A5.2A.3 **08:40**

Applications of Using Conformal SCMR System for Batteryless Wearable Sensor Device

Kun Bao, Stavros V. Georgakopoulos, Florida International University, United States

TH-A5.2A.4 **09:00**

Cylindrical Vector Beams for Wireless Power Transfer

Faris Alsolamy, University of Michigan, United States; Waleed Alomar, Communication and Information Technology Research Institute (CITRI), KACST, Saudi Arabia; Anthony Grbic, University of Michigan, United States

TH-A5.2A.5 **09:20**

Miniaturized Wireless Power Transfer Systems using 3-D Strongly Coupled Magnetic Resonance

Hao Hu, Kun Bao, Stavros V. Georgakopoulos, Florida International University, United States

Break **09:40**

TH-A5.2A.6 **10:00**

Cylindrical Topology of SCMR Wireless Power Transfer System

Daerhan Liu, Stavros V. Georgakopoulos, Florida International University, United States

TH-A5.2A.7 **10:20**

Experimental Validation of Multi-Layer Coil Inductance Estimation Method

Jihoon Kim, Gwangju Institute Science and Technology, Republic of Korea; Bobae Kim, Jihan Kang, Hanwha Systems, Republic of Korea; Kangwook Kim, Gwangju Institute Science and Technology, Republic of Korea

TH-A5.2A.8 **10:40**

Multi-Device Wireless Charging based on Misalignment Insensitive of Conformal Strongly Coupled Magnetic Resonant System

Hao Hu, Kun Bao, Daerhan Liu, Stavros V. Georgakopoulos, Florida International University, United States

TH-A5.2A.9 **11:00**

Microwave Power Transmission for Multi-targeting Antenna Using Time-Reversal Technology

Ping Lu, Xue-Song Yang, Bing-Zhong Wang, University of Electronic Science of Technology of China Chengdu, China, China

TH-A5.2A.10 **11:20**

Wideband Wide-Slot Antenna Array with Protrusion for Wide-Angle Scanning

Sheng Ye, Donghua University, China; Xianling Liang, Junping Geng, Ronghong Jin, Shanghai Jiao Tong University, China

Wideband Horn and Vivaldi Antennas

Session Co-Chairs: Nathan Jastram, University of Colorado Boulder; Marco Panduro, Centro de Investigación Científica y de Educación Superior de Ensenada

TH-A1.1A.1 **08:00**

Wide Bandwidth Cavity-Backed Dual-Polarized Vivaldi Array Antenna

Elie Tianang, Mohamed Elmansouri, Dejan Filipovic, University of Colorado Boulder, United States

TH-A1.1A.2 **08:20**

Comparative Study of Dual-Linear Versus Dual-Circular Horns for 18 to 45 GHz Repeaters

Nathan Jastram, Dejan Filipovic, University of Colorado Boulder, United States

TH-A1.1A.3 **08:40**

Design of Ultra-Wideband Aperiodic Antenna Arrays using a Geometry of Concentric Rings

Marco A. Panduro, CICESE Resarch Center, Mexico; Alberto Reyna, Omar Elizarraras, Aldo Mendez, Universidad Autónoma de Tamaulipas, Mexico

TH-A1.1A.4 **09:00**

The radiation characteristics of the Vivaldi antenna, located on a wedge-cylinder coupling surface

Yury Yukhanov, Tatiana Privalova, Armen Gevorkyan, Southern federal university, Russian Federation

TH-A1.1A.5 **09:20**

Balanced Antipodal Tapered Slot Antenna With Low Cross-Polarized Radiation

Chittajit Sarkar, University of Calcutta, India; Latheef A Shaik, Indian Institute of Space Science and Technology, India; Jawad Y Siddiqui, University of Calcutta, India; Chinmoy Saha, Indian Institute of Space Science and Technology, India; Yahia M. M. Antar, Royal Military College of Canada, Canada

Break **09:40**

TH-A1.1A.6 **10:00**

Wideband Circularly Polarized Antenna Based on Vivaldi Antenna Structure

Xue Ren, Shaowei Liao, Quan Xue, City University of Hong Kong, Hong Kong SAR of China; Bin-Long Bu, Comba Telecom Systems Limited, China

TH-A1.1A.7 **10:20**

An Ultrawideband Tightly Coupled Antipodal Vivaldi Antenna Array for UHF-Ku Band Applications

Ming Huang, Kaizhi Zhang, Li Wang, Wensheng Qiao, Southwest China Institute of Electronic Technology, China

TH-A1.1A.8 **10:40**

E-Band Wideband High-Efficiency Plate Array Antenna Based on Integrated Ridge Horn

Mingming Zhou, Yujian Cheng, University of Electronic Science and Technology of China, China

TH-A1.1A.9 **11:00**

Low Cross-Polarization Ultrawideband Planar Antenna Array

Hangyu Zhang, Shiwen Yang, Yangjun Ou, Yikai Chen, University of Electronic Science and Technology of China, China

TH-A1.1A.10 **11:20**

A Wide-Band Dual-Polarized Reconfigurable Slot-Ring Antenna/Array with A Compact CPW Feeding Structure

Junyi Huang, Mahmoud Shirazi, Xun Gong, University of Central Florida, United States

Hybrid Methods

Session Co-Chairs: Jianming Jin, University of Illinois at Urbana-Champaign; Alexander B. Yakovlev, University of Mississippi

TH-A3.1A.1 **08:00**

Broadband Monostatic Scattering Calculation of Deep Open Cavities

Kedi Zhang, Jian-Ming Jin, University of Illinois at Urbana-Champaign, United States; Chao-Fu Wang, National University of Singapore, Singapore

TH-A3.1A.2 **08:20**

An MPI-Accelerated Multi-Solver Algorithm for Electromagnetic Modeling of Complex Objects

Jian Guan, Su Yan, Kedi Zhang, Jian-Ming Jin, University of Illinois at Urbana-Champaign, United States

TH-A3.1A.3 **08:40**

Computations of Electromagnetic Wave Scattering Using FEM-BEM-DDM with H-Matrices

Ping-Hao Jia, Jun Hu, Rongrong Zhang, Lianning Song, Zaiping Nie, University of Electronic Science and Technology of China, China

TH-A3.1A.4 **09:00**

Computations of Scattering by Shaped Dielectric Lenses and a comparison with Measurements

Ravishankar Sankaranarayanan, Shushrutha Koyaram, Mahesh Appajappa, Rashtriya Vidyalaya College of Engineering, India; Arjun Ravishankar, Qualcomm Inc, United States

TH-A3.1A.5 **09:20**

A 2D FDFD Eigenmode Method with Edge Singularity Correction and Conformal Technique

Yong Wang, Scott Langdon, Remcom Inc., United States

Break **09:40**

TH-A3.1A.6 **10:00**

Transient Analysis of Resonant Waveguide Devices Using a Hybrid FETD-GSM Algorithm

Kedi Zhang, Jian-Ming Jin, University of Illinois at Urbana-Champaign, United States; Chao-Fu Wang, National University of Singapore, Singapore

TH-A3.1A.7 **10:20**

Towards Real-time In-Situ Antenna Analysis and Design on Platforms of 1000 Wavelengths

Brian MacKie-Mason, Zhen Peng, University of New Mexico, United States

TH-A3.1A.8 **10:40**

A Hybrid Perfectly Matched Layer - Spectral Element Boundary Integral Method for Periodic/ Non-Periodic Analyses

Jun Niu, Duke University, United States; Yi Ren, Chongqing University of Posts and Telecommunications, China; Qing Huo Liu, Duke University, United States

TH-A3.1A.9 **11:00**

Improved Current Continuity Boundary Condition of Hybrid MoM-PO Method

Zi-Liang Liu, Chao-Fu Wang, National University of Singapore, Singapore

TH-A3.1A.10 **11:20**

A Computational Platform That Unifies and Hybridizes Numerical Methods

Junfeng Wang, University of Electronic Science and Technology of China, China; Zhizhang (David) Chen, Dalhousie University, Canada; Yang Wu, Bo Xu, University of Electronic Science and Technology of China, China

Layered Medium Integral Equation Methods

Session Co-Chairs: Donald Wilton, University of Houston; Ali Yilmaz, University of Texas at Austin

TH-A3.2A.1 **08:00**

Singularity Extraction for Periodic Layered Medium Green's Function under Matrix-Friendly Formulation

Jun Niu, Duke University, United States; Yi Ren, Chongqing University of Posts and Telecommunications, China; Qing Huo Liu, Duke University, United States

TH-A3.2A.2 **08:20**

Accuracy Preserving Computation of Asymptotically Smoothed Layered Medium Green's Functions in Finite Precision Arithmetic

Hongfeng Yang, Ali E. Yilmaz, The University of Texas at Austin, United States

TH-A3.2A.3 **08:40**

Efficiency Improvement with a Recursive Taylor Expansion of Bessel Functions for Layered Media Green's Function

Keisuke Konno, Qiang Chen, Tohoku University, Japan; Robert Burkholder, The Ohio State University, United States

TH-A3.2A.4 **09:00**

Far Field Approximation of Half-Space Green's Function

Chun Yun Kee, Chao-Fu Wang, Temasek Laboratories@NUS, Singapore

TH-A3.2A.5 **09:20**

Efficient Simulation of Electromagnetic Telemetry Using Thin Wire Kernel and Layered Media Green's Function

Shubin Zeng, Dawei Li, Donald Wilton, Jiefu Chen, University of Houston, United States

Novel Integral Equation Formulations

Session Co-Chairs: Hakan Bagci, King Abdullah University of Science and Technology (KAUST); Meisong Tong, Tongji University

TH-A3.3A.1 **10:00**

A Single-Source Surface Integral Equation Formulation for Composite Dielectric Objects

Utkarsh Patel, Piero Triverio, Sean V. Hum, University of Toronto, Canada

TH-A3.3A.2 **10:20**

Potential Integral Equations in Electromagnetics

Jie Li, Michigan State University, United States; Xin Fu, The University of Hong Kong, China; Balasubramaniam Shanker, Michigan State University, United States

TH-A3.3A.3 **10:40**

An Accurate Combined Source Integral Equation for Perfect Electrically Conducting Bodies

Jonas Kornprobst, Thomas F. Eibert, Technical University of Munich, Germany

TH-A3.3A.4 **11:00**

Two New Volume Integral Equation Formulations of Composite Material Bodies

Shaode Huang, Jin Pan, University of Electronic Science and Technology of China, Colombia

TH-A3.3A.5 **11:20**

Fastly Converging 2D Solutions of TE-EFIE on Modified Superformula Contours Optimized via Genetic Algorithms

Sadri Güler, Can Önol, Özgür Ergül, Middle East Technical University, Turkey; Emrah Sever, Fatih Dikmen, Yury A. Tuchkin, Gebze Technical University, Turkey

Frequency Reconfigurable Antennas

Session Co-Chairs: Raed Shubair, Khalifa University of Science and Technology; Kwai Man Luk, City University of Hong Kong

TH-A1.2A.1 **08:00**

A Frequency Tunable Origami Spherical Helical Antenna

Xueli Liu, Shun Yao, Stavros V. Georgakopoulos, Florida International University, United States

TH-A1.2A.2 **08:20**

A Frequency-Tunable Dual-Band Multi-Ring Microstrip Antenna Fed by an L-probe with Varactor Diodes

Shuhei Sato, Sakuyoshi Saito, Yuichi Kimura, Saitama University, Japan

TH-A1.2A.3 **08:40**

Frequency Reconfigurable Wideband Compact Dual-Polarized Magneto-Electric Dipole

Abdul-Sattar Kaddour, Serge Bories, CEA-LETI, France; Anthony Bellion, CNES, France; Christophe Delaveaud, CEA-LETI, France

TH-A1.2A.4 **09:00**

A Frequency Diversity Reconfigurable Antenna With Circular Polarization Switching Capability

Muhammad Asad Rahman, Eisuke Nishiyama, Ichihiko Toyoda, Saga University, Japan

TH-A1.2A.5 **09:20**

A Novel Compact Reconfigurable UWB Antenna for Cognitive Radio Applications

Adnan Kantemur, University of Arizona, United States; Ahmed Abdelrahman, University of Colorado Boulder, United States; Hao Xin, University of Arizona, United States

Break **09:40**

TH-A1.2A.6 **10:00**

A Wideband High-Efficiency Polarization Reconfigurable Antenna for Wireless Communication

Fan Wu, Kwai Man Luk, City University of Hong Kong, China

TH-A1.2A.7 **10:20**

Dual-band Frequency Reconfigurable MIMO Antenna with Continuous Tuning Range

Ali Raza, National University of Sciences & Technology, Pakistan; Rifaqat Hussain, King Fahd University of Petroleum and Minerals, Pakistan; Farooq Ahmad Tahir, Muhammad Umar Khan, National University of Sciences & Technology, Pakistan; Mohammad Said Sharawi, King Fahd University of Petroleum and Minerals, Pakistan

TH-A1.2A.8 **10:40**

A Low-Profile Frequency Reconfigurable Metasurface Patch Antenna

Yuan-Ming Cai, Yinzeng Yin, Xidian University, China; Ke Li, Northwest University, China

TH-A1.2A.9 **11:00**

A Wideband Monopole Antenna with Tunable and Switchable Notch Response

Ke Fan Hou, Ke Wei Qian, Ying Jiang Guo, Wen Xun Li, University of Electronic Science and Technology of China, China

TH-A1.2A.10 **11:20**

A Novel mm-Wave Antenna Array Design for Future Metallic Casing Mobile Phone Applications

Bin Yu, Kang Yang, Zhanyi Qian, Huizhou Speed Wireless Technology Co. Ltd., China; Chow-Yen-Desmond Sim, Feng Chia University, Taiwan; Guangli Yang, Shanghai University, China

Smart, Beam Switching and Multi-beam Antennas

Session Co-Chairs: Ali Gharsallah, University of Tunis El Manar.; Ahmed Abdelrahman, University of Colorado Boulder

TH-A1.3A.1 **08:00**

Analysis of a Helmet-Based FMCW Radar for Impact Prediction

Hossein Mehrpour Bernety, David Schurig, University of Utah, United States

TH-A1.3A.2 **08:20**

A Nulls Synthesis Method for High-Resolution DoA Estimation in MIMO Systems

Seyed Mohammad Amjadi, Kamal Sarabandi, The University of Michigan, United States

TH-A1.3A.3 **08:40**

Compact Smart Antenna System for Improving Probability of Detection

Abhishek Singh, Jaakko Kyllonen, Sebastien Caduc, John Shamblin, Mehak Garg, Akihiro Horie, Ethertronics, United States

TH-A1.3A.4 **09:00**

Dual-Polarized Ulta-wideband Multi-Beam Antennas in Wireless Communications

Lin-Ping Shen, Hua Wang, Willi Lotz, Minya Gavrilovic, Communication Components Antenna Inc, Canada

TH-A1.3A.5 **09:20**

Antenna Beamforming using Multiplicative Array Processing

Dayalan Kasilingam, Jigar Shah, University of Massachusetts Dartmouth, United States

Break **09:40**

TH-A1.3A.6 **10:00**

A Smart Beam-Switching Multi-Antenna System for UAV

Soroush Rasti Boroujeni, Zhichao Li, Safieddin Safavi-Naeini, University of Waterloo, Canada

TH-A1.3A.7 **10:20**

Performance of Full Azimuth Beam Switching Antenna System

Mohamed Aymen El Cafsi, University of Tunis El Manar, Tunisia; Mourad Nedil, Université du Québec en Abitibi-Témiscamingue, Canada; Lotfi Osman, Ali Gharsallah, University of Tunis El Manar, Tunisia

TH-A1.3A.8 **10:40**

Antenna Beam Shaping Using Deformable Grating Grid

An-Yao Chou, Chia-Chan Chang, Sheng-Fuh Chang, National Chung-Cheng University, Taiwan; Wei-Lun Sung, Wei-Leun Fang, National Tsing Hua University, Taiwan

TH-A1.3A.9 **11:00**

Rectangular and Circular Arrays with Independently Controlled Beamwidth and Sidelobe Level

Mohammed Al-Husseini, Hassan Ghaziri, Lebanese Center for Studies and Research, Lebanon; Elias Yaacoub, Arab Open University, Lebanon; Karim Kabalan, American University of Beirut, Lebanon

TH-A1.3A.10 **11:20**

Planar Array Design based on the GEBPSO-vm Algorithm

Peng Xu, Xiaoqin Wang, Jiahe Mei, Tao Jiang, Harbin Engineering University, China; Sanjun Dong, Northwestern Polytechnical University, China

Wave Propagation in Indoor Environments

Session Co-Chairs: Darmindra Arumugam, Jet Propulsion Laboratory; Simon Cotton, Queen's University Belfast

TH-A4.1A.1 **08:00**

Physical-Layer Frequency-Based Schemes to Improve 5.8 GHz Links in Presence of People Moving

Iñigo Cuiñas, Manuel García Sánchez, Universidade de Vigo, Spain

TH-A4.1A.2 **08:20**

An Indoor Localization Algorithm in the Absence of A Priori Propagation Information

Lin Cheng, Trinity College, United States; Tianzhu Qiao, Oregon State University, United States

TH-A4.1A.3 **08:40**

Indoor Localization with UWB and 2.4 GHz Bands

Biki Barua, Nahi Kandil, Nadir Hakem, Nour Zaarour, Université du Québec en Abitibi-Témiscamingue, Canada

TH-A4.1A.4 **09:00**

An Evaluation of Micro and Macro Based Diversity Combining for Wearable Communications

Seong Ki Yoo, Simon Cotton, Queens University Belfast, United Kingdom

TH-A4.1A.5 **09:20**

Investigation of Wireless Channel Asymmetry in Indoor Environments

Ehab Salahat, Ahmed Al-Tunaiji, Etisalat British Telecom Center (EBTIC) & Khalifa University, United Arab Emirates; Nazar Ali, Raed Shubair, Khalifa University, United Arab Emirates

Break **09:40**

TH-A4.1A.6 **10:00**

Through-the-wall indoor tracking and navigation using deep-sub-wavelength magnetoquasistatics

Darmindra Arumugam, California Institute of Technology, United States

TH-A4.1A.7 **10:20**

A Comparison of 24 GHz and 2.55 GHz MIMO Measurements in Two Indoor Scenarios

Rashid Mehmood, Brigham Young University, United States; Jon Wallace, Waseh Ahmad, Yahan Yang, Lafayette College, United States; Michael Jensen, Brigham Young University, United States

TH-A4.1A.8 **10:40**

Simulation of Spatial Variations of RF Exposure Within a Macrocell

David Plets, Wout Joseph, Luc Martens, Ghent University/iMinds, Belgium

TH-A4.1A.9 **11:00**

The Calibration of Ray Tracer based on Indoor Office Measurement at 28 GHz

Xin Liu, Bo Ai, Danping He, Ke Guan, Zhangdui Zhong, Longhe Wang, Beijing Jiaotong University, China

TH-A4.1A.10 **11:20**

Channel Characteristics Analysis in Smart Warehouse Scenario

Longhe Wang, Bo Ai, Danping He, Guangkai Li, Ke Guan, Ruisi He, Zhangdui Zhong, Beijing Jiaotong University, China

Reconfigurable Antennas and Cognitive Radio

Session Co-Chairs: Anthony Grbic, University of Michigan; Amelendu Patnaik, IIT Roorkee

TH-UB.1A.1 **08:00**

A Dual-Polarized Patch Antenna for In-Band Full-Duplex Communications

Carlene Goodbody, Gregory Makar, Washington State University Vancouver, United States; Nghi Tran, University of Akron, United States; Tutku Karacolak, Washington State University Vancouver, United States

TH-UB.1A.2 **08:20**

Study of the Influence of Dogs in Radio Propagation Considering Domestic Environments

Erik Aguirre, Peio Lopez-Iturri, Public University of Navarre, Spain; Leyre Azpilicueta, Tecnologico de Monterrey, Mexico; Daniel Santesteban, Francisco Falcone, Public University of Navarre, Spain

TH-UB.1A.3 **08:40**

Deterministic Radio Propagation Estimations in Judo venues for WSN deployment by 3D Ray Launching Method

Peio Lopez-Iturri, Erik Aguirre, Public University of Navarre, Spain; Leyre Azpilicueta, Tecnologico de Monterrey, Mexico; José Javier Astrain, Jesús Villadangos, Francisco Falcone, Public University of Navarre, Spain

TH-UB.1A.4 **09:00**

Printed tunable reflectoarrays on flexible functionalized BST-polymer based substrates

Ehsan Hajisaeid, Ronak Vaghani, Joshua Desrochers, Artee Panwar, Carol Barry, Joey Mead, Alkim Akyurtlu, University of Massachusetts Lowell, United States

TH-UB.1A.5 **09:20**

Chemical Sensor using RF Circular Waveguide

Muhammad Usman Memon, Sungjoon Lim, Chung - Ang University, Republic of Korea

Break **09:40**

TH-UB.1A.6 **10:00**

A Novel Wireless Metamaterial-Inspired Rotation Sensor

Ali Maleki Gargari, Vakur B. Erturk, Bilkent University, Turkey; Ozgur Kurc, Middle East Technical University, Turkey; Ayhan Altintas, Hilmi Volkan Demir, Bilkent University, Turkey

TH-UB.1A.7 **10:20**

Bandwidth and Beamsteering Reconfigurable Antenna

Md. Asaduzzaman Towfiq, Israfil Bahceci, Bedri Artug Cetiner, Utah State University, United States

TH-UB.1A.8 **10:40**

A tunable polarization rotator based on metasurfaces

Zhanni Wu, University of Michigan, Ann Arbor, United States; Younes Ra'di, The University of Texas at Austin, United States; Anthony Grbic, University of Michigan, Ann Arbor, United States

TH-UB.1A.9 **11:00**

Synchronization Issues in Ultra-Wideband Multi-Channel Digital Beam-Formers

Dimitrios Siafarikas, Elias Alwan, John L. Volakis, The Ohio State University, United States

TH-UB.1A.10 **11:20**

Mixed Quadratic Model for Peak Spatial-average SAR of Coherent Multiple Antenna Devices

Arash Ebadi-Shahrivar, Jun Ren, Bertrand M. Hochwald, Patrick Fay, University of Notre Dame, United States; Jian-Ming Jin, University of Illinois at Urbana-Champaign, United States; David J. Love, Purdue University, United States

RF Propagation Modeling and Measurements

Session Co-Chairs: Michael Newkirk, JHU/APL; Jacques Claverie, CREC St-Cyr & IETR

TH-UF.1A.1 **08:00**

Assessment of an analytical expression for an evaporation duct refractivity profile

Jacques Claverie, CREC St-Cyr & IETR, France; Yvonick Hurtaud, DGA MI, France

TH-UF.1A.2 **08:20**

Multipath Signals in a Refractive Environment

Mark Wagner, Santosh Nannuru, Peter Gerstoft, University of California, San Diego, United States

TH-UF.1A.3 **08:40**

Efficient Field Reconstruction Using Compressive Sensing

Andrew Austin, Michael Neve, The University of Auckland, New Zealand

TH-UF.1A.4 **09:00**

RF propagation measurement in maritime environment off Southern California during Santa Ana winds episode

Luyao Xu, Caglar Yardim, Swagato Mukherjee, Joshua Compaleo, The Ohio State University, United States; Qing Wang, Naval Postgraduate School, United States

TH-UF.1A.5 **09:20**

The Current State of Radar and Communication Electromagnetic Wave Propagation Models

Abby Anderson, Naval Surface Warfare Center Dahlgren Division, United States

Break **09:40**

TH-UF.1A.6 **10:00**

Investigation of Gaseous Attenuation on a Ka-Band Propagation Link in Tropical Region

*Feng Yuan, Shilpa Manandhar, Yee Hui Lee, Nanyang Technological University, Singapore; Yu Song Meng, Agency for Science, Technology and Research (A*STAR), Singapore*

TH-UF.1A.7 **10:20**

A Cost/Benefit Analysis of Spatially Processed GNSS Signals under Different Conditions of Geometrical Dilution of Precision (GDOP)

Saeed Khan, Kansas State University, United States

TH-UF.1A.9 **11:00**

In Situ Far-Field Measurement Antenna Patterns Using an Unmanned Air Vehicle

Jorge Salazar-Cerreno, Simon Duthoit, William Doyle, Brenton Wolf, Arturo Umeyama, Phillip Chilson, Caleb Fulton, The Univerisity of Oklahoma, United States

TH-UF.1A.10 **11:20**

Ionospheric Clutter Simulator for High Frequency Radars Wave Propagation

Marie-José Abi Akl, Florent Jangal, ONERA The French Aerospace Lab, France; Muriel Darces, Marc Hélier, Sorbonne Universities, University Pierre and Marie Curie, France

MIMO Technology Implementations

Session Co-Chairs: Jon Wallace, Lafayette College; Michael Jensen, Brigham Young University

TH-A5.3A.1 **08:00**

Efficient Optimization Method for a Reconfigurable OTA Chamber

Matthew Arnold, Rashid Mehmood, Brigham Young University, United States; Jon Wallace, Lafayette College, United States; Michael Jensen, Brigham Young University, United States

TH-A5.3A.2 **08:20**

Numerical Analysis of Correlation Coefficient for MIMO Antennas in a Mode-Stirred Chamber

Jongsung Kim, Kyungsung University, Republic of Korea; Raj Mittra, University of Central Florida, United States

TH-A5.3A.3 **08:40**

Over the Air Calibration of Massive MIMO TDD Arrays for 5G Applications

Lars Jacob Foged, Lucia Scialacqua, Francesco Saccardi, Microwave Vision Italy, Italy; Nicolas Gross, Alessandro Scannavini, Microwave Vision Industries, France

TH-A5.3A.4 **09:00**

Experimental Evaluation of 1-Tap Time Domain Beamforming based on 75 GHz Indoor CSI

Mizuki Suga, Kazuto Goto, Takahiro Tsuchiya, Hideyuki Tsuboi, Chunhsiang Huang, Kazuki Maruta, Atsushi Ohta, NTT Corporation, Japan

TH-A5.3A.5 **09:20**

High Data rate Wireless Transmission in the Non-far Zone with 2D Orthogonal Beams

Karim Tekkouk, Jiro Hirokawa, Makoto Ando, Tokyo Institute of Technology, Japan

Break **09:40**

TH-A5.3A.6 **10:00**

Dual Slant Polarized Cavity Backed Massive MIMO Panel Array Antenna with Digital Beamforming

Mohana Komandla, Ghanshyam Mishra, Satish Kumar Sharma, San Diego State University, United States

TH-A5.3A.7 **10:20**

Discretely-Sampled Partial Aperture Receiver for Orbital Angular Momentum modes

Timothy Drysdale, The Open University, United Kingdom; Ben Allen, Christopher Stevens, The University of Oxford, United Kingdom

TH-A5.3A.8 **10:40**

Direction of Arrival Estimation Using Compact MIMO Array for Portbale Devices

Sining Sun, Hui Li, Dalian University of Technology, China; Jiang Xiong, Computational Electromagnetics Laboratory in University of Electronic Science & Technology of China , Chengdu, China, China

TH-A5.3A.9 **11:00**

Performance Analysis of a Reconfigurable Antenna Array in WLAN Channel Models

Simon Begashaw, Kapil Dandekar, Drexel University, United States

Millimeter Wave Antennas

Session Co-Chairs: Dejan Filipovic, University of Colorado Boulder; Rainee Simons, NASA Glenn Research Center

TH-UB.2A.1 **08:00**

Assembly Strategies for Millimeter Wave Horn Antennas

Saurabh Sanghai, Ljubodrag Boskovic, Nathan Jastram, Dejan Filipovic, University of Colorado Boulder, United States

TH-UB.2A.2 **08:20**

Metamaterial-Corrugated Fermi Tapered Slot Antenna for MMW Applications

Shraman Gupta, Zouhair Briqech, Abdel Razik Sebak, Concordia University, Canada

TH-UB.2A.3 **08:40**

Millimeter-Wave Conformal Antenna Array for 5G Wireless Applications

Syeda Fizzah Jilani, Akram Alomainy, Queen Mary University of London, United Kingdom

TH-UB.2A.4 **09:00**

An LTCC Beam-switching Antenna with High Beam Overlap for 60-GHz Mobile Access Points

Francesco Foglia Manzillo, University of Rennes 1 - IETR, France; Maciej Smierzchalski, CEA-LETI, France; Mauro Ettorre, University of Rennes 1 - IETR, France; Jouko Aurinsalo, Kari T. Kautio, Markku S. Lahti, Antti E. I. Lamminen, Jussi Säily, VTT Technical Research Centre of Finland Ltd., Finland; Ronan Sauleau, University of Rennes 1 - IETR, France

TH-UB.2A.5 **09:20**

Circuit-Board Edge-Mount Dual-Polarized Millimeter-Wave Antenna

Zunnurain Ahmad, Jan Hesselbarth, University of Stuttgart, Germany

Break **09:40**

TH-UB.2A.6 **10:00**

A 60-GHz RLSA Fed by Butler Matrix Carrying Three OAM Modes

Xin Xu, Dan Mori, Tokyo Institute of Technology, Japan; Agnese Mazzinghi, Angelo Freni, University of Florence, Italy; Jiro Hirokawa, Makoto Ando, Kiyomichi Araki, Tokyo Institute of Technology, Japan

TH-UB.2A.7 **10:20**

A Ka-Band (26 GHz) Circularly Polarized 2x2 Microstrip Patch Sub-Array with Compact Feed

Andrew Chrysler, Cindy Furse, University of Utah, United States; Rainee Simons, Félix Miranda, NASA Glenn Research Center, United States

TH-UB.2A.8 **10:40**

A Millimeter-Wave Connected Antenna Array for 5G Applications

Muhammad Ikram, Mohammad Said Sharawi, King Fahd University of Petroleum and Minerals, Saudi Arabia; Atif Shamim, KAUST, Saudi Arabia

TH-UB.2A.9 **11:00**

A Millimeter-Wave Patch-Fed Slot Antenna with Air Cavity

Peiqin Liu, Yue Li, Zhijun Zhang, Zhenghe Feng, Tsinghua University, China

Wideband Phased Arrays for 5G Wireless and Beyond

Session Co-Chairs: Johnson J. H. Wang, Wang Electro-Opto Corporation; Andrew F. Peterson, Georgia Institute of Technology

TH-SP.1P.1 **13:20**

Beam Scanning Enabled Massive MIMO for the Realization of Futuristic 5G Technologies

Gopinath Gampala, C. J. Reddy, Altair Engineering Inc, United States

TH-SP.1P.2 **13:40**

Development of Active Phased Array Antenna for High SHF Wideband Massive MIMO in 5G

Satoshi Yamaguchi, Hideyuki Nakamizo, Shintaro Shinjo, Koji Tsutsumi, Toru Fukasawa, Hiroaki Miyashita, Mitsubishi Electric Corporation, Japan

TH-SP.1P.3 **14:00**

24–71 GHz PCB Array for 5G/ISM

Markus Novak, The Ohio State University, United States; Félix Miranda, National Aeronautics and Space Administration, United States; John L. Volakis, The Ohio State University, United States

TH-SP.1P.4 **14:20**

Limitations of Phased Arrays for 5G Wireless Communications

Wei Hong, Zhi Hao Jiang, Shiwen He, Jianyi Zhou, Peng Chen, Zhiqiang Yu, Jixin Chen, Ling Tian, Chao Yu, Jianfeng Zhai, Nianzu Zhang, Guangqi Yang, Southeast University, China

TH-SP.1P.5 **14:40**

Addressing the Challenges of 5G Systems: Research at the Georgia Institute of Technology

Andrew F Peterson, Hua Wang, Manos M. Tentzeris, Geoffrey Li, Ian Akyildiz, Georgia Institute of Technology, United States

Break **15:00**

TH-SP.1P.6 **15:20**

5G Antenna Array with Wide-Angle Beam Steering and Dual Linear Polarizations

Kirill Klionovski, Atif Shamim, King Abdullah University of Science and Technology, Saudi Arabia; Mohammad Said Sharawi, King Fahd University of Petroleum and Minerals, Saudi Arabia

TH-SP.1P.7 **15:40**

mmWave 5G Phased-arrays with Switchable Pattern and Polarization for Future Smartphones

Wonbin Hong, Pohang University of Science and Technology (POSTECH), Republic of Korea; Wonil Roh, Samsung Electronics, Republic of Korea

TH-SP.1P.8 **16:00**

Wideband Wide-Scan Millimeter-Wave Phased Arrays for Enhanced Security/Privacy and Performance in 5G Mobile Wireless

Johnson Wang, Wang Electro-Opto Corporation, United States

TH-SP.1P.9 **16:20**

3D Lens Antenna Array for Tbps Communications

Marta Arias Campo, Diego Emer, Giorgio Carluccio, Nuria Llombart, TU Delft, Netherlands

TH-SP.1P.10 **16:40**

Channel Capacity Analysis of Different Mobile Antenna Array Topologies in the Outdoor Urban Environment for 5G mm Wave System

Qingbi Liao, KTH Royal Institute of Technology, Sweden; Zhinong Ying, Sony Mobile Communications, Sweden; Carl Gustafson, Lund University, Sweden

Modern Longwave Antennas

Session Co-Chairs: Walter Wall, HRL Laboratories, LLC; Jim Plesa, DXE, LLC

TH-SP.2P.1 **13:20**

Low Frequency Mechanical Antennas

James Bickford, Ronald McNabb, Paul Ward, Daniel Freeman, Marc Weinberg, Draper, United States

TH-SP.2P.2 **13:40**

Spinning Magnets: An Unconventional Method for Compact Generation of ELF Radio Signals

David Arnold, Hunter Burch, Michael Mitchell, Alexandra Garraud, Robert Moore, University of Florida, United States

TH-SP.2P.3 **14:00**

Spinning Magnet Antenna for VLF Transmitting

Skyler Selvin, Srinivas Prasad M N, Yikun Huang, Yuanxun Ethan Wang, University of California, Los Angeles, United States

TH-SP.2P.4 **14:20**

Wideband VLF and LF Systems

David Hershberger, Continental Electronics, United States

TH-SP.2P.5 **14:40**

An Electrically Small Antenna Concept Design for Transmitting a Baseband Signal

Majid Manteghi, Virginia Tech, United States

Break **15:00**

TH-SP.2P.6 **15:20**

An Overview of Low Profile Miniaturized Antennas for Low Frequency Applications

Kamal Sarabandi, The University of Michigan, United States

TH-SP.2P.7 **15:40**

VLF/LF Generation via Electrically Short Plasma Antennas

Parker Singletary, Nathan Opalinski, Cheong Chan, Mitchell Walker, Georgia Institute of Technology, United States; Mark Golkowski, University of Colorado Boulder, United States; Morris Cohen, Georgia Institute of Technology, United States

TH-SP.2P.8 **16:00**

HF Heating of the Ionosphere: An Interesting Source of ELF and VLF Waves

Robert Moore, University of Florida, United States

TH-SP.2P.9 **16:20**

Circuit Analysis of the Stability of a Two-Element Non-Foster Impedance Matching Network

Stephen Stearns, Consulting Engineer, United States

TH-SP.2P.10 **16:40**

Monopole and Conformal PIFA for Small Cylindrical Groundplane Mounting

Roshanak Zabihi, Rodney G Vaughan, Simon Fraser University, Canada

Applications of Metasurfaces

Session Co-Chairs: Alexander B. Yakovlev, University of Mississippi; Mohammad Albooyeh, University of California Irvine

TH-A2.1P.1 **13:20**

Controllable Angular Scattering with a Bianisotropic Metasurface

Karim Achouri, Christophe Caloz, Polytechnique Montréal, Canada

TH-A2.1P.2 **13:40**

Dual-band chiral metasurfaces

Minseok Kim, George Eleftheriades, University of Toronto, Canada

TH-A2.1P.3 **14:00**

A Highly-confined Dielectric Waveguide Enabled by Conformal Anisotropic Impedance Surfaces

Zhi Hao Jiang, Southeast University, China; Lei Kang, Taiwei Yue, Douglas H. Werner, The Pennsylvania State University, United States

TH-A2.1P.4 **14:20**

Metasurface-based lens with application to horn beam squinting

Mario Jr. Mencagli, University of Siena, Italy; Francesco Caminita, Enrica Martini, Wave Up Srl, Italy; Stefano Maci, University of Siena, Italy

TH-A2.1P.5 **14:40**

Windmill clutter mitigation using active meta-surfaces

Yang Wang, Minqing Yun, Feng Lin, Zhong-Tao Luo, Chongqing University of Posts and Telecommunications, China

Break **15:00**

TH-A2.1P.6 **15:20**

Tunable hybrid metasurfaces for image quality enhancement

Alexey Slobozhanyuk, Yuri Kivshar, Australian National University, Australia; Alena Shchelokova, Irina Melchakova, Stanislav Glybovski, Pavel Belov, ITMO University, Russian Federation; Andrew Webb, Leiden University Medical Center, Netherlands

TH-A2.1P.7 **15:40**

Cylindrical Metasurfaces for exotic electromagnetic wave manipulations

Mahdi Safari, Ali Abdolali, Iran University of Science and Technology, Iran; Hamidreza Kazemi, Mohammad Albooyeh, Mehdi Veysi, Filippo Capolino, University of California, Irvine, United States

TH-A2.1P.8 **16:00**

A Circular Polarization Selective Surface Employing Jerusalem Cross-Based Polarizers

Mehdi Hosseini, Sean V. Hum, University of Toronto, Canada

TH-A2.1P.9 **16:20**

Reconfigurable Impedance Ground Plane for Broadband Antenna Systems

Sanghoon Kim, Aobo Li, Daniel F. Sievenpiper, University of California, San Diego, United States

TH-A2.1P.10 **16:40**

Design of Broadband Reflecting Metasurfaces for Polarization Conversion

Michele Borgese, Filippo Costa, Simone Genovesi, Agostino Monorchio, Università di Pisa, Italy

Terahertz IR and Optical Applications

Session Co-Chairs: Andrea Neto, Delft University of Technology; Georgios Trichopoulos, Arizona State University

TH-A5.1P.1 **13:20**

Millimeter- and Submillimeter-Wave Applications in Biology: Potential and Challenges

Peter H. Siegel, California Institute of Technology, United States

TH-A5.1P.3 **14:00**

Power Measurements of THz Radiation from Photoconductive Antennas for Validating a Norton Equivalent Circuit

Alessandro Garufo, Giorgio Carluccio, Delft University of Technology, Netherlands; Joshua Freeman, David Bacon, University of Leeds, United Kingdom; Nuria Llombart, Delft University of Technology, Netherlands; Edmund Linfield, Giles Davies, University of Leeds, United Kingdom; Andrea Neto, Delft University of Technology, Netherlands

TH-A5.1P.4 **14:20**

Multiview Techniques for mm-Wave Imaging

Jaime Laviada Martinez, Yuri Alvarez-Lopez, Ana Arboleya-Arboleya, Universidad de Oviedo, Spain; Borja Gonzalez Valdes, Universidad de Vigo, Spain; Fernando Las-Heras Andres, Universidad de Oviedo, Spain

TH-A5.1P.5 **14:40**

Cooperative MIMO Radar using Multiple Receiving Stations for Human Localization

Nobuyuki Shiraki, Dai Sasakawa, Naoki Honma, Iwate University, Japan; Takeshi Nakayama, Shoichi Iizuka, Panasonic Corporation, Japan

Break **15:00**

TH-A5.1P.6 **15:20**

Toward a Terahertz Quasi-optical Vector Network Analyzer

Yiran Cui, Georgios Trichopoulos, Arizona State University, United States

TH-A5.1P.7 **15:40**

A Novel THz Radar Imaging System Using the Radon Transform

Panagiotis Theofanopoulos, Georgios Trichopoulos, Arizona State University, United States

TH-A5.1P.8 **16:00**

Terahertz Horn Antenna for Frequency Domain Material Properties Estimation

Saleem Shahid, Gian Guido Gentili, Politecnico di Milano, Italy

TH-A5.1P.9 **16:20**

Dielectric Constant Measurement of Collagen at Terahertz Band using Terahertz Time Domain Spectroscopy

Ke Yang, Nishtha Chopra, QMUL, United Kingdom; Qammer Abbasi, Khalid Qaraqe, Texas A&M University, Qatar; Akram Alomainy, QMUL, United Kingdom

TH-A5.1P.10 **16:40**

Study of field enhancement in overlapped bowtie antenna for Infrared harvesting application

Azat Meredov, Gaurav Jayaswal, Atif Shamim, King Abdullah University of Science and Technology, Saudi Arabia

Dielectric Resonator and Slot Antennas: High Gain or Circular Polarized Deisgns

Session Co-Chairs: Yahia Antar, Royal Military College of Canada; Hussein Attia, King Fahd University of Petroleum and Minerals

TH-A1.1P.1 **13:20**

Wide-band Circularly Polarized Dielectric Resonator Antenna Array

Abdelhady Mahmoud, Benha University, Egypt; Hussein Attia, King Fahd University of Petroleum and Minerals, Saudi Arabia

TH-A1.1P.2 **13:40**

Hight-Gain Circularly Polarized Multilayer Dielectric Resonator Antenna for Millimeter-Wave application

Mejdi Laribi, Nadir Hakem, Taieb Elkarkraoui, LRTCS, Canada

TH-A1.1P.3 **14:00**

Inverted Stair Case/Hat Shaped Dielectric Resonator Antenna: High Gain Design with Higher Order Mode

Debatosh Guha, Poulomi Gupta, University of Calcutta, India; Chandrakanta Kumar, ISRO Satellite Centre , Govt. of India, India; Yahia M. M. Antar, Royal Military College of Canada, Canada

TH-A1.1P.4 **14:20**

Integration of Substrate Integrated Waveguide Filter with Dielectric Resonator Antenna

Hanyue Xu, Ying Wang, University of Ontario Institute of Technology, Canada; Wael Abdel-Wahab, University of Waterloo, Canada; Langis Roy, University of Ontario Institute of Technology, Canada; Jingping Liu, Nanjing University of Science and Technology, China

TH-A1.1P.5 **14:40**

Substrate integrated waveguide fed circularly polarized elliptical dielectric resonator antenna array

Jyoti Roat, Abhishek Sharma, Animesh Biswas, M. J. Akhtar, Indian Institute of Technology Kanpur, India

Break **15:00**

TH-A1.1P.6 **15:20**

Wideband Circularly Polarized Cylindrical Dielectric Resonator Antenna

Jian Ren, City University of Hong Kong, Hong Kong SAR of China; Lei Guo, École Polytechnique de Montréal, Canada; Kwok Wa Leung, City University of Hong Kong, Hong Kong SAR of China

TH-A1.1P.7 **15:40**

A Circular Truncated Cone Slot Antenna with Circular Polarized Conical Beam

Guanshen Chenhu, Junping Geng, Liang Liu, Han Zhou, Xiaonan Zhao, Yuliang Liang, Xianling Liang, Weiren Zhu, Ronghong Jin, Shanghai Jiao Tong University, China

Spiral and Log-Periodic Antennas

Session Co-Chairs: Hisamatsu Nakano, Hosei University; Mohamed Elmansouri, University of Colorado Boulder

TH-A1.2P.1 **13:20**

Effects of a Dielectric Substrate on the Radiation Characteristics of a Spiral Antenna with Slots

Hisamatsu Nakano, Ittoku Yoshino, Yuhei Kameta, Junji Yamauchi, Hosei University, Japan

TH-A1.2P.2 **13:40**

4-40 GHz Conical Spiral Antenna Recessed in a Cavity

Maxim Ignatenko, Dejan Filipovic, University of Colorado Boulder, United States

TH-A1.2P.3 **14:00**

An Updated Version of the Dyson Conical Quad-Spiral Array (DYQSA) Feed System for VGOS Applications

Kerlos Atia Abdalmalak, Gabriel Santamaría Botello, Sergio Llorente Romano, Luis Enrique García Muñoz, Daniel Segovia Vargas, Carlos III University of Madrid, Spain

TH-A1.2P.4 **14:20**

A 6-18 GHz Log-Periodic Monopole End-Fire Antenna Based on Microstrip-to-Slotline Transition

Yuanhua Sun, Yongjun Huang, Guangjun Wen, University of Electronic Science and Technology of China, China; Haobin Zhang, Science and Technology on Electronic Information Control Laboratory, China

TH-A1.2P.5 **14:40**

3-Arm Spiral Antennas for Direction Finding Applications

Nahid Rahman, Gregor Lasser, Mohamed Elmansouri, Dejan Filipovic, University of Colorado Boulder, United States

Break **15:00**

TH-A1.2P.6 **15:20**

Wide Bandwidth and Beamwidth Flush-Mountable Planar and Pyramidal Log-Periodic Antennas

Jaegeun Ha, Dejan Filipovic, University of Colorado Boulder, United States

TH-A1.2P.7 **15:40**

Structural Composite Materials near a Broadband Log-Periodic-Dipole-Array (LPDA)

Mohammod Ali, Nicholas Bishop, University of South Carolina, United States; William Baron, Jason Miller, James Tuss, David Zeppettella, Air Force Research Laboratory, United States

TH-A1.2P.8 **16:00**

A 6–18 GHz Cavity-Backed Log-Periodic-Slot End-Fire Antenna for Conformal Application

Yongjun Huang, Jian Li, Guangjun Wen, University of Electronic Science and Technology of China, China; Haobin Zhang, Science and Technology on Electronic Information Control Laboratory, China

TH-A1.2P.9 **16:20**

Double-Arm Hexagonal Archimedean Spiral Antenna for Wideband Compact Array

Chan Ju Park, Seung Gook Cha, Young Joong Yoon, Yonsei University, Republic of Korea; Hyungrak Kim, Daelim University College, Republic of Korea

TH-A1.2P.10 **16:40**

A Multimode Wideband Dual-Polarized Antenna Based on Stub-Loaded Dipoles

Dong-Ze Zheng, Qing-Xin Chu, South China University of Technology, China

Basis Functions and Numerical Integration

Session Co-Chairs: Francesco P. Andriulli, Ecole Nationale Superieure Mines-Telecom Atlantique; Zhen Peng, University of New Mexico

TH-A3.1P.1 **13:20**

Results in quadrature error estimation for weak near-singular MoM integrals

Matthys Botha, Stellenbosch University, South Africa; Thomas Rylander, Chalmers University of Technology, Sweden

TH-A3.1P.2 **13:40**

Isogeometric Analysis of EM Scattering on Multiply-Connected Subdivision Surfaces

Jie Li, Balasubramaniam Shanker, Michigan State University, United States

TH-A3.1P.3 **14:00**

Linear-Linear Basis Functions for Source Reconstruction Using Magnetic-Field Integral Equations in Very-Near-Field Measurements

Rezvan Rafiee Alavi, Ali Kiaee, Rashid Mirzavand, Pedram Mousavi, University of Alberta, Canada

TH-A3.1P.4 **14:20**

Acceleration of the Fully Numerical Evaluation of Galerkin Interactions on Surface Elements

Javier Rivero, Universidad de Extremadura, Spain; Francesca Vipiana, Politecnico di Torino, Italy; Donald R. Wilton, University of Houston, United States; William A. Johnson, New Mexico Institute of Mining and Technology, United States

TH-A3.1P.5 **14:40**

Higher Order Electromagnetic Modeling in Current and Charge Integral Equation Method

Yi Ren, Shi-Wei Zhao, Chongqing University of Posts and Telecommunications, China; Jing-He Li, Guilin University of Technology, China; Jun Niu, Duke University, United States; Hong-Sheng Zhang, Wen Huang, Chongqing University of Posts and Telecommunications, China

Break **15:00**

TH-A3.1P.6 **15:20**

Clarifications on the Surface Integral Equation Computation of the Characteristic Modes of Dielectric Objects

Hamad Alroughani, The Pennsylvania State University, United States; Derek McNamara, University of Ottawa, Canada

TH-A3.1P.7 **15:40**

Fast multiple-reflection physical optics (FMRPO) through comprehensive MLFMM acceleration

Dao Xiang, Matthys Botha, Stellenbosch University, South Africa

TH-A3.1P.8 **16:00**

A General Equivalent Model for Understanding Theory of Characteristic Modes

Fu-Gang Hu, Chao-Fu Wang, National University of Singapore, Singapore

TH-A3.1P.9 **16:20**

Duffy Transformation with a Simple Polynomial Smoothing Strategy for Weakly Singular Integrals

Ming-Da Zhu, Donghua University, China

TH-A3.1P.10 **16:40**

Electromagnetic Scattering Analysis from Anisotropic Media Using Volume Integral Equation with Higher Order Hierarchical Vector Basis Functions

Zhi-Peng Zhang, Yan-Wen Zhao, Qiang-Ming Cai, Yu-Teng Zheng, Li Gu, Zai-Ping Nie, University of Electronic Science and Technology of China, China

Thursday, July 13 | 13:20 - 15:00
TH-A3.2P | Mission Beach AB

Advances in the Finite Element Methods

Session Co-Chairs: Dan Jiao, Purdue University; Joseph Kotulski, Sandia National Laboratories

TH-A3.2P.1 **13:20**

Hybrid FEM-Random Walk Method for Plasmonic Structure Field Computations

Ramakrishna Janaswamy, Dimitrios Makris, Marinos N. Vouvakis, University of Massachusetts, United States

TH-A3.2P.2 **13:40**

Analytical Method for Finding the Nullspace of Stiffness Matrix in the Finite Element Method

Li Xue, Dan Jiao, Purdue University, United States

TH-A3.2P.3 **14:00**

A Memory-efficient Sparse Direct Solver with Applications in CEM

Javad Moshfegh, Marinos N. Vouvakis, University of Massachusetts Amherst, United States

TH-A3.2P.4 **14:20**

Frequency-Domain Method Having a Diagonal Mass Matrix in Arbitrary Unstructured Meshes for Efficient Electromagnetic Analysis

Kaiyuan Zeng, Dan Jiao, Purdue University, United States

TH-A3.2P.5 **14:40**

Finite Element Modeling of Anisotropic Half-Space Problems by a Simple Mesh Truncation Scheme

Ozlem Ozgun, Hacettepe University, Turkey; Mustafa Kuzuoglu, Middle East Technical University, Turkey

Thursday, July 13 | 15:20 - 17:00
TH-UB.1P | Mission Beach AB

Advances in Differential Equation Based Methods

Session Co-Chairs: Andrew Austin, The University of Auckland; Joseph Kotulski, Sandia National Labs

TH-UB.1P.1 **15:20**

A Perfectly Matched Layer Integrated with Boundary Integral Equation to Serve as the Absorbing Boundary Condition

Runren Zhang, Qingtao Sun, Qinghuo Liu, Duke University, United States

TH-UB.1P.2 **15:40**

Time-Stepping Schemes for Quasi-Magnetostatic Analysis of Magnetic-Conducting Material

John Young, University of Kentucky, United States; Stephen Gedney, University of Colorado Boulder, United States; Robert Adams, University of Kentucky, United States

TH-UB.1P.3 **16:00**

Fast Scan FEM Preconditioning for Infinite Periodic Structures

Dimitrios Makris, Marinos N. Vouvakis, University of Massachusetts Amherst, United States

TH-UB.1P.4 **16:20**

Efficient Estimation of Parameter Sensitivities in the FDTD Method Using Automatic Differentiation

Andrew Austin, Michael Neve, The University of Auckland, New Zealand

TH-UB.1P.5 **16:40**

A Numerical Approach for Efficient Simulation and Design of Yagi-Uda Nanoantennas

Qiang Ren, Yusheng Bian, Lei Kang, Jogender Nagar, Ping Werner, Douglas H. Werner, The Pennsylvania State University, United States

Thursday, July 13 | 13:20 - 17:00
TH-A1.3P | Promenade AB

Phased Array Antennas: Theory and Design

Session Co-Chairs: Steven Holland, Milwaukee School of Engineering; Jie Xu, Loyola Marymount University

TH-A1.3P.1 **13:20**

The Vertigo Array for Grating Lobe Reduction

Luca Piattella, Rainer Maria Rossi, Ivan Russo, Elettronica S.p.A., Italy

TH-A1.3P.2 **13:40**

Near-Field and Far-Field Characterization of Active Electronically Scanned Antennas (AESA) Using Electro-Optic Field Probes

Kazem Sabet, Richard Darragh, Ali Sabet, EMAG Technologies Inc., United States; Kamal Sarabandi, The University of Michigan, United States

TH-A1.3P.3 **14:00**

Impedance Bandwidth of a Slotted Waveguide Array: Impact of Waveguide Length and Element Shape

Maryam Razmhosseini, Rodney G Vaughan, Simon Fraser University, Canada

TH-A1.3P.4 **14:20**

Modeling of Photonic Bandgap Effects on Scan Blindnesses in Printed Dipole Arrays

Steven Holland, Milwaukee School of Engineering, United States

TH-A1.3P.5 **14:40**

Near-Field Receive Beamforming Analysis using Circularly Distributed Random Arrays

Kris Buchanan, Carlos Flores-Molina, Oren Sternberg, Drew Overturf, Sara Wheeland, Nicholas Johnson, SPAWAR Systems Center Pacific, United States

Break **15:00**

TH-A1.3P.6 **15:20**

Scan Blindness-Free Electromagnetic Bandgap Phased Arrays

Enver Adas, Franco De Flaviis, University of California, Irvine, United States; Nicolaos G. Alexopoulos, Broadcom Foundation, United States

TH-A1.3P.7 **15:40**

Generating LG Modes with Aperture or Array

Jie Xu, Loyola Marymount University, United States

TH-A1.3P.8 **16:00**

Grating Lobe Reduction in Phased Arrays with Regular Subarray Architecture

Fei Yan, Peng Yang, Min Gao, Xuewu Cui, Feng Yang, University of Electronic Science and Technology of China, China

TH-A1.3P.9 **16:20**

Control of Scattering Patterns of a Phased array with Swtiches Loaded Annular Slot Elements

Peng Yang, Fei Yan, Feng Yang, University of Electronic Science and Technology of China, China

TH-A1.3P.10 **16:40**

Efficiency Improvement in TMA Using Complementary Mode Switching

Mohammad Hossein Mazheri, Mohammad Fakharzadeh, Mahmood Akbari, Sharif University of Technology, Iran

Antennas for Energy Harvesting

Session Co-Chairs: Joseph Costantine, American University of Beirut; John Pantoja, Universidad Nacional de Colombia

TH-A5.2P.1 **13:20**

A Wideband and High Gain Antenna on Multilayer Insulation Blanket for RF Energy Harvesting

Jun Iwata, Japan Patent Office, Japan; Jo Bito, Manos M. Tentzeris, Georgia Institute of Technology, United States

TH-A5.2P.2 **13:40**

A Novel Efficient Multiple Input Single Output RF Energy Harvesting Rectification Scheme

Oskar Björkqvist, Christos Kolitsidas, Oskar Dahlberg, Gustaf Silver, Martin Mattsson, Lars Jonsson, KTH Royal Institute of Technology, Sweden

TH-A5.2P.3 **14:00**

A Compact Fractal Structure Based Rectenna with the Rectifier Circuit Integrated

Euclides Lourenço Chuma, Lisandro de la Torre Rodríguez, Yuzo Iano, Leonardo L. Bravo Roger, University of Campinas - UNICAMP, Brazil; Miguel-Angel Sanchez-Soriano, University of Alicante, Spain

TH-A5.2P.4 **14:20**

A high gain Dual-Polarised Differential Rectenna for RF Energy Harvesting

Martin Mattsson, Christos Kolitsidas, Gustaf Silver, Oskar Björkqvist, Oskar Dahlberg, Lars Jonsson, KTH Royal Institute of Technology, Sweden

TH-A5.2P.5 **14:40**

Multi-port RF Energy Harvester with a Tapered Matching Network

Aline Eid, Joseph Costantine, American University of Beirut, Lebanon; Youssef Tawk, Notre Dame University Louaize, Lebanon; Mahmoud Abdallah, American University of Beirut, Lebanon; Ali Ramadan, Fahad Bin Sultan University, Saudi Arabia; Christos Christodoulou, University of New Mexico, United States

Break **15:00**

TH-A5.2P.6 **15:20**

Wearable Inkjet Printed Energy Harvester

Tong-Hong Lin, Jo Bito, Manos M. Tentzeris, Georgia Institute of Technology, United States

TH-A5.2P.7 **15:40**

A Study of Directional Antenna for Recycled Energy Improvement in Electromagnetic Wave Energy Harvesting

Nobuyasu Takemura, Yuhei Kohara, Syunta Ichikawa, Hideto Kondo, Nippon Institute of Technology, Japan

TH-A5.2P.8 **16:00**

High Efficiency Rectifier for RF Energy Harvesting in the GSM band

Alex Mouapi, Nadir Hakem, Nahi Kandil, Université du Québec en Abitibi-Témiscamingue, Canada

TH-A5.2P.9 **16:20**

Ultra Small Dual Band Antenna Design for Implantable Devices

Jaechun Lee, Joonseong Kang, Wonseok Lee, Junyeub Suh, Young-Jun Hong, Samsung Advanced Institute of Technology, Republic of Korea

Wave Propagation in Terrestrial, Oceanic and Atmospheric Environments

Session Co-Chairs: Magdy Iskander, University of Hawaii at Manoa; Darmindra Arumugam, Jet Propulsion Laboratory

TH-A4.1P.1 **13:20**

Vector vs. Raster Representations of 3D Ridges for Propagation Modeling Over Terrains

Zhengqing Yun, Magdy F. Iskander, University of Hawaii, United States

TH-A4.1P.2 **13:40**

Mitigation of time-varying spectral nulls in a wideband HF signal

Michael Daly, Jeffery Allen, Tomasz Wojtaszek, Marcos Ontiveros, SPAWAR Systems Center Pacific, United States

TH-A4.1P.3 **14:00**

LTE signal propagation in a maritime environment: validation of a hybrid MoM-ray tracing prediction method

Marco Sfrecola, Italian Navy, Italy; Alessandro Corucci, Consorzio Nazionale Interuniversitario per le Telecomunicazioni (CNIT), Italy; Agostino Monorchio, Università di Pisa, Italy

TH-A4.1P.4 **14:20**

Localization in planetary sub-surfaces using deep-sub-wavelength magnetoquasistatics

Darmindra Arumugam, California Institute of Technology, United States

TH-A4.1P.5 **14:40**

Rain Attenuation Analysis at 84 GHz

Nadine Daoud, Christos Christodoulou, University of New Mexico, United States; David Murrell, Air Force Research Laboratory, United States

Break **15:00**

TH-A4.1P.6 **15:20**

Link Performance Analysis of 433MHz Band in High Stress Environments

Saleem Shahid, Politecnico di Milano, Italy; Awais Aslam, Saad B. Qaisar, National University of Sciences & Technology, Pakistan; Ijaz Naqvi, Lahore University of Management Sciences (LUMS), Pakistan

TH-A4.1P.7 **15:40**

Robust Extraction of Rectangular Waveguide Surrogate Models of Wave Propagation in Tunnels

Xingqi Zhang, Costas D. Sarris, University of Toronto, Canada

TH-A4.1P.8 **16:00**

A Doppler Frequency Calibration Method by Ionosphere for Skywave OTHR

Yang Li, Chang Liu, Ning Zhang, Harbin Institute of Technology, China

TH-A4.1P.9 **16:20**

An Ionospheric Clutter Recognition Method Based on Machine Learning

Yang Li, Mengke He, Ning Zhang, Harbin Institute of Technology, China

TH-A4.1P.10 **16:40**

A Hybrid Method of FDTD and Vector Parabolic Equation for Radio Wave Propagation Prediction in Tunnels

Weibin Hou, Junhong Wang, Yujian Li, Beijing Jiaotong University, China

Biological Imaging and Sensing

Session Co-Chairs: Erdem Topsakal, Virginia Commonwealth University; Ozlem Kilic, Catholic University of America

TH-UK.1P.1 **13:20**

Future of Implantable Wireless Medical Telemetry

Erdem Topsakal, Virginia Commonwealth University, United States

TH-UK.1P.2 **13:40**

Non-invasive Home-Based Maternal-Fetal ECG Monitoring System

Victor Ho, Daniel Schossow, Peter Ritchie, Manuja Sharma, Tadesse Ghirmai, Daniel Bustillos, Mabel Ezeonwu, Sandeep Krishnan, University of Washington, United States; Michael P.H. Lau, Sensoriis, United States; J.-C. Chiao, The University of Texas at Arlington, United States; Hung Cao, University of Washington, United States

TH-UK.1P.3 **14:00**

Surface Mapping of Cardiac Electrical Activity using Implantable Electrodes

Sanjana Paul, Madeline Hays, Alex Surette, Sarah Moore, Umar Hasni, Umit Ozgur, Vigneshwar Kasirajan, Erdem Topsakal, Virginia Commonwealth University, United States

TH-UK.1P.4 **14:20**

Sensing Volume of Breast Tissue for Microwave Dielectric Characterization

Madeline Hays, Erdem Topsakal, Virginia Commonwealth University, United States

TH-UK.1P.5 **14:40**

Non-invasive Monitoring and Tracking of Human Activities using Continuous-wave Radar

Nghia Tran, Ozlem Kilic, The Catholic University of America, United States

Break **15:00**

TH-UK.1P.6 **15:20**

Human Activity Estimation by Height and RCS Information Detected by MIMO Radar

Dai Sasakawa, Naoki Honma, Iwate University, Japan; Takeshi Nakayama, Shoichi Iizuka, Panasonic Corporation, Japan

TH-UK.1P.7 **15:40**

Electric and Hydrodynamic Properties of Stem Cells with Realistic Three-Dimensional Morphologies

Somen Baidya, Ahmed Hassan, University of Missouri-Kansas City, United States; Beatriz Pazmino, Jack Douglas, Edward Garboczi, National Institute of Standards and Technology, United States

TH-UK.1P.8 **16:00**

Increasing the Amount of Data for Microwave Imaging System Using Field Perturbing Elements

Mohammad Asefi, Joe Lovetri, University of Manitoba, Canada

TH-UK.1P.9 **16:20**

Microwave Hyperthermia for Breast Cancer Therapy Monitored by Compressive Thermoacoustic Imaging

Lifan Xu, Xiong Wang, ShanghaiTech University, China

Electromagnetic Compatability and Interference

Session Co-Chairs: Salvatore Campione, Sandia National Laboratories; Scott Tyo, University of New South Wales Canberra

TH-UE.1P.1 **13:20**

Measuring Coupled Signals on Active Ship-Based Communication System

Alan O'Donnell, Alan Michaels, Robert McGwier, Virginia Tech, United States

TH-UE.1P.2 **13:40**

A CubeSat Platform for Characterizing the Reliability of Electronic Components

Paul Tarantino, Nicolas Lee, Sigrid Close, Stanford University, United States

TH-UE.1P.3 **14:00**

Evaluation of Harmful Interference in Realistic Operating Environments

Sakshi Srivastava, Jennifer T. Bernhard, University of Illinois at Urbana-Champaign, United States

TH-UE.1P.4 **14:20**

Efficient Cross-talk Reduction of Nanophotonic Circuits Enabled by Periodic Silicon Strip Arrays

Yusheng Bian, Qiang Ren, Lei Kang, Ping Werner, Douglas H. Werner, The Pennsylvania State University, United States

TH-UE.1P.5 **14:40**

Finite and Infinite Lossy Conductors over a Lossy Ground Plane Excited by an Electromagnetic Pulse

Salvatore Campione, Larry K. Warne, Lorena I. Basilio, C. David Turner, Keith L. Cartwright, Kenneth C. Chen, Sandia National Laboratories, United States

Break **15:00**

TH-UE.1P.6 **15:20**

Loading cavities with electrical small antenna feeds to accomplish power combining in HPEM applications

J Scott Tyo, University of New South Wales Canberra, Australia; Richard W. Ziolkowski, University of Arizona, United States

TH-UE.1P.7 **15:40**

Power Loss Reduction on Right-Angled CPW Bend Using Finger Slots

Chieh-Yu Liao, Yueh-Hsien Cheng, Chun-Long Wang, National Taiwan University of Science and Technology, Taiwan

TH-UE.1P.8 **16:00**

Application of the Random Coupling Model to the Hierarchical Modeling of Electromagnetic Coupling to Partially-Shielded Enclosures

Xiao Ma, Xu Chen, Aosheng Rong, Andreas Cangellaris, University of Illinois at Urbana-Champaign, United States

TH-UE.1P.9 **16:20**

Application of Space Object Conjunction Method in the Radio Channel Modeling and Interference Analysis

Tao Jiang, Asad Husnain Baqar, Harbin Engineering University, China; Yachen Zhang, Heilongjiang University, China

Thursday, July 13 | 13:20 - 17:00
TH-A5.3P | Torrey Hills AB

MIMO Antenna Design

Session Co-Chairs: Raed Shubair, Khalifa University of Science and Technology; Jiro Hirokawa, Tokyo Institute of Technology

TH-A5.3P.1 **13:20**

A Novel 32 Port Cube MIMO Combining Broadside and Endfire Radiation Patterns for Full Azimuthal Coverage - A Modular Unit Approach for a Massive MIMO System

Oskar Dahlberg, Christos Kolitsidas, Martin Mattsson, Gustaf Silver, Oskar Björkqvist, B.L.G. Jonsson, KTH Royal Institute of Technology, Sweden

TH-A5.3P.2 **13:40**

Flexible Reconfigurable Antenna With MIMO Configuration

Saud M. Saeed, Arizona State University and Prince Sattam bin Abdulaziz University, United States; Constantine A. Balanis, Craig R. Birtcher, Arizona State University, United States

TH-A5.3P.3 **14:00**

Defected Ground Structure with Two Resonances for Decoupling of Dual-band MIMO Antenna

Sing Wai Cheung, Qinlong Li, Di Wu, Changfei Zhou, Bo Wang, The University of Hong Kong, Hong Kong SAR of China

TH-A5.3P.4 **14:20**

A Low Profile Pattern Reconfigurable Antenna with Enhanced Bandwidth and Gain

Fei Gao, Gang Shen, Jinxing Lu, Wei Wang, Bell Labs, China, China

TH-A5.3P.5 **14:40**

A compact 4-element LTE MIMO antenna design for mobile phone

Zheqiang Wu, Guangli Yang, Shanghai University, China

Break **15:00**

TH-A5.3P.6 **15:20**

4 Elements UWB MIMO Antenna for Wireless Applications

Ahmed Ibrahim, Minia University, Egypt; Mahmoud A. Abdalla, MTC College, Egypt; John L. Volakis, The Ohio State University, United States

TH-A5.3P.7 **15:40**

A Planar 8-Port MIMO Antenna for 2.4-GHz WLAN Applications

Xiaoxue Hua, Di Wu, Sing Wai Cheung, Qinlong Li, The University of Hong Kong, Hong Kong SAR of China

TH-A5.3P.8 **16:00**

Design and Measurement of a Compact UWB MIMO Antenna With Asymmetric Coplanar Strip Feed

Ahmed Ibrahim, Minia University, Egypt; Jan Machac, Czech Technical University in Prague, Czech Republic; Raed Shubair, Khalifa University & MIT, United States; Milan Svanda, Czech Technical University in Prague, Czech Republic

TH-A5.3P.9 **16:20**

Metamaterial-Enhanced Dual Polarized HMSIW Antenna for MIMO Applications

Jing-Wei Lei, Xue-Xia Yang, Elobied Abubaker, Shanghai University, China

TH-A5.3P.10 **16:40**

A Single Radiator with Four Decoupled Ports for Four by Four MIMO Antennas and Systems

Luyu Zhao, Aobo Chen, Jianqiang Zhang, Shufeng Zheng, Yingzeng Yin, Xidian University, China

Thursday, July 13 | 13:20 - 16:20
TH-A2.2P | Solana Beach

Applications of Periodic Structures

Session Co-Chairs: Eva Rajo-Iglesias, University Carlos III of Madrid; Christos Christodoulou, University of New Mexico

TH-A2.2P.1 **13:20**

Mode-Free Radiating Electromagnetic Bandgap Materials as Phased Array Antenna Elements

Enver Adas, Franco De Flaviis, University of California, Irvine, United States; Nicolaos G. Alexopoulos, Broadcom Foundation, United States

TH-A2.2P.2 **13:40**

New EBG-Filter Design in Inverted Microstrip Gap Waveguide Technology

Luis Inclan-Sanchez, Carlos Sanchez-Cabello, Jose Luis Vazquez-Roy, Eva Rajo-Iglesias, Carlos III University of Madrid, Spain

TH-A2.2P.3 **14:00**

Reflection Phase Characterization of Spherical High Impedance Surfaces with Circular Periodicity

Mikal Amiri, Constantine A. Balanis, Craig R. Birtcher, Arizona State University, United States

TH-A2.2P.4 **14:20**

Extending the Performance of Quasiconformal Lens Transformations Using Geometrical Optics Principles

Sawyer D. Campbell, Jogender Nagar, Douglas H. Werner, The Pennsylvania State University, United States

TH-A2.2P.5 **14:40**

A Spiral Element above a Spherically Curved AMC Ground Plane

Mikal Askarian Amiri, Constantine A. Balanis, Craig R. Birtcher, Arizona State University, United States

Break **15:00**

TH-A2.2P.6 **15:20**

Notable Gain Enhancement of Curvilinear Elements Using a Circular HIS Ground Plane

Mikal Askarian Amiri, Constantine A. Balanis, Craig R. Birtcher, Arizona State University, United States

TH-A2.2P.7 **15:40**

A Novel Electromagnetic Band Gap Structures for Two-element MIMO Antenna

Xiaochao Jiang, Jiahe Mei, Tao Jiang, Harbin Engineering University, China; Yachen Zhang, Heilongjiang University, China

TH-A2.2P.8 **16:00**

Orbital Angular Momentum Generation from a Defect in Photonic Crystals

Menglin Chen, Li Jun Jiang, Wei Sha, The University of Hong Kong, Hong Kong SAR of China

Thursday, July 13 | 15:20 - 17:00
TH-UB.2P | Mission Beach C

3D Printed and Planar Structures

Session Chair: Anthony Grbic, University of Michigan

TH-UB.2P.1 **15:20**

Miniaturised Inkjet-printed Quadrature Hybrid Couplers for Multiband Wireless Systems

Oludotun Olukoya, Andrzej Tarczynski, Djuradj Budimir, University of Westminster, United Kingdom

TH-UB.2P.2 **15:40**

On the Use of 3D Printable Conductive Materials for Antenna Fabrication

Milad Mirzaee, Sima Noghanian, University of North Dakota, United States

TH-UB.2P.3 **16:00**

Conductivity of 3D Printed Aluminum and Electroplated Printed Aluminum Measured at Microwave Frequencies

Yannick Lee Yow, Lauren Powell, Phil Venezia, Custom Microwave Inc, United States

TH-UB.2P.4 **16:20**

Bending and Stretching Effects on the 3D Printed Wearable Flexible Antennas

Milad Mirzaee, Sima Noghanian, University of North Dakota, United States

TH-UB.2P.5 **16:40**

Broadband Planar Luneburg Lens Antenna Using Glide-symmetric Meandered Transmission Lines

Mahsa Ebrahimpouri, Oscar Quevedo-Teruel, KTH Royal Institute of Technology, Sweden; Anthony Grbic, University of Michigan, United States

In-Body Devices for Wireless Biotelemetry: Implants and Ingestibles

Session Co-Chairs: Asimina Kiourti, The Ohio State University; Raed Shubair, Massachusetts Institute of Technology

FR-SP.1A.1 **08:00**

Implantable and Ingestible Sensors for Wireless Physiological Monitoring: A Review

Asimina Kiourti, The Ohio State University, United States; Raed Shubair, Research Laboratory of Electronics, MIT, United States

FR-SP.1A.2 **08:20**

Wireless Telemetry Performance of Transplanted Organ Monitoring at Ultra Wideband Range Considering Respiration-Induced Organ Movement

Pongphan Leelatien, Koichi Ito, Kazuyuki Saito, Chiba University, Japan; Akram Alomainy, Yang Hao, Queen Mary University of London, United Kingdom; Manmohan Sharma, Nanyang Technological University, Singapore

FR-SP.1A.3 **08:40**

A Novel Design to Power the micro-ECG Sensor Implanted in Adult Zebrafish

Daniel Schossow, Peter Ritchie, Hung Cao, University of Washington, United States; J.-C. Chiao, The University of Texas at Arlington, United States; Jingchun Yang, Xiaolei Xu, Mayo Clinic, United States

FR-SP.1A.4 **09:00**

A Wireless, Fully-Passive Recorder for Medical Applications

Cedric W. Lee, Asimina Kiourti, John L. Volakis, The Ohio State University, United States

FR-SP.1A.5 **09:20**

An Investigation on In-body Radio Channels Based on Inhomogeneous Model

Jingzhen Li, Zedong Nie, Yuhang Liu, Lei Wang, Shenzhen Institutes of Advanced Technology, Chinese Academy of Science, China; Yang Hao, School of Electronic Engineering and Computer Science, Queen Mary College, University of London, United Kingdom

Break **09:40**

FR-SP.1A.6 **10:00**

Safety Assessment of a Cortical Implant for the Restoration of Vision to the Blind

Erik Gamez Rodriguez, Pragya Kosta, Javad Paknahad, Kyle Loizos, University of Utah, United States; Arup Roy, Robert Greenberg, Nick Talbot, Scott Seidman, Proyag Datta, Rongqing Dai, Second Sight Medical Products, United States; Gianluca Lazzi, University of Utah, United States

FR-SP.1A.7 **10:20**

Miniaturized Implantable Patch Antenna for Near-Field Communication at ISM Band

João M. Felício, Carlos A. Fernandes, Instituto de Telecomunicações/Instituto Superior Técnico, Portugal; Jorge R. Costa, Instituto de Telecomunicações/ISCTE-IUL, Portugal

FR-SP.1A.8 **10:40**

Integration of Inductive Energy Harvesting in a Biotelemetry Implant

Stavros Koulouridis, University of Patras, Greece; Antoine Diet, Yann Le Bihan, Lionel Pichon, GeePs - CNRS, France

FR-SP.1A.9 **11:00**

Split Ring Resonator Antenna System with Implantable and Wearable Parts for Far Field Readable Backscattering Implants

Shubin Ma, Leena Ukkonen, Lauri Sydänheimo, Toni Björninen, Tampere University of Technology, Finland

FR-SP.1A.10 **11:20**

Miniaturized and Multiple-Polarization Ingestible Capsule Antennas

Yongxin Guo, National University of Singapore, Singapore

Handset LTE Antenna Design and Challenges

Session Chair: Hongwei Liu, Huawei Device USA, Inc.

FR-SP.2A.1 **08:00**

A Novel Wide-Band MIMO Antenna System For Smart Phones

Muhammad Ikram, Rifaqat Hussain, Mohammad Said Sharawi, King Fahd University of Petroleum and Minerals, Saudi Arabia

FR-SP.2A.2 **08:20**

Frequency Reconfigurable MIMO Slot and UWB Sensing Antennas for CR Applications

Rifaqat Hussain, Mohammad Said Sharawi, King Fahd University of Petroleum and Minerals, Saudi Arabia

FR-SP.2A.3 **08:40**

Capacity Based MIMO Antenna Design

Nicholas Buris, NEBENS, United States; Mohammed Abdul-Gaffoor, Eric Krenz, Motorola Mobility, United States

FR-SP.2A.4 **09:00**

Multi-Gbps Massive MIMO for Future Smartphones and MIMO System Performance Verification

Kin-Lu Wong, Chih-Yu Tsai, National Sun Yat-sen University, Taiwan; Wei-Yu Li, Industrial Technology Research Institute (ITRI), Taiwan

FR-SP.2A.5 **09:20**

OTA Testing of 3G-5G Devices with MIMO: From Anechoic Chambers to Reverberation Chambers and ... Back Again?

Per-Simon Kildal, Andres Alayon Glazunov, Chalmers University of Technology, Sweden

Break **09:40**

FR-SP.2A.6 **10:00**

Channel Capcity Estimation of Mobile Terminal MIMO Antenna by Correlation and Efficiency

Hiroyuki Arai, Yokohama National University, Japan

FR-SP.2A.7 **10:20**

A Compact LTE Multi-Band Loop Antenna With Additional 3400-3800 MHz Coverage for Mobile Phone Application

Huafeng Shen, Yixin Li, Wei Shi, Xiaoqiang Li, Guangli Yang, Shanghai University, China

FR-SP.2A.8 **10:40**

A LTE/WLAN antenna design for mobile handset applications

Chia-Mei Peng, I-Fong Chen, Zong-Han Jiang, Heng-Yi Liao, Jinwen University of Science and Technology, Taiwan

FR-SP.2A.10 **11:20**

An Antenna Design for LTE 4x4 MIMO Cell Phone

Hongwei Liu, Wee Kian Toh, Chulmin Han, Xiaomeng Su, Huawei Device USA, Inc., United States

Design and Analysis of Metasurfaces I

Session Co-Chairs: Christophe Caloz, Polytechnique Montreal; Raphael Kastner, Tel Aviv University

FR-A2.1A.1 **08:00**

Normal vs Tangential Polarizations in Metasurfaces

Mohammad Albooyeh, Hamidreza Kazemi, Filippo Capolino, University of California, Irvine, United States; Do-Hoon Kwon, University of Massachusetts Amherst, United States; Do-Hoon Kwon, Sergei Tretyakov, Aalto University, United States

FR-A2.1A.2 **08:20**

Time-domain Circuit Modelling of Huygens' Metasurfaces

Tom J. Smy, Scott A. Stewart, Shulabh Gupta, Carleton University, Canada

FR-A2.1A.3 **08:40**

Floquet Analysis of Parametric Huygens' Metasurfaces

Shulabh Gupta, Tom J. Smy, Carleton University, Canada

FR-A2.1A.4 **09:00**

Perfectly Refractive Metasurface using Bianisotropy

Guillaume Lavigne, Karim Achouri, Christophe Caloz, Polytechnique Montréal, Canada; Viktar Asadchy, Sergei Tretyakov, Aalto University, Finland

FR-A2.1A.5 **09:20**

Independent Amplitude and Phase Control based on All-Dielectric Huygens' Metasurfaces

Sonya K. Stuhec-Leonard, Shulabh Gupta, Carleton University, Canada

Break **09:40**

FR-A2.1A.6 **10:00**

Field Moving Metasurface

Yousef Vahabzadeh, Christophe Caloz, École Polytechnique de Montréal, Canada

FR-A2.1A.7 **10:20**

All-Dielectric Bianisotropic Metasurfaces

Amin Ranjbar, Anthony Grbic, University of Michigan, United States

FR-A2.1A.8 **10:40**

Dispersion of Surface Waves Supported by Truncated Metasurfaces

Miguel Camacho, University of Exeter, United Kingdom; Rafael R. Boix, Francisco Medina, University of Seville, United Kingdom; Alastair P. Hibbins, J. Roy Sambles, University of Exeter, United Kingdom

FR-A2.1A.9 **11:00**

Transparent Metasurface with Prescribed Aperture Field

Nasim Mohammadi Estakhri, Nader Engheta, Raphael Kastner, University of Pennsylvania, United States

FR-A2.1A.10 **11:20**

Characterization of Metascreens Based on Babinet's Principle and Generalized Sheet Transition Conditions for Metafilms

Xiao Liu, Fan Yang, Maokun Li, Shenheng Xu, Tsinghua University, China

Metamaterial-Inspired Antennas

Session Co-Chairs: Ashwin Iyer, University of Alberta; Tetsuya Ueda, Kyoto Institute of Technology

FR-A2.2A.1 **08:00**

A Low-Profile Dual-Band Circular Patch Antenna for GPS Using Metamaterial-Based EBGs

Stuart Barth, Ashwin K. Iyer, University of Alberta, Canada

FR-A2.2A.2 **08:20**

Broadband Fully Substrate-Integrated Fabry-Pérot cavity Antenna

Lamine Mohamed Abdelghani, Tarek Djerafi, Tayeb Ahmed Denidni, INRS, Université du Québec, Canada

FR-A2.2A.3 **08:40**

Equivalent Circuit Model for Wideband Zeroth-Order Resonant Antennas

Shuhei Terada, Tetsuya Ueda, Electronic Engineering and Electronics, Kyoto Institute of Technology, Japan; Masakazu Ikeda, Yuji Sugimoto, Nipponsoken, Inc, Japan; Hiroaki Kuraoka, Shiro Koide, Denso Corporation, Japan

FR-A2.2A.4 **09:00**

Novel Dual-Band Open-Ended Zeroth-Order Resonant Antenna

Pei-Ling Chi, En Deng, National Chiao Tung University, Taiwan

FR-A2.2A.5 **09:20**

Metamaterial Bessel Beam Radiator

Nikolaos Chiotellis, Anthony Grbic, University of Michigan, United States

Break **09:40**

FR-A2.2A.6 **10:00**

High-Isolation Metamaterial MIMO Antenna

Ahmed Ibrahim, Minia University, Egypt; Mahmoud A. Abdalla, MTC College, Egypt; Raed Shubair, Khalifa University & MIT, United Arab Emirates

FR-A2.2A.7 **10:20**

Radiation Enhancement for Planar Omni-directional Antennas with ENZ Metamaterials

Yifeng Hu, Jiang Xiong, University of Electronic Science and Technology of China, China

FR-A2.2A.8 **10:40**

Isolation Enhancement of Patch Antennas using Metamaterial Superstrate

Prakash Kumar Panda, Debalina Ghosh, Indian Institute of Technology Bombay Bhubaneswar, India

Terahertz Antennas and Sources

Session Co-Chairs: Mohamed Othman, University of California Irvine; Georgios Trichopoulos, Arizona State University

FR-A5.1A.1 **08:00**

A Figure of Merit to Assess the Performance of Photoconductive Antennas at Terahertz Band

Jordi Romeu, Marc de Cea, Lluís Jofre, Universitat Politecnica de Catalunya, Spain; Ayhan Yazgan, Karadeniz Technical University, Turkey

FR-A5.1A.2 **08:20**

A Long Wave Infrared Polarization Sensing Detector with Wide Dynamic Range

Elham Mohammadi, Nader Behdad, University of Wisconsin-Madison, United States

FR-A5.1A.3 **08:40**

OAM Modulation induced in Millimeter Waves using Impedance Matched Flat Phase Plate

Ashutosh Patri, Patanjali V. Parimi, State University of New York at Oswego, United States

FR-A5.1A.4 **09:00**

Resonant Tunneling Diodes for Feeding Antenna-Structures for Terahertz Source Applications

Caiyu Wang, Shubhendu Bhardwaj, John L. Volakis, The Ohio State University, United States

FR-A5.1A.5 **09:20**

Plasmonic Nano-Antenna Arrays for High-Sensitivity and Broadband Terahertz Detection

Nezih Tolga Yardimci, Mona Jarrahi, University of California, Los Angeles, United States

Break **09:40**

FR-A5.1A.6 **10:00**

Boosting Radiation Efficiency of Photoconductive Nano-Antennas through 3D Light Confinement

Nezih Tolga Yardimci, Semih Cakmakyapan, Soroosh Hemmati, Mona Jarrahi, University of California, Los Angeles, United States

FR-A5.1A.7 **10:20**

Space Division Multiplexing Using Disordered Optical Antennas

Mohammad Haghtalab, S. Mohsen Raeis-Zadeh, Hussam Al-Saedi, Safieddin Safavi-Naeini, University of Waterloo, Canada

FR-A5.1A.8 **10:40**

Design of a Frequency Reconfigurable, Terahertz Folded Antenna for Photomixers

Kazim Demir, Asaf Behzat Sahin, Mehmet Unlu, Yildirim Beyazit University, Turkey

FR-A5.1A.9 **11:00**

Optimized Design of THz Microstrip Antenna Based-on Dual-Surfaced Multiple Split-Ring Resonators

Ge Zhang, Shi Pu, Xiao-Ying Xu, Can Tao, Jin-Yuan Dun, Wuhan University of Technology, China

FR-A5.1A.10 **11:20**

Reflector Backed High Gain Photoconductive THz Antenna Using Conical GaAs Horn and Si Lens

Utkarsh Deva, Physical Research Laboratory, India; Chinmoy Saha, Indian Institute of Space Science and Technology, India; Jawad Y Siddiqui, University of Calcutta, India

Dielectric Resonator Antennas

Session Co-Chairs: Debatosh Guha, University of Calcutta; Zhirun Hu, University of Manchester

FR-A1.1A.1 **08:00**

On the Cause of Radiation from Dielectric Resonator Antennas

Ahmed Ashoor, Omar Ramahi, University of Waterloo, Canada

FR-A1.1A.2 **08:20**

Graphene Microwave Resonators

Xiao Zhang, Gregory Auton, Ernie Hill, Kewen Pan, University of Manchester, United Kingdom; Habiba Ouslimani, Université Paris Ouest Nanterre La Défense, France; Mahmoud A. Abdalla, MTC College University, Egypt; Zhirun Hu, University of Manchester, United Kingdom

FR-A1.1A.3 **08:40**

SIW fed MIMO DRA for future 5G applications

Abhishek Sharma, Anirban Sarkar, Moitreya Adhikary, Animesh Biswas, M. J. Akhtar, Indian Institute of Technology Kanpur, India

FR-A1.1A.4 **09:00**

Dielectric Resonator Antenna: A solution for its mount on metallic body

Debatosh Guha, Chandreyee Sarkar, University of Calcutta, India; Chandrakanta Kumar, Indian Space Research Organisation, India

FR-A1.1A.5 **09:20**

Design of Dual-band Pattern Reconfigurable Cylindrical Dielectric Resonator Antenna

Beijia Liu, Jinghui Qiu, Hua Zong, Harbin Institute of Technology, China; Guoqiang Li, Harbin Kejia General Mechanical and Electrical Company, China

Techniques for Coupling and Side-lobes Control

Session Co-Chairs: David Kelly, Bucknell University; Ashwin Iyer, University of Alberta

FR-A1.2A.1 **10:00**

Analytical Model of Coupling for a Set of Randomly Distributed Dipoles

Imad Adjali, Benoit Poussot, Shermila Mostarshedi, Jean-Marc Laheurte, Laboratoire ESYCOM - Université Paris-Est, France; Ayichatou Gueye, Florence Nadal, Laboratoire ESYCOM - ESIEE, France

FR-A1.2A.2 **10:20**

Investigation of Choke-Ring Structures for Ground-Penetrating Radar

David Sawyer, Ashwin K. Iyer, University of Alberta, Canada; A. Peter Annan, Nectaria Diamanti, Sensors & Software Inc., Canada

FR-A1.2A.3 **10:40**

Reduction of Cross-Polarized Back Lobe Radiation in Circularly Polarized Loop Yagi Arrays

Ryan Chaky, David Kelley, Bucknell University, United States

FR-A1.2A.4 **11:00**

Mutual Coupling Reduction in Two Elements UWB Notch Antenna System

Donya Nazif, Raneem Rabie, October University for Modern Sciences and Arts, Egypt; Mahmoud A. Abdalla, MTC College, Egypt

FR-A1.2A.5 **11:20**

Self-curing Decoupling Technique for Two Inverted-F Antennas Working in Adjacent Bands

Jiangwei Sui, Ke-Li Wu, The Chinese University of Hong Kong, Hong Kong SAR of China

Wideband Printed Antennas

Session Co-Chairs: Diego Caratelli, The Antenna Company; Mitsuo Taguchi, Nagasaki University

FR-A1.3A.1 **08:00**

Design and Full-Wave Characterization of Supershaped Printed Monopole Antennas

Diego Caratelli, The Antenna Company, Netherlands; Luciano Mescia, Politechnic University of Bari, Italy; Pietro Bia, EmTeSys, Italy

FR-A1.3A.2 **08:20**

30-2000 MHz Multi-band Body Wearable Antenna (MBWA)

Johnson Wang, John Adley, Wang Electro-Opto Corporation, United States

FR-A1.3A.3 **08:40**

Offset Fed Planar Inverted L Antenna with Built-in Coplanar Waveguide

Mitsuo Taguchi, Koya Takata, Nagasaki University, Japan

FR-A1.3A.4 **09:00**

A Compact CPW-Fed Wideband Antenna Design for 5G/WLAN Wireless Application

Yibo Wang, Shanghai University, China; Zhinong Ying, SONY Mobile Communications AB, Sweden; Guangli Yang, Shanghai University, China

FR-A1.3A.5 **09:20**

A Novel Dual-polarized Antenna with Low Profile and High Port Isolation

Jinxin Li, Shiwen Yang, Jing Ai, Zaiping Nie, University of Electronic Science and Technology of China, China; William Thomas Joines, Duke University, United States

Break **09:40**

FR-A1.3A.6 **10:00**

Miniaturization of Base-station Antenna Element

Hai-Liang Zhu, Gao Wei, Luyang Ji, Northwestern Polytechnical University, China

FR-A1.3A.7 **10:20**

A Novel Compact ACS-Fed Antenna with Triple Band-Notched Characteristics for UWB Applications

Guodong Zhao, Peng Gao, University of Electronic Science and Technology of China, China

FR-A1.3A.8 **10:40**

WLAN Wideband-Notched UWB Slot Antenna Using I-shaped MTM

Bihui Xu, University of Electronic Science and Technology of China; Jimei University, China; Yan-Wen Zhao, Yuteng Zheng, Li Gu, University of Electronic Science and Technology of China, China

FR-A1.3A.9 **11:00**

A Broadband and High Gain Yagi Antenna with Complex Parabolic Boundary Reflector

Lu Liu, Shu Lin, Alexander Denisov, Dongyu Liang, Yangyang Cao, Shuo Tian, Harbin Institute of Technology, China

FR-A1.3A.10 **11:20**

A Dual-Band Notched Ultra Wideband Microstrip Antenna

Ying Suo, Wei Li, Hongyong Wang, Harbin Institute of Technology, China

Time Domain Methods

Session Co-Chairs: Hakan Bagci, King Abdullah University of Science and Technology (KAUST); Reza Abedi, University of Tennessee Space Institute

FR-UB.1A.1 **08:00**

Time Stepping Alternatives for Higher Order Time-Domain Mixed Finite-Elements

Zane Crawford, Balasubramaniam Shanker, Michigan State University, United States

FR-UB.1A.2 **08:20**

A Nyström-based Explicit Time Marching Scheme for Solving the Time Domain Magnetic Field Integral Equation

Rui Chen, Sadeed Bin Sayed, Hakan Bagci, King Abdullah University of Science and Technology, Saudi Arabia

FR-UB.1A.3 **08:40**

Broadband Parametric Modeling of Electromagnetic Structures with the FDTD Method Coupled with the Multi-Complex Step Derivative Approximation

Kae-An Liu, Costas D. Sarris, University of Toronto, Canada

FR-UB.1A.4 **09:00**

Quantum-Corrected Transient Analysis of Plasmonic Nanostructures Using a Volume Integral Equation Solver

Sadeed Bin Sayed, Ismail Enes Uysal, King Abdullah University of Science and Technology, Saudi Arabia; Hüseyin Arda Ülkü, Gebze Technical University, Turkey; Hakan Bagci, King Abdullah University of Science and Technology, Saudi Arabia

FR-UB.1A.5 **09:20**

Unconditionally Stable Time-Domain Mixed Finite-Element Method

Zane Crawford, Jie Li, Andrew Christlieb, Balasubramaniam Shanker, Michigan State University, United States

Break **09:40**

FR-UB.1A.6 **10:00**

DGTD Method for SAR Evaluation in a Human Head Model Exposed to a Wideband Antenna

Geng Chen, Lei Zhao, Wenhua Yu, Jiangsu Normal University, China; Jian-Ming Jin, University of Illinois at Urbana-Champaign, United States

FR-UB.1A.7 **10:20**

Matrix-Free Time-Domain Method for Thermal Analysis in Unstructured Meshes

Jin Yan, Dan Jiao, Purdue University, United States

FR-UB.1A.8 **10:40**

An h-adaptive Time Domain Discontinuous Galerkin Method for Electromagnetics

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

FR-UB.1A.9 **11:00**

Scattering and Radiation Simulation by Discontinuous Galerkin Time Domain Method

Xuewu Cui, Longjian Zhou, Min Gao, Zhipeng Liang, Fei Yan, Feng Yang, University of Electronic Science and Technology of China, China

FR-UB.1A.10 **11:20**

The implementation of perfectly matched layers for the E-H time-domain finite-element method

Zhenbao Ye, Haijing Zhou, Institute of Applied Physics and Computational Mathematics, China

Frequency Domain Methods

Session Co-Chairs: Valentin De la Rubia, Universidad Politecnica de Madrid; Andrew Greenwood, US Air Force Research Laboratory

FR-UB.2A.1 **08:00**

Optimal Scaling Factors of One-Element Perfectly Matched Layer in Spectral Element Method

Runren Zhang, QingHuo Liu, Duke University, United States

FR-UB.2A.2 **08:20**

Data-driven Model Order Reduction for Fast Frequency Sweep in Hybrid BI-FEM Domain Decomposition Solution in Large Finite Frequency Selective Surfaces

Valentin de la Rubia, Universidad Politecnica de Madrid, Spain; Zhen Peng, University of New Mexico, United States

FR-UB.2A.3 **08:40**

Fast Frequency Sweep for the Computation of Monostatic RCS using the Method of Moments via the Reduced-Basis Method

Alberto Monje-Real, Valentin de la Rubia, Universidad Politecnica de Madrid, Spain

FR-UB.2A.4 **09:00**

Extremely Low-Frequency Electromagnetic Computation by Using the Mixed Spectral-Element Method to Overcome the Low-Frequency Breakdown

Yuanguo Zhou, Mingwei Zhuang, Na Liu, Xiamen University, China; Qing Huo Liu, Duke University, United States

FR-UB.2A.5 **09:20**

The Higher Accuracy Mixed Spectral Element Method for Computing Graphene Plasmonic Waveguide Modes

Na Liu, Xuanying Hou, Institute of Electromagnetics and Acoustics, and Department of Electronic Science, Xiamen University, Xiamen, Fujian, P. R. China, 361005, China; Qing Huo Liu, Department of Electrical and Computer Engineering, Duke University, Durham, NC, USA, 27708, United States

Hybrid and Optimization Techniques

Session Co-Chairs: Francesca Vipiana, Politecnico di Torino; Navid Barani, University of Michigan

FR-UB.3A.1 **10:00**

Hybrid Ray Launching-Collaborative Filtering Approach for Wireless Propagation in Indoor Environments

Peio Lopez-Iturri, Public University of Navarre, Spain; Fran Casino, Rovira i Virgili University, Spain; Erik Aguirre, Public University of Navarre, Spain; Leyre Azpilicueta, Tecnologico de Monterrey, Mexico; Agusti Solanas, Rovira i Virgili University, Spain; Francisco Falcone, Public University of Navarre, Spain

FR-UB.3A.2 **10:20**

New frequency domain discontinuous Galerkin method with domain decomposition technique for electromagnetic modeling

Qingtao Sun, Runren Zhang, Qing Huo Liu, Duke University, United States

FR-UB.3A.3 **10:40**

Comparison Between Integral Equation and FEM Solvers for Electromagnetic-Micromagnetic Coupled Equations

Simon Couture, Vitaliy Lomakin, University of California, San Diego, United States

FR-UB.3A.4 **11:00**

A Comparative Study of EP, GAs and PSO in Subsurface Inverse Profiling of Sectored Dielectric Elliptical-Cylindrical Objects

Maryam Hajebi, Amirkabir University of Technology, Iran; Ahmad Hoorfar, Villanova University, United States

FR-UB.3A.5 **11:20**

Analysis of Wave Propagation in Glide-Symmetric Metasurfaces Using Mode-Matching Technique

Fatemeh Ghasemifard, KTH Royal Institute of Technology, Sweden; Guido Valerio, Sorbonne Universités, France; Oscar Quevedo-Teruel, KTH Royal Institute of Technology, Sweden

Phased Array Antenna Designs

Session Co-Chairs: Atef Elsherbeni, Colorado School of Mines; John Volakis, Ohio State University

FR-A1.4A.1 **08:00**

Ultra wideband phased arrays and low-cost beamforming

John L. Volakis, The Ohio State University, United States

FR-A1.4A.3 **08:40**

Innovative Array Architectures for 5G Communications

Giacomo Oliveri, Paolo Rocca, Lorenzo Poli, Giorgio Gottardi, Nicola Anselmi, Marco Salucci, University of Trento, Italy; Renato Lombardi, Men Chuan, Maurizio Mattivi, Pietro Vinetti, Fabio Morgia, Huawei Technologies, Italy; Andrea Massa, University of Trento, Italy

FR-A1.4A.4 **09:00**

UHF Planar Ultra-Wideband Modular Antenna (PUMA) Arrays

Christopher Merola, Marinos N. Vouvakis, University of Massachusetts, United States

FR-A1.4A.5 **09:20**

Small Millimeter Wave Printed Antenna Arrays for 5G Applications

Dimitris Psychoudakis, Alireza Foroozesh, Samsung Research America, United States

Break **09:40**

FR-A1.4A.6 **10:00**

A Novel Planar Frequency Diverse Array Design Approach for Far-Field Wireless Power Transmission

A-Min Yao, Nanjing University of Science and Technology, China; Nicola Anselmi, Paolo Rocca, University of Trento, Italy

FR-A1.4A.7 **10:20**

A Highly Isolated Dual-polarized Linear Array Antenna with Very Low Cross-polarization

Mirhamed Mirmozafari, Guifu Zhang, University of Oklahoma, United States

FR-A1.4A.8 **10:40**

Isoflux Phased Array Design for Cubesats

Joseph Diener, Robert Jones, Atef Elsherbeni, Colorado School of Mines, United States

FR-A1.4A.9 **11:00**

A Mechanically Robust Modular Vivaldi Array Panel for Ultra-wideband Sensing Applications

Jie-Bang Yan, Sivaprasad Gogineni, University of Alabama, United States

FR-A1.4A.10 **11:20**

A Wideband And Wide-angle Scanning Circularly Polarized Array With Low Profile

Jie Ren, Shanghai Jiao Tong University, China; Lina Zhang, Shanghai Aerospace Electronic Technology Institute, China; Xianling Liang, Weile Yuan, Shanghai Jiao Tong University, China; Qiaoyuan Qian, Shanghai Aerospace Electronic Technology Institute, China; Junping Geng, Weiren Zhu, Ronghong Jin, Shanghai Jiao Tong University, China

On-chip Antennas

Session Co-Chairs: Oscar Quevedo-Teruel, KTH Royal Institute of Technology; Junming Diao, Brigham Young University

FR-A5.2A.1 **08:00**

Integrated Dual Polarized On-Chip Antenna for mm-Wave Applications

Ronny Hahnel, Martin Becker, Bernhard Klein, Dirk Plettemeier, Dresden University of Technology, Germany

FR-A5.2A.2 **08:20**

200 GHz High Gain and Area Efficient On-Chip Yagi-Uda Antenna in 28nm FD-SOI CMOS

Ali Basaligheh, Parvaneh Saffari, Rambabu Karumudi, Kambiz Moez, University of Alberta, Canada

FR-A5.2A.3 **08:40**

Feasibility study of Transmission between Wireless Interconnects in Multichip Multicore systems

Rounak Singh Narde, Jayanti Venkataraman, Amlan Ganguly, Rochester Institute of Technology, United States

FR-A5.2A.4 **09:00**

Chip Reference Antennas: Improving Millimeter-Wave On-Chip Antenna Measurements

Per O. Iversen, Edward Szpindor, MVG-Orbit/FR, Inc, United States; Lars Jacob Foged, Lucia Scialacqua, MVG Italy, Italy

FR-A5.2A.5 **09:20**

SU-8 Derived Novel Ultra Compact Carbon Antenna Using C-MEMS Technology

Bidhan Pramanick, Sergio O. Martinez-Chapa, Tec de Monterrey, Mexico; Marc Madou, Tec de Monterrey; University of California, Mexico; Latheef A Shaik, Chinmoy Saha, Indian Institute of Space Science and Technology, India; Jawad Y Siddiqui, University of Calcutta, India

Design of Phased Array Elements

Session Co-Chairs: Dejan Filipovic, University of Colorado Boulder; Jingni Zhong, Ohio State University

FR-A1.5A.1 **10:00**

Full Duplex Antenna Subsystem for Handheld Radios

Ahmed Abdelrahman, Dejan Filipovic, University of Colorado Boulder, United States

FR-A1.5A.2 **10:20**

7.2 to 1 Ultra-Wideband Dual-Linear Polarized Phased Array with 60o Scanning

Jingni Zhong, Elias Alwan, John L. Volakis, The Ohio State University, United States

FR-A1.5A.3 **10:40**

Hybrid-Fed Microstrip Patch Antenna For MPAR Application

Hadi Saeidi-Manesh, Guifu Zhang, University of Oklahoma, United States

FR-A1.5A.4 **11:00**

Comparison of Radiation Pattern Modeling Methods for GPS Controlled Reception Pattern Array

Jeffrey Maloney, Do-Hoon Kwon, Ramakrishna Janaswamy, University of Massachusetts Amherst, United States; Steven Keller, U.S. Army Research Laboratory, United States

FR-A1.5A.5 **11:20**

On the Effects of Parasitic Horns Within Tightly Packed Concave Linear Arrangements

Carlos Mulero Hernandez, Maxim Ignatenko, Dejan Filipovic, University of Colorado Boulder, United States

Propagation in Complex Environments

Session Co-Chairs: Mahta Moghaddam, University of Southern California; Francisco Falcone, Universidad Pública de Navarra

FR-A4.1A.1 **08:00**

Enabling Accurate Propagation Modeling of Complex Tunnel Geometries with Ray-Tracing

Neeraj Sood, Costas D. Sarris, University of Toronto, Canada

FR-A4.1A.2 **08:20**

cmWave through vegetation: correlation of pixels and attenuation using UT and Bayes Inference

Leonardo Menezes, Alexandre Jose Figueiredo Loureiro, University of Brasilia, Brazil

FR-A4.1A.3 **08:40**

A Discrete Scatterer Technique for FOPEN Radar Scattering and Imaging Characterization

DaHan Liao, U.S. Army Research Laboratory, United States

FR-A4.1A.4 **09:00**

Modeling and Analysis of Bistatic Scattering from Forests in Support of Soil Moisture Retrieval

Amir Azemati, Mahta Moghaddam, University of Southern California, United States

FR-A4.1A.5 **09:20**

Closed-Form Models of Propagation Characteristics of Non-Planar CPW

Payal Majumdar, University of Delhi South Campus, United States

Break **09:40**

FR-A4.1A.6 **10:00**

A Numerical Model for Investigating the Effect of Rough Surface Parameters on Radar Cross Section Statistics

Mustafa Kuzuoglu, Middle East Technical University, Turkey; Ozlem Ozgun, Hacettepe University, Turkey

FR-A4.1A.7 **10:20**

Analysis of transmission characteristics for periodic perfect and real metal apertures

Sungjun Yoo, Hosung Choo, Jong-Eon Park, Hongik University, Republic of Korea

FR-A4.1A.8 **10:40**

2.4 GHz Radio-Channel Characterization of an Underground Mine using Patch antennas

Lamia Arabi, Mourad Nedil, Nahi Kandil, Mohamedlamine Seddiki, Université du Québec en Abitibi-Témiscamingue, Canada; Moulay Elhassan El Azhari, Larbi Talbi, University of quebec in outaouais, Canada

FR-A4.1A.9 **11:00**

Wave structure function of electromagnetic waves propagating through anisotropic hypersonic turbulence

Jiangting Li, Teng Gong, Lixin Guo, Shaofei Yang, School of Physics and Optoelectronic Engineering, Xidian University, China

FR-A4.1A.10 **11:20**

Effects of atmospheric turbulence on mode purity of orbital angular momentum millimeter waves

Minjian Cheng, Lixin Guo, Jiangting Li, Songhua Liu, School of Physics and Optoelectronic Engineering, China; Mingjian Cheng, State Key Laboratory of Pulsed Power Laser Technology, China

Scattering and Diffraction

Session Co-Chairs: Zhongxiang Shen, Nanyang Technological University; Yi Huang, University of Liverpool

FR-A4.2A.1 **08:00**

An Efficient Hybrid CEM Approach to Modeling Backscatter of Forest Clutter

Raghu Raj, Michael Kluskens, Dale Zolnick, S.T. Chun, John Brozena, U.S. Naval Research Laboratory, United States

FR-A4.2A.2 **08:20**

Scattering studies on sorted materials of high-speed rail scenario for propagation channel simulations

Guangkai Li, Bo Ai, Longhe Wang, Ke Guan, Danping He, Zhangdui Zhong, Beijing Jiaotong University, China; Li Tian, Jianwu Dou, ZTE corporation, China

FR-A4.2A.3 **08:40**

Improved Millimeter-Wave Radar Equations to Predict Backscattering in a Sand-and-Dust Storm

Mu-Min Chiou, Jean-Fu Kiang, National Taiwan University, Taiwan

FR-A4.2A.4 **09:00**

Low-cost Gas Sensors utilizing mm-Wave Radars

Shuo Liu, George Shaker, Safieddin Safavi-Naeini, J.Michael Chong, University of Waterloo, Canada

FR-A4.2A.5 **09:20**

Efficient Measurement Techniques on OTA Test in Reverberation Chamber

Zhihao Tian, Yi Huang, University of Liverpool, United Kingdom; Qian Xu, Nanjing University of Aeronautics and Astronautics, China

Break **09:40**

FR-A4.2A.6 **10:00**

Dielectric Cloaks as Analytical or Numerical Solutions of Inverse Scattering Problems

Giuseppe Labate, Politecnico d Torino, Italy; Loreto Di Donato, University of Catania, Italy; Ladislau Matekovits, Politecnico di Torino, Italy; Tommaso Isernia, University Mediterranea of Reggio Calabria, Italy

FR-A4.2A.7 **10:20**

A Modified Matching Pursuit Algorithm for Two-Dimensional Electromagnetic Imaging

Ali Imran Sandhu, Hakan Bagci, King Abdullah University of Science and Technology, Saudi Arabia

FR-A4.2A.8 **10:40**

Efficient Monostatic RCS Calculation with Higher-Order MLFMM

Oscar Borries, Peter Meincke, Erik Jørgensen, TICRA, Denmark

FR-A4.2A.9 **11:00**

Accurate Solution of Electromagnetic Scattering by Chiral Objects Based on VIEs

Wen Jie Chen, Mei Song Tong, Tongji University, China

FR-A4.2A.10 **11:20**

Cicular Polarization Selective Structure Based on Planar Helix

Jiang Wang, Wen Wu, Nanjing University of Science and Technology, China; Zhongxiang Shen, Nanyang Technological University, Singapore

Electromagnetic Interaction, Propagation and Scattering

Session Co-Chairs: Weng Cho Chew, University of Illinois at Urbana-Champaign; Loic Markley, University of British Columbia

FR-UB.4A.1 **08:00**

Minimizing Idle Power Losses in Magnetic Resonance Coupling Wireless Power Transfer

Connor Badowich, Loic Markley, University of British Columbia, Okanagan Campus, Canada

FR-UB.4A.2 **08:20**

Predicting the Nature of Electromagnetic Field Fluctuations in Random Interconnections of Large Complicated Cavities

Ghadeh Hadi, Sameer Hemmady, Edl Schamiloglu, University of New Mexico, United States

FR-UB.4A.3 **08:40**

Performance Considerations on Various Iteration Schemes for the Distorted-Born Iterative Method

Mert Hidayetoglu, Wen-Mei Hwu, Weng Cho Chew, University of Illinois at Urbana-Champaign, United States

FR-UB.4A.4 **09:00**

Numerical Investigation of the Influence of Stokes Lines on Creeping Wave Propagation

Whitney Larsen, Honeywell Federal Manufacturing & Technologies (FM&T), United States; Deb Chatterjee, University of Missouri-Kansas City, United States

Millimeter Wave Propagation

Session Co-Chairs: Peder Hansen, Independent Consultant; Richard Ziolkowski, University of Technology Sydney

FR-A4.3A.1 **10:00**

Ray Tracing Simulations for Millimeter Wave Propagation in 5G Wireless Communications

An-Yao Hsiao, Chang-Fa Yang, National Taiwan University of Science and Technology, Taiwan; Te-Shun Wang, Yuanpei University of Medical Technology, Taiwan; Ike Lin, former Nearfield Systems Inc, Taiwan; Wen-Jiao Liao, National Taiwan University of Science and Technology, Taiwan

FR-A4.3A.2 **10:20**

User Association-Based Interference Management in Ultra-Dense Networks

Zhuoyu Wen, Gang Zhu, Minming Ni, Siyu Lin, Beijing Jiaotong University, China

FR-A4.3A.3 **10:40**

Channel Simulation of Adaptive Beamforming at 60GHz Millimeter-Wave band under High-Speed Railway Scenario

Yichuan Lin, Zhangdui Zhong, Danping He, Ke Guan, Beijing Jiaotong University, China; Dongying Zhang, ZTE Corporation, China

FR-A4.3A.4 **11:00**

Calibration of Ray-tracing simulator for Millimeter-Wave Outdoor Communications

Size Wei, Bo Ai, Danping He, Ke Guan, Longhe Wang, Zhangdui Zhong, State Key Laboratory of Rail Traffic Control and Safety, Beijing Jiaotong University, China

FR-A4.3A.5 **11:20**

Efficient Environment Model for Intra-Wagon Millimeter Wave Ray-Tracing Simulation

Kunmao Li, Danping He, Ke Guan, Bo Ai, Zhangdui Zhong, Beijing Jiaotong University, China; Li Tian, Jianwu Dou, ZTE Corporation, China

MIMO System Applications

Session Co-Chairs: Ryan Adams, University of North Carolina at Charlotte; Leonardo Lizzi, Université Côte d'Azur

FR-A5.3A.1 **08:00**

UAV Attitude Estimation using Antenna Arrays

Attiya Mahmood, Brigham Young University, United States; Jon Wallace, Lafayette College, United States; Michael Jensen, Brigham Young University, United States

FR-A5.3A.2 **08:20**

On the Impact of Velocity on the Train-to-Earth MIMO Propagation Channel Statistical observations and Qualitative Analysis

Claes Beckman, KTH Royal Institute of Technology, Sweden; Johan Garcia, Stefan Alfredsson, Anna Brunstrom, Karlstad University, Sweden

FR-A5.3A.3 **08:40**

Dual Band, Dual Polarized, Rail Mount MIMO Stadium Antenna

Joshua Shehan, Paris McGee, James Carson, Amphenol Antenna Solutions, United States; Ryan Adams, University of North Carolina at Charlotte, United States

FR-A5.3A.4 **09:00**

High Performance MIMO Antenna For 5G Wearable Devices

Lijia Zhu, Shanghai University, China; Huan-Sheng Hwang, Intel Corp., United States; Eugene Ren, Mojoose Inc., United States; Guangli Yang, Shanghai University, China

FR-A5.3A.5 **09:20**

A Directional Antenna for Higher Order MIMO Applications

John Sanford, Ubiquiti Networks, United States

Break **09:40**

FR-A5.3A.6 **10:00**

Validation of a Decoupling Technique by Using Two Types of Antennas

Lamia Sadaoui, Georges Kossiavas, Robert Staraj, Université Côte d'Azur, CNRS, LEAT, France

FR-A5.3A.7 **10:20**

Impact of MIMO Antenna Design on Communication Channel Capacity Using the Kronecker Model

A. M. Allam, German University of Cairo, Egypt; Raed Shubair, Khalifa University & MIT, United Arab Emirates; Adham Hemdan, Steven Botros, German University of Cairo, Egypt

FR-A5.3A.8 **10:40**

Validation Of An Open Source Software Defined Radio Test Bed

Cyril Buey, Philippe Ratajczak, Orange Labs, France; Fabien Ferrero, Leonardo Lizzi, Université Côte d'Azur, CNRS, France; Theoni Magounaki, Florian Kaltenberger, EURECOM, France

FR-A5.3A.9 **11:00**

Effects of Regular and Aperiodic Array Layout in Multi-User MIMO Applications

Carlo Bencivenni, Andrés Glazunov, Rob Maaskant, Marianna Ivashina, Chalmers University of Technology, Sweden

FR-A5.3A.10 **11:20**

Advanced Directional Networking: Simulation Results and Prototype Measurements

Gui Chao Huang, Farhan A. Qazi, Magdy F. Iskander, Zhenqing Yun, University of Hawaii at Manoa, United States

Reduction of Complex Structures

Session Co-Chairs: Makoto Sano, Toshiba Corporation; Maria Pour, University of Alabama in Huntsville

FR-A4.1P.1 **13:20**

Novel Technique for Enhancing RCS Reduction Bandwidth of Checkerboard Surfaces

Anuj Y. Modi, Constantine A. Balanis, Craig R. Birtcher, Arizona State University, United States

FR-A4.1P.2 **13:40**

Dual Frequency Band RCS Reduction Using Checkerboard Designs

Wengang Chen, Constantine A. Balanis, Craig R. Birtcher, Arizona State University, United States

FR-A4.1P.3 **14:00**

AMC Cells for Broadband RCS Reduction Checkerboard Surfaces

Anuj Y. Modi, Constantine A. Balanis, Craig R. Birtcher, Arizona State University, United States

FR-A4.1P.4 **14:20**

Wideband Low RCS Antenna Based on Absorbing Surface and Microstrip Resonators

Jingjing Xue, Shuxi Gong, Wen Jiang, Tao Hong, National Key Laboratory of Antennas and Microwave Technology Xidian University; Collaborative Innovation Center of Information Sensing and Understanding at Xidian University, China

FR-A4.1P.5 **14:40**

Broadband RCS Reduction by Gradient Index Meta-Surface Composed of Jerusalem-Shaped Patches

Haijian Hou, Junhong Wang, Zheng Li, Beijing Jiaotong University, China

Break **15:00**

FR-A4.1P.6 **15:20**

Low-RCS Frequency Reconfigurable Antenna With Polarization Conversion Metasurface and Phase Tunable Reflector

Mao Long, Wen Jiang, Shuxi Gong, Tao Hong, National Key Laboratory of Antennas and Microwave Technology, Xidian University, China

FR-A4.1P.7 **15:40**

Low-RCS and High-Gain Broadband Circularly Polarized Antenna

Yongtao Jia, Ying Liu, Xidian University, China

FR-A4.1P.8 **16:00**

Backward RCS Reduction by Gradient Index Meta-surface Composed of Polarization Independent Ring-Shaped Patches

Haijian Hou, Junhong Wang, Zheng Li, Beijing Jiaotong University, China

FR-A4.1P.9 **16:20**

A Novel Checkerboard AMC Surface for X-, Ku- and K-band RCS Reduction

You-Feng Cheng, Xiao Ding, Wei Shao, Tu-Lu Liang, University of Electronic Science and Technology of China, China

FR-A4.1P.10 **16:40**

Facet Based Investigation on the Composite EM Scattering from Ship over Sea surface

Jinxing Li, Min Zhang, Xidian University, China

AMTA Special Session - Advances in RF Measurement Technology

Session Co-Chairs: Ivan LaHaie, Integrity Applications Inc.; Lars Jacob Foged, MVG Italy

FR-SP.1P.1 **13:20**

Validation of the Polynomial for RF Absorber Reflectivity for the Prediction of Anechoic Chambers

Vince Rodriguez, NSI-MI Technologies, United States

FR-SP.1P.2 **13:40**

Measurement and Simulation Comparison using Measured Source Antenna Representation of GNSS Antenna on Sentinel Satellite

Lars Jacob Foged, Maria Alberica Saporetti, Lucia Scialacqua, Francesco Saccardi, Microwave Vision Italy, Italy; Jan Zackrisson, RUAG Space AB, Sweden; Damiano Trenta, Luca Salghetti Drioli, European Space Agency, ESTEC, Netherlands

FR-SP.1P.3 **14:00**

Verification of Feed Spillover Reduction using FF-MARS in a CATR Using Computational Electromagnetic Simulation

Stuart Gregson, Allen Newell, NSI-MI, United States; Clive Parini, Queen Mary University of London, United Kingdom

FR-SP.1P.5 **14:40**

Reverberation Chambers for Flexible Over-the-Air Testing of Internet-of-Things Devices

Mats Kristoffersen, Christian Patané Lötbäck, Derek Skousen, Bluetest AB, Sweden

International Standards Development and Applications

Session Chair: Vikass Monebhurrun, Centrale Supelec, France

FR-SP.2P.1 **15:20**

Characterizing Antennas in the Time and Frequency Domains

Everett Farr, Farr Fields, LC, United States

FR-SP.2P.2 **15:40**

Antenna Terms and Measurement Techniques for Active Receiving Arrays

Karl F. Warnick, Brigham Young University, United States

FR-SP.2P.3 **16:00**

Active E-field Gain: Toward a Standard Description of MEAs

Nicholas Buris, NEBENS, United States

FR-SP.2P.4 **16:20**

Equivalent Isotropic Response as a Surrogate for Incident Field Strength

Daniel Kuester, Duncan McGillivray, John Ladbury, Adam Wunderlich, Ari Feldman, William Young, Sheryl Genco, National Institute of Standards and Technology, United States

FR-SP.2P.5 **16:40**

Subsurface Conductivity Mapping using Controlled Source Electromagnetic Method

Jaideva Goswami, C&J Research and Technology, United States; Maokun Li, Tsinghua University, China; Aria Abubakar, Schlumberger, United States; Tarek Habashy, Schlumberger-Doll Research, United States

Metasurfaces for Antenna Applications

Session Co-Chairs: Stefano Maci, University of Siena; Karu Esselle, Macquarie University

FR-A2.1P.1 **13:20**

Design of Modulated Metasurface Antennas

Stefano Maci, University of Siena, Italy

FR-A2.1P.3 **14:00**

"Phasenna" based on a Metasurface System

Guillaume Lavigne, Christophe Caloz, Polytechnique Montréal, Canada

FR-A2.1P.4 **14:20**

Extracting Surface Impedance Method for an Anisotropic Polygon Unit Cell

Jiyeon Lee, Daniel F. Sievenpiper, University of California, San Diego, United States

FR-A2.1P.5 **14:40**

A Cylindrical Metasurface Antenna

Mohamed El Badawe, Omar Ramahi, University of Waterloo, Canada

Break **15:00**

FR-A2.1P.6 **15:20**

Application of Near-Field Phase Transformation to Steer the Beam of High-Gain Antennas in Two Dimensions

Muhammad U. Afzal, Karu P. Esselle, Macquarie University, Australia

FR-A2.1P.7 **15:40**

Metasurface Sectoral Isoflux Beam Antenna for Space Application

Gabriele Minatti, Stefano Maci, Francesco Caminita, Enrica Martini, University of Siena, Italy; Marco Sabbadini, European Space Agency, Netherlands; Valerio Martorelli, Mauro Bandinelli, IDS - Ingegneria dei Sistemi, Italy

FR-A2.1P.8 **16:00**

A Metasurfaced Circularly Polarized Antenna

Changfei Zhou, Sing Wai Cheung, Qinlong Li, Di Wu, Bo Wang, The University of Hong Kong, China

FR-A2.1P.9 **16:20**

Improved Design of a Low Sidelobe Pyramidal Horn Antenna Loaded with a Metasurface Lens

Xuxiang Chen, Yuehe Ge, Huaqiao University, China; Trevor Bird, Antengenuity, Australia

Design and Analysis of Metamaterials

Session Co-Chairs: Daniel Cavallo, Delft University of Technology; Quang Nguyen, U.S. Army Research Laboratory

FR-A2.2P.1 **13:20**

Systematic Development of a Robust Circuit-model Technique for Subwavelength Imaging with Wire-Medium Type Lenses

Gabriel Moreno, Ali Forouzmand, Alexander Yakovlev, University of Mississippi, United States; Mario Silveirinha, University of Lisbon, Portugal; George Hanson, University of Wisconsin - Milwaukee, United States

FR-A2.2P.2 **13:40**

Analytical Models for Artificial Dielectrics with Non-Aligned Layers

Daniele Cavallo, Cantika Felita, Delft University of Technology, Netherlands

FR-A2.2P.3 **14:00**

Local Thickness-Dependent Permittivity of Wire Media in CST Microwave Studio

Gabriel Moreno, Maziar Hedayati, Ali Forouzmand, Alexander Yakovlev, University of Mississippi, United States; Mario Silveirinha, University of Lisbon, United States; George Hanson, University of Wisconsin - Milwaukee, United States

FR-A2.2P.4 **14:20**

Novel Fishnet-like Chiral Metamaterial Structure with Negative Refractive Index and Low Losses

Oscar Fernandez, Álvaro Gómez, Angel Vegas, Universidad de Cantabria, Spain; Gregorio J. Molina-Cuberos, Universidad de Murcia, Spain; Angel J. García-Collado, Universidad Católica de San Antonio, Spain

FR-A2.2P.5 **14:40**

Green's Function of Periodic Scatterers Applied to Scattering by Finite Periodic Arrays of Scatterers

Shurun Tan, Leung Tsang, University of Michigan, United States

Break **15:00**

FR-A2.2P.6 **15:20**

Wide-Band High Permeability Metamaterials

Quang Nguyen, Amir Zaghloul, Steven Weiss, U.S. Army Research Laboratory, United States

FR-A2.2P.7 **15:40**

Polarizability Tensors of Highly Conductive Bodies

Lukas Jelinek, Czech Technical University in Prague, Czech Republic; Ondrej Kratky, Siemens Czech Republic Ltd, Czech Republic; Miloslav Capek, Czech Technical University in Prague, Czech Republic

FR-A2.2P.8 **16:00**

Dual-band Transmission Measurement in a Metamaterial

Xianfeng Tang, Zhaoyun Duan, Fei Wang, Xinwu Ma, Zhanliang Wang, Yubin Gong, University of Electronic Science and Technology of China, China

FR-A2.2P.9 **16:20**

Comprehensive Analysis of Magnetoelastic Nonlinear Metamaterials

Wenran Lv, Yongjun Huang, Guangjun Wen, University of Electronic Science and Technology of China, China

Terahertz Antennas and Focal Plane Arrays

Session Co-Chairs: Cosan Caglayan, Ohio State University; Kubilay Sertel, Ohio State University

FR-UB.1P.1 **13:20**

Analysis and Design of Large-format THz Imaging Systems Using Conjugate Field Coupling

Panagiotis Theofanopoulos, Georgios Trichopoulos, Arizona State University, United States

FR-UB.1P.2 **13:40**

Fourier Optics Analysis for Quasi-Optical Imagers with Large Focal Plane Arrays

Shahab Oddin Dabironezare, Giorgio Carluccio, Andrea Neto, Nuria Llombart, Delft University of Technology, Netherlands

FR-UB.1P.3 **14:00**

On the Imaging Speed of Wideband Direct Detection FPAs

Sven van Berkel, Ozan Yurduseven, Delft University of Technology, Netherlands; Angelo Freni, Università degli studi Firenze, Italy; Andrea Neto, Nuria Llombart, Delft University of Technology, Netherlands

FR-UB.1P.4 **14:20**

Wide Field of View Dual-Lens Antenna at Sub-Millimeter Wave Frequencies

Erio Gandini, Nuria Llombart, Delft University of Technology, Netherlands; Aleksi Tamminen, Arttu Luukanen, Asqella Oy, Finland

FR-UB.1P.5 **14:40**

Non-Contact, On-Wafer Characterization of Schottky Diodes

Cosan Caglayan, The Ohio State University, United States; Jeffrey L. Hesler, Virginia Diodes Inc., United States; Kubilay Sertel, The Ohio State University, United States

Break **15:00**

FR-UB.1P.6 **15:20**

Silicon Micromachined High-contrast Artificial Dielectrics for Millimeter-wave Transformation Optics Antennas

Nicolas Garcia, Wenlong Bai, Thibault Twahirwa, David Connelly, Jonathan Chisum, University of Notre Dame, United States

FR-UB.1P.7 **15:40**

Generation of Broadband Orbital Angular Momentum in Millimeter Wave Domain

Fan Bi, Xiong Wang, ShanghaiTech University, China

FR-UB.1P.8 **16:00**

Dense, Planar Arrays of Compact Resonant Cavity Antennas

Arslan Kiyani, Raheel Hashmi, Karu P. Esselle, Macquarie University, Australia

Beam Scanning Antennas and Arrays

Session Chair: Arezou Edalati, Ellumen Inc

FR-A1.1P.1 **13:20**

Grounded Colocated Antennas for Wideband Vector Sensor Applications

Johan Duplouy, Christophe Morlaas, ENAC, France; Hervé Aubert, LAAS-CNRS, France; Patrick Potier, Philippe Pouliguen, Christopher Djoma, DGA, France

FR-A1.1P.3 **14:00**

Dual-band conical-scanning Yagi-Uda antenna

Chainarong Kittiyanpunya, Monai Krairiksh, King Mongkut's Institute of Technology Ladkrabang, Thailand

FR-A1.1P.4 **14:20**

A Beam Switching Antenna with Gain Enhancement

Jinxin Li, Qingsheng Zeng, Tayeb A. Denidni, National Institute for Scientific Research, Canada

FR-A1.1P.5 **14:40**

Reconfigurable Frequency Selective Surface for Fabry-Perot Cavity Antenna System

Chanjoon Lee, Robert Sainati, Rhonda Franklin, University of Minnesota, United States

Break **15:00**

FR-A1.1P.6 **15:20**

A Novel Dual-Band Beam-Switching Antenna Based on Active Frequency Selective Surfaces

Arezou Edalati, William McCollough, Ellumen Inc, United States

FR-A1.1P.7 **15:40**

Influence of an Impedance Flange on the Radiation and Scattering Characteristics of a Plane Semi-Infinite Waveguide Array

Yury Yukhanov, Tatiana Privalova, Egor Privalov, Southern federal university, Russian Federation

FR-A1.1P.8 **16:00**

EMSICC-Based Compact Array Antenna Having Switchable Frequency Beam-Scanning Range in Microstrip Environment

Anirban Sarkar, Prasun Chongder, Abhishek Sharma, Moitreya Adhikary, Animesh Biswas, M. J. Akhtar, Indian Institute of Technology Kanpur, India

FR-A1.1P.9 **16:20**

Design of a Ku-band 1-bit Reconfigurable Transmitarray with 16×16 Slot Coupled Elements

Min Wang, Shenheng Xu, Fan Yang, Maokun Li, Tsinghua University, China

Microwave to Millimeter Measurements and Standards

Session Chair: Seth McCormick, US Army Research Laboratory

FR-UA.1P.1 **13:20**

Thru-Load De-embedding Method for Millimeter Wave Transmission Lines

Vipin Velayudhan, Ayssar Serhan, Nicolas Corrao, Emmanuel Pistono, Jean-Daniel Arnould, IMEP-LAHC, France

FR-UA.1P.2 **13:40**

TTW Life Sign Detection by means of CW X-band Radar, Homeland security and rescue Applications

Sree Bash Chandra Debnath, University of Trento, Italy

FR-UA.1P.3 **14:00**

RCS Measurements : Statistical Characterization of the Impact of the Coupling Between a Calibration Sphere and a Styrofoam Positioner

Sylvain Morvan, Omar Fergui, CEA, France

FR-UA.1P.4 **14:20**

Measurement of High-Impedance Surface Backed Microstrip Structures Using Multimode TRL Calibration

Kevin Keegan, Kiersten Kerby-Patel, University of Massachusetts Boston, United States

FR-UA.1P.5 **14:40**

Canonical Target Response in a Reverberation Chamber

William Coburn, Seth McCormick, U.S. Army Research Laboratory, United States

Break **15:00**

FR-UA.1P.6 **15:20**

Statistical Characterization of Through-Wall Attenuation at 10 and 30 GHz

Anmol Bhardwaj, University of British Columbia, Canada; Guangkun Guo, University of Electronic Science and Technology of China, China; Yangyang Liu, Northwestern Polytechnical University, China; Siamak Bonyadi Ram, David Michelson, University of British Columbia, Canada

FR-UA.1P.7 **15:40**

Shaped Reflectors for Toroidal Beams

George Cheng, Yong Zhu, Jan Grzesik, Allwave Corporation, United States

FR-UA.1P.8 **16:00**

Practical Aspects and Design Considerations of Millimeter Wave Thin Lens

Jungsuek Oh, Inha University, Republic of Korea

FR-UA.1P.9 **16:20**

A Novel Calculable Loop Antenna for Antenna Calibration Verification below 30MHz

Xiao Liu, Donglin Meng, National Institute of Metrology, China

FR-UA.1P.10 **16:40**

Accurate Complex Antenna Factor by Broadband Calculable Dipoles over 10 MHz to 1000 MHz

Donglin Meng, Yuling Kong, National Institute of Metrology, China

Advanced Concepts in Metamaterials

Session Co-Chairs: Andrea Alu, University of Texas at Austin; Loic Markley, University of British Columbia

FR-UB.2P.1 **13:20**

On invisible bodies, nonradiating sources, and embedded eigenstates

Francesco Monticone, Cornell University, United States; Andrea Alù, The University of Texas at Austin, United States

FR-UB.2P.2 **13:40**

Microwave Pulse Compression Devices with Modal Degeneracy

Dmitry Oshmarin, Mohamed A. K. Othman, Filippo Capolino, University of California, Irvine, United States

FR-UB.2P.3 **14:00**

Frozen Modes in All-Dielectric 3-Way-Coupled Ridge Waveguides

Raed Almhmadi, Kubilay Sertel, The Ohio State University, United States

FR-UB.2P.4 **14:20**

Time Variant induced non-reciprocity enhanced by exceptional points of degeneracy

Mehdi Veysi, Mohamed A. K. Othman, Hamidreza Kazemi, Filippo Capolino, University of California, Irvine, United States

FR-UB.2P.5 **14:40**

Recent Advances on Angular Momentum Magnet-Free Circulators

Ahmed Kord, Dimitrios Sounas, Younes Radi, Andrea Alù, The University of Texas at Austin, United States

Break **15:00**

FR-UB.2P.6 **15:20**

Development of A Rigorous Equivalent Circuit Model for Nested Split-Ring Resonator Structures

Burak Ozbey, Ayhan Altintas, Hilmi Volkan Demir, Vakur B. Erturk, Bilkent University, Turkey

FR-UB.2P.7 **15:40**

Investigation of Propagation in Screw-Symmetric Structures

Oskar Dahlberg, Oscar Quevedo-Teruel, KTH Royal Institute of Technology, Sweden

FR-UB.2P.8 **16:00**

Perfect Transmission of Evanescent Waves Through Single-Negative Media

Spencer Bostock, Kenneth J. Chau, Loïc Markley, University of British Columbia, Canada

FR-UB.2P.9 **16:20**

Ideal Light Capturing by a Hermitian System

Alexander Krasnok, The University of Texas at Austin, United States; Denis Baranov, Chalmers University of Technology, Sweden; Andrea Alù, The University of Texas at Austin, United States

FR-UB.2P.10 **16:40**

Fiber-Optics Meta-tips for Light Manipulation and Sensing

Maria Principe, Marco Consales, Alberto Micco, University of Sannio, Italy; Alessio Crescitelli, National Research Council, Italy; Giuseppe Castaldi, University of Sannio, Italy; Emanuela Esposito, National Research Council, Italy; Vera La Ferrara, ENEA, Italy; Antonello Cutolo, Vincenzo Galdi, Andrea Cusano, University of Sannio, Italy

Electrically Small Antennas: Applications

Session Co-Chairs: Miloslav Capek, Czech Technical University in Prague; Giuseppe Mazzarella, Università di Cagliari

FR-A1.2P.1 **13:20**

An Electrically Small Antenna for Potential Aircraft Applications

Ana López-Yela, Fernando Albarracín-Vargas, Daniel Segovia-Vargas, Charles III University of Madrid, Spain

FR-A1.2P.2 **13:40**

Parasitic Antennas for Small Metallic Platforms

Navid Barani, Behzad Yektakhah, Kamal Sarabandi, University of Michigan, United States

FR-A1.2P.3 **14:00**

A Navigation and Positining System for Unmanned Underwater Vehicles Based on a Mechanical Antenna

Majid Manteghi, Virginia Tech, United States

FR-A1.2P.4 **14:20**

Novel Miniature Antenna for Biomedical Sensors

Mohannad Alharbi, Technical Affairs (Engineering Studies)/ Jeddah Islamic Port, Saudi Arabia; Sima Noghanian, Electrical Engineering Department, University of North Dakota, United States

FR-A1.2P.5 **14:40**

Characterization of miniature antenna for Sub-GHz on-body applications

Hajar Berrada, Université Côte d'Azur, France; Fabien Ferrero, Université Cote d'Azur -CNRS cote azur - LEAT - Universite Nice Sophia, France; Leonardo Lizzi, Université Nice Sophia Antipolis, France; Christophe Danchesi, Stephane Boudaud, Abeeway, France

Break **15:00**

FR-A1.2P.6 **15:20**

A Robust Antenna for On-Body Clinical Applications

Giacomo Muntoni, Alessandro Fanti, Giorgio Montisci, Giuseppe Mazzarella, Università degli Studi di Cagliari, Italy

FR-A1.2P.7 **15:40**

Miniaturized UHF Three-Element Sequential Rotation Array Antenna

Shaowei Liao, Quan Xue, City University of Hong Kong, Hong Kong SAR of China; Bin-Long Bu, Comba Telecom Systems Limited, China

FR-A1.2P.8 **16:00**

Miniaturized Vivaldi Antenna Based on Low Frequency Resonance for WLAN Application

Yunpeng Zhang, En Li, Jing Zhang, University of Electronic Science and Technology of China, China

FR-A1.2P.9 **16:20**

The low-profile end-fire antenna with circular polarization at S band

Jin Huang, Zhenghui Xue, Wu Ren, Weiming Li, Beijing Institute of Technology, China

Phased Array Antennas: Analysis, Synthesis and Optimization

Session Co-Chairs: Satish Sharma, San Diego State University; Paolo Rocca, University of Trento

FR-A1.3P.1 **13:20**

Fast Synthesis of Multiple Nulls in an Omnidirectional Pattern

Rashmi Mital, Mark Dorsey, US Naval Research Laboratory, United States

FR-A1.3P.2 **13:40**

A Novel Analytic Beam Steering Approach for Clustered Phased Array Architectures

Paolo Rocca, Nicola Anselmi, Marco Salucci, Giorgio Gottardi, Lorenzo Poli, Andrea Massa, University of Trento, Italy

FR-A1.3P.3 **14:00**

Deterministic Synthesis of Conformal Linear Aperiodic Antenna Arrays

Diego Caratelli, The Antenna Company, Netherlands; Giovanni Toso, European Space Agency, Netherlands

FR-A1.3P.4 **14:20**

Innovative Optimization-based Design of UWB Planar Arrays for Grating Lobes Reduction

Lorenza Tenuti, Paolo Rocca, Marco Salucci, Giorgio Gottardi, Andrea Massa, University of Trento, Italy

FR-A1.3P.5 **14:40**

A sparse forcing conformal array synthesis method

Daniele Pinchera, Marco Donald Migliore, Fulvio Schettino, Mario Lucido, Gaetano Panariello, University of Cassino and Southern Lazio, Italy

Break **15:00**

FR-A1.3P.6 **15:20**

Optimized Dual-Linear Polarization Frequency Scanning Microstrip Array antenna for Cylindrical Polarimetric Phased Array Radar (CPPAR)

Hadi Saeidi-Manesh, Guifu Zhang, University of Oklahoma, United States

FR-A1.3P.7 **15:40**

On The Phase Center Analysis of Linear Phased-Array Antennas

Ahmed Nafe, Gabriel M. Rebeiz, University of California, San Diego, United States

FR-A1.3P.8 **16:00**

Tiling Optimization of Orthogonal-Polygon Shaped Aperture for Phased Array Antennas

Nicola Anselmi, Paolo Rocca, Giorgio Gottardi, Marco Salucci, Andrea Massa, University of Trento, Italy

FR-A1.3P.9 **16:20**

Advanced Time-Modulated Array Synthesis for Directional Modulation Optimization

Mohammad Abdul Hannan, Marco Salucci, Giorgio Gottardi, Lorenzo Poli, Paolo Rocca, University of Trento, Italy

Wireless Power Transfer and Energy Harvesting

Session Co-Chairs: Youssef Tawk, Notre Dame University Louaize; Anatoliy Boryssenko, AE Partnership

FR-A5.1P.1 **13:20**

Tightly Coupled Antennas for Low Cost and Highly Efficient Energy Harvesters

Thamer Almoneef, Faruk Erkmen, Omar Ramahi, University of Waterloo, Canada

FR-A5.1P.2 **13:40**

5.8 GHz Experimental Rectena Dipole Array

Anatoliy Boryssenko, Elen Boryssenko, AE Partnership, United States; David Criswell, Cis-Lunar Inc., United States

FR-A5.1P.3 **14:00**

Proposal of Multidirectional Power Transmission System using Monopole Antennas and Parasitic Elements

Masami Nakayama, Antenna giken, Japan; Takefumi Hiraguri, Nippon Institute of Technology, Japan; Tsutomu Mitsui, Kentaro Nishimori, Niigata University, Japan; Takahiro Matsuda, Graduate School of Engineering,Osaka University, Japan; Kazuhiro Hirasawa, Yeap Kim Ho, Tsukuba University, Japan

FR-A5.1P.4 **14:20**

A Planar Dipole Array with High-Permittivity Superstrate for Efficient Electromagnetic Wireless Energy Harvesting

Ahmed Ashoor, Omar Ramahi, University of Waterloo, Canada

FR-A5.1P.5 **14:40**

A Broadband L-Probe Microstrip Patch Rectenna for Ambient RF Energy Harvesting

Shanpu Shen, Chi-Yuk Chiu, Ross D. Murch, The Hong Kong University of Science and Technology, Hong Kong SAR of China

Theory and Application of Guided Waves

Session Co-Chairs: Edward Rothwell, Michigan State University; Michael Havrilla, Air Force Institute of Technology

FR-UB.3P.1 **15:20**

Ultra-deep-subwavelength Light Transport in Hybrid Nanowire-loaded Silicon Nano-rib Waveguides

Qiang Ren, Yusheng Bian, Ping Werner, Douglas H. Werner, The Pennsylvania State University, United States

FR-UB.3P.2 **15:40**

Third Order Modal Degeneracy in Waveguids: Features and Application in Amplifiers

Farshad Yazdi, Mohamed A. K. Othman, Mehdi Veysi, Alexander Figotin, Filippo Capolino, University of California, Irvine, United States

FR-UB.3P.3 **16:00**

Evaluation of Anisotropic Overlay Materials for Use in the Free-Space, TEM, or Waveguide Characterization of Conductor-Backed Absorbers

Edward Rothwell, Michigan State University, United States; Raenita Fenner, Loyola University, United States

FR-UB.3P.4 **16:20**

Waveguide Calibration and Material Characterization under Common and Differential Excitation

Michael Havrilla, Air Force Institute of Technology, United States

FR-UB.3P.5 **16:40**

Fabrication of a Triaxial Applicator for the Characterization of Conductor-Backed Absorbing Materials

Saranraj Karuppuswami, Jonathan Frasch, Edward Rothwell, Prem Chahal, Michigan State University, United States; Michael Havrilla, Air Force Institute of Technology, United States

Propagation Phenomena and Scattering of EM Waves

Session Co-Chairs: Ramakrishna Janaswamy, University of Massachusetts Amherst; Prasant Sahu, Indian Institute of Technology, Bhubaneswar

FR-UB.4P.1 **13:20**

Numerical Estimation of Propagation Path Loss for Smart Gas Meters in Built-up Areas Based on Large-Scale FDTD Simulation

Takashi Hikage, Masakazu Yamagishi, Toshio Nojima, Hokkaido University, Japan; Sota Tsuchiya, Takuya Kawata, Tokyo Gas Co., Ltd., Japan

FR-UB.4P.2 **13:40**

From Physics-Based Propagation Modeling to Network Design for Train Communication Systems in Tunnels

Neeraj Sood, Jorg Liebeherr, Costas D. Sarris, University of Toronto, Canada

FR-UB.4P.3 **14:00**

Parameter analysis of propagation attenuation characteristics for 1-6 GHz in the open environment

Jae-Won Choi, Chosun University, Republic of Korea; Hwa Choon Lee, Chodang University, Republic of Korea; Young Chul Lee, Mokpo National Maritime University, Republic of Korea; Donggeun Choi, Sung Won Park, National Radio Research Agency, Republic of Korea; Soon-Soo Oh, Chosun University, Republic of Korea

FR-UB.4P.4 **14:20**

Oblique Scattering by Penetrable Cylinders of Arbitrary Cross Section

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

FR-UB.4P.5 **14:40**

Comparison of Methods for Layered Spheroid Scattering Analysis: Application to BioEM Problems

Chang Liu, Ali E. Yilmaz, The University of Texas at Austin, United States

Break **15:00**

FR-UB.4P.6 **15:20**

Reduction of Radar Cross Section Using Active Microstrip Antenna Elements

Sohini Sengupta, David R. Jackson, Daniel Onofrei, Henry Council, University of Houston, United States

FR-UB.4P.7 **15:40**

Approximative Computation Methods for Electromagnetic Scattering Reduction

Andreas Ericsson, Daniel Sjöberg, Christer Larsson, Torleif Martin, Lund University, Sweden

FR-UB.4P.8 **16:00**

Numerical Analysis of Brillouin Precursor Formation Through Wet Loamy Soil-filled Waveguide

Muhammad Dawood, Kaixing Li, New Mexico State University, United States; Ana Alejos, New Mexico State University/University of Vigo, Spain

FR-UB.4P.9 **16:20**

High-Frequency Analysis of Diffraction within the Tubes of an Interferometric Detector of Gravitational Waves

Giuseppe Pelosi, University of Florence, Italy; Innocenzo M. Pinto, University of Sannio, Italy; Leonardo Possenti, Stefano Selleri, University of Florence, Italy

FR-UB.4P.10 **16:40**

A study on Free Space Optical Communication for Bhubaneswar City

Suman Malik, Prasant Kumar Sahu, Indian Institute of Technology Bombay Bhubaneswar, India

High Frequency and Asymptotic Methods

Session Co-Chairs: Robert Paknys, Concordia University; Yaniv Brick, University of Texas at Austin

FR-A3.1P.1 **13:20**

Convergence Analysis for Iterative Physical Optics Algorithms

Igor Gershenzon, Amir Boag, Tel Aviv University, Israel; Yaniv Brick, The University of Texas at Austin, United States

FR-A3.1P.2 **13:40**

Comparison of Exact Solution and High Frecuency Asymptotic Methods in the Cannonical Wedge Diffraction Problem

Hernan Triana, Andrés Navarro, Universidad Icesi, Colombia

FR-A3.1P.3 **14:00**

Physical Optics Method Over High-order Triangular Element for Complex Source Beam Applications

Min Gao, Xuewu Cui, Zhipeng Liang, Feng Yang, University of Electronic Science and Technology of China, China

FR-A3.1P.4 **14:20**

Electromagnetic Scattering from a PEC Target over a Random Rough Sea Surface using Hybrid KA-PO-PTD Method

Mahdi Behdani, Parisa Dehkhoda, Ahad Tavakoli, Mohammad Zoofaghari, Amirkabir University of Technology, Iran

Friday, July 14 | 13:20 - 15:00
FR-A1.4P | Golden Hill AB

Novel Reflectarray Designs and Applications

Session Co-Chairs: Shenheng Xu, Tsinghua University; Ahmed Abdelrahman, University of Colorado Boulder

FR-A1.4P.1 **13:20**

Simultaneous Transmit And Receive Reflectarray Antennas on Low Cost UAV Platforms

Aman Samaiyar, Ahmed Abdelrahman, Dejan Filipovic, University of Colorado Boulder, United States

FR-A1.4P.2 **13:40**

Passive Repeater for Removal of Blind Spot in NLOS Path for 5G Fixed Wireless Access (FWA) System

Dohyuk Ha, Dongkyu Choi, Hyunjin Kim, JunSig Kum, Jungyub Lee, YoungJu Lee, Samsung Electronics, Republic of Korea

FR-A1.4P.3 **14:00**

Design of a Single-Layer Dual-Band Metal-Only Reflectarray

Ruyuan Deng, Shenheng Xu, Fan Yang, Maokun Li, Tsinghua University, China

FR-A1.4P.4 **14:20**

A Novel Ku/Ka Dual-Band Reflectarray Antenna With Arbitrary Polarization

Jianing Zhao, Hao Li, Wei Mao, Shengli Cao, Keqiang Wang, Peng Zhao, Qian Li, University of Electronic Science and Technology of China, China

FR-A1.4P.5 **14:40**

Mode Analysis of 1-Bit Reflectarray Element Using p-i-n Diode at W-band

Xiaotian Pan, Fan Yang, Shenheng Xu, Maokun Li, Tsinghua National Laboratory for Information Science and Technology, China

Friday, July 14 | 15:20 - 16:40
FR-UB.5P | Golden Hill AB

Wave-guiding Devices and Applications

Session Chair: Vakur Erturk, Bilkent University

FR-UB.5P.1 **15:20**

Radially-polarized Few-Cycle Terahertz Pulse Emission, In-Coupling and Propagation in Coaxial Waveguides

Miguel Navarro-Cía, University of Birmingham, United Kingdom; Jiang Wu, Liu Huiyun, Oleg Mitrofanov, University College London, United Kingdom

FR-UB.5P.2 **15:40**

Metal Cap Antenna with Two Slots Fed by the Post-wall Waveguide

Jiro Hirokawa, Haruhisa Hirayama, Makoto Ando, Tokyo Institute of Technology, Japan

FR-UB.5P.3 **16:00**

Low Temperature, Micromachined, Rotated Rectangular Waveguides at Y-band for Leaky Wave Antenna Applications

Amr Ibrahim, Kamal Sarabandi, University of Michigan, United States; Hussein Shaman, King Abdulaziz City for Science and Technology, Saudi Arabia

FR-UB.5P.4 **16:20**

Implementation of Three-Way Power Divider Based on Substrate Integrated Waveguide

Orçun Kiris, Volkan Akan, Mesut Gokten, Lokman Kuzu, TUBITAK Space Technologies Research Institute, Turkey

Friday, July 14 | 13:20 - 15:00
FR-UB.6P | Torrey Hills AB

MIMO Antennas and Systems

Session Co-Chairs: Ryan Adams, University of North Carolina at Charlotte; Andres Alayón Glasunov, Chalmers University of Technology

FR-UB.6P.1 **13:20**

Optimization of Ultra-Wideband Phased Arrays in MIMO Configuration with Coding for Increased Channel Capacity

Samuel Mensah, Abe Akhiyat, Elias Alwan, John L. Volakis, The Ohio State University, United States

FR-UB.6P.2 **13:40**

Metamaterial Inspired Antenna Design for Massive MIMO, 5G Communications System

Khem Poudel, William Robertson, Middle Tennessee State University, United States

FR-UB.6P.3 **14:00**

A Novel EBG Structure to Improve Isolation in MIMO Antenna

Ahsan Altaf, Istanbul Medipol University, Turkey; M.A. Alsunaidi, King Fahd University of Petroleum and Minerals, Saudi Arabia; Ercument Arvas, Istanbul Medipol University, Turkey

FR-UB.6P.4 **14:20**

Single-Layer Spherical Lens for 5G Wireless Networks

Joshua Shehan, James Carson, Amphenol Antenna Solutions, United States; Ryan Adams, University of North Carolina at Charlotte, United States

FR-UB.6P.5 **14:40**

The Simple and Efficient Wearable Off-body Communication System on a Wrist Model

Semyoung Oh, Gil Young Lee, Jongha Yoon, SangKu Lee, Republic Of Korea Air Force Academy, Republic of Korea

Friday, July 14 | 15:20 - 16:40
FR-UB.7P | Torrey Hills AB

Microwave Imaging

Session Co-Chairs: David Smith, Duke University; Hakan Bagci, King Abdullah University of Science and Technology (KAUST)

FR-UB.7P.1 **15:20**

Dynamic Metasurface Antennas for Computational Microwave Imaging

Mohammadreza F. Imani, Timothy Sleasman, Michael Boyarsky, Laura Pulido-Mancera, Duke University, United States; Thomas Fromenteze, University of Limoges, France; Jonah N. Gollub, David R. Smith, Duke University, United States

FR-UB.7P.2 **15:40**

Improving Discontinuous Galerkin Method Contrast Source Inversion Microwave Imaging using a Hybridizable Forward Solver Formulation

Nicholas Geddert, Kevin Brown, Ian Jeffrey, University of Manitoba, Canada

FR-UB.7P.3 **16:00**

Data Hopping and Convergence Criteria for Microwave Imaging

Joe LoVetri, Cameron Kaye, Anastasia Baran, Ian Jeffrey, University of Manitoba, Canada

FR-UB.7P.4 **16:20**

A Projected Steepest Descent Accelerated Contrast-Source Inversion Scheme for Nonlinear Electromagnetic Imaging

Ali Imran Sandhu, King Abdullah University of Science and Technology, Saudi Arabia; Abdulla Desmal, Tufts University, United States; Hakan Bagci, King Abdullah University of Science and Technology, Saudi Arabia

Interactive Forum

Interactive Forum Reception
Tuesday, July 11, 16:00 - 18:00 , Grand Hall A/C

Antenna Arrays with Non-Uniform Feeding

Session Co-Chairs: Bilgehan Avser, University of California, San Diego; Hiroyuki Arai, Yokohama National University

TUP-A1.1P.1 **Board A.1**

Non-uniform Feeding Networks for Limited-Scan Phased Array Systems

Bilgehan Avser, Gabriel M. Rebeiz, University of California, San Diego, United States

TUP-A1.1P.2 **Board A.2**

Substrate Integrated Waveguide Slotted Antenna Array with Amplitude Weighting and Integrated Monopulse Feed

Daniel Lawrence, Technology Service Corporation, United States

TUP-A1.1P.3 **Board A.3**

Exploiting the Non-uniformity for Circularly Polarized Antenna Arrays at Ku-Band

Luz Idalia Balderas, Alberto Reyna, Universidad Autónoma de Tamaulipas, Mexico; Marco A. Panduro, Centro de Investigación Científica y de Educación Superior de Ensenada, Mexico

TUP-A1.1P.4 **Board A.4**

Beam Steering System using Rotman lens for 5G Applications at 28 GHz

Mohamed A. Hassanien, Michael Jenning, Dirk Plettemeier, TU Dresden, Germany

TUP-A1.1P.5 **Board A.5**

Linearly Polarized Slotted Patch Antenna Array Fed by Power Weighting Distribution

Achmad Munir, Yussi Perdana Saputra, Institut Teknologi Bandung, Indonesia; Farohaji Kurniawan, Josaphat Tetuko Sri Sumantyo, Chiba University, Japan

TUP-A1.1P.6 **Board A.6**

Experiment of Ka-band Orbital Angular Momentum Steering Technique

Mingtuan Lin, Peiguo Liu, Jibin Liu, National University of Defense Technology, China; Yue Gao, Queen Mary University of London, United Kingdom

TUP-A1.1P.7 **Board A.7**

Minimizing gain roll-off in Rotman lens antenna using phase gradient transmission lines

Jianping Li, Weiren Zhu, Han Zhou, Guanshen Chenhu, Yu Yao, Jueling Liu, Xianling Liang, Junping Geng, Ronghong Jin, Shanghai Jiao Tong University, China

TUP-A1.1P.8 **Board A.8**

Synthesis of Sparse Antenna Arrays with Concurrently Weighted Inter-element Spacings and Amplitude Excitation Coefficients

V S Gangwar, A K Singh, Defence Research and Development Organization (DRDO), India; S P Singh, Indian Institue of Technology (IIT-BHU), India

TUP-A1.1P.9 **Board A.9**

Plate-laminated slotted-waveguide fed 2×3 Planar Inverted F Antenna Array

Badar Muneer, Waseem Shabir, Faisal Shaikh, Mehran University of Engineering & Technology, Jamshoro, Pakistan; Qi Zhu, University of Science & Technology of China, China

TUP-A1.1P.10 **Board A.10**

Array-antenna Decoupling Surfaces for Quasi-Yagi Antenna Arrays

Changning Wei, Ke-Li Wu, The Chinese University of Hong Kong, Hong Kong SAR of China

Feeding Networks and Arrays

Session Co-Chairs: Mohammad Akbari, Concordia University; Can Ding, University of Technology, Sydney (UTS)

TUP-A1.2P.1 **Board A.11**

A Sequential-Phase Feed Antenna Subarray Based on Ridge Gap Waveguide

Mohammad Akbari, Concordia University, Canada; Ali Farahbakhsh, Iran University of Science and Technology, Iran; Mohammadmahdi Farahani, Institute National De La Recherché Scientifique, Canada; Abdel Razik Sebak, Concordia University, Canada; Tayeb A. Denidni, Institute National De La Recherché Scientifique, Canada

TUP-A1.2P.2 **Board A.12**

Dual-Polarized X-Band Microstrip Sub-Array with Hybrid Feed Network for SAR Payload on Small Satellite

Xing Zhao, Swee Ping Yeo, National University of Singapore, Singapore; L. C. Michael Ong, Muhammad Faeyz Karim, Institute for Infocomm Research, Singapore

TUP-A1.2P.3 **Board A.13**

Compact Antenna System Fed by Dual-layer Rotman Lens to Support Millimeter Wave Devices

Toan Vo Dai, Tuan Nguyen, Ozlem Kilic, The Catholic University of America, United States

TUP-A1.2P.4 **Board A.14**

Wideband Feeding Method for Full-Wave Dipole

Can Ding, Bevan Jones, Haihan Sun, Pei-Yuan Qin, Jay Guo, University of Technology Sydney, Australia; Luyang Ji, Northwestern Polytechnical University, China

TUP-A1.2P.5 **Board A.15**

On Systematic Design of Corporate Feeds for Chebyshev Microstrip Linear Antenna Arrays

Slawomir Koziel, Stanislav Ogurtsov, Reykjavik University, Iceland

TUP-A1.2P.6 **Board A.16**

Series-Fed Antenna Lattice Featuring Dual-Circular Polarization with Integrated Feeding Network

Szczepan Odrobina, Izabela Slomian, Slawomir Gruszczynski, Krzysztof Wincza, AGH University of Science and TechnologyAGH, Poland

TUP-A1.2P.7 **Board A.17**

Performance Validation of the 19-element Multibeam Feed for the Five-hundred-metre Aperture Spherical Radio Telescope

Stephanie Smith, Alex Dunning, Ken Smart, Robert Shaw, Simon Mackay, Mark Bowen, Douglas Hayman, CSIRO, Australia

TUP-A1.2P.8 **Board A.18**

A Novel Passive Feeding Network for Isolation Enhancement of Dual-polarized Antenna

Jinxin Li, Shiwen Yang, Mengkui Shen, Zaiping Nie, University of Electronic Science and Technology of China, China; William Thomas Joines, Duke University, China

TUP-A1.2P.9 **Board A.19**

A Compact SIW Butler Matrix with Straight Delay Lines at 60 GHz

Zhefan Chen, Xidong Wu, Fan Yang, Zhejiang University, China

TUP-A1.2P.10 **Board A.20**

A T-Shaped Feed Structure to Enhance the Performance of a Polarization Diversity Antenna

Guanshen Chenhu, Junping Geng, Bin Zhou, Jianping Li, Yifeng Chen, Weiren Zhu, Xianling Liang, Ronghong Jin, Shanghai Jiao Tong University, China; Richard Wowski Ziolkowski, University of Technology Sydney, Australia

Gain Enhancement Techniques for Planar Antennas

Session Chair: Ashraf Badawi, Zewail City of Science and Technology

TUP-A1.3P.1 **Board A.21**

Gain Enhancement of Suspended Miniaturized Antenna on High-loss Paper Substrate

Do Hanh Ngan Bui, Tan-Phu Vuong, University of Grenoble-Alpes, France; Jacques Verdier, Bruno Allard, University of Lyon, INSA, France; Philippe Benech, University of Grenoble-Alpes, France

TUP-A1.3P.2 **Board A.22**

A Modified Square Loop Antenna Radiating a Circularly Polarized Conical Beam – Its Application to Tilted Beam Formation with Enhanced Gain

Kazuhide Hirose, Takuya Yoshida, Shibaura Institute of Technology, Japan; Hisamatsu Nakano, Hosei University, Japan

TUP-A1.3P.3 **Board A.23**

High Gain Enhancement Off-body Antenna for Underground Mining Communications

Amine Habani, Mourad Nedil, Université du Québec en Abitibi-Témiscamingue, Canada; Tayeb A. Denidni, Institut National de la Recherche Scientifique (INRS), Canada; Larbi Talbi, Université du Québec en Outaouais, Canada

TUP-A1.3P.4 **Board A.24**

Gain Enhancement of Dual-band Antenna Using Square Loop FSS

Francisco Lucena, Crislane Silva, Túlio Pedrosa, Marcos de Melo, Universidade Federal de Pernambuco, Brazil

TUP-A1.3P.5 **Board A.25**

Two-Layered Ground Radiation Antenna for High Efficiency Applications

Hyunwoong Shin, Longyue Qu, Jihoon Kim, Hongkoo Lee, Min-Gi Kim, Hanyang University, Republic of Korea; Hyung Hoon Kim, Kwangju Women's University, Republic of Korea; Hyeongdong Kim, Hanyang University, Republic of Korea

TUP-A1.3P.6 **Board A.26**

A High-gain Printed Antenna Loaded by Plane Dielectric Based on Substrate integrated waveguide Technology

Shu Lin, Yandi Bi, Yu Mao, Maorui Zhang, Harbin Institute of Technology, China

TUP-A1.3P.7 **Board A.27**

A High Gain Patch Antenna Using Near Zero-Index Metamaterial Coating

Kai Yu, Yingsong Li, Harbin Engineering University, China; Xiaoguang "leo" Liu, University of California, Davis, United States

TUP-A1.3P.8 **Board A.28**

A Gain-enhanced Rectangular Patch Antenna with Artificial Magnetic Conductor Ground

Wei Li, Ying Suo, Xiaopeng Xu, Yan Liu, Harbin Institute of Technology, China

TUP-A1.3P.9 **Board A.29**

A Compacted Substrate Integrated Waveguide Antenna Array for W-band applications

Zhuofu Ding, Shaoqiu Xiao, Hong-Chun Yang, University of Electronic Science and Technology of China, China; Runjun Xiao, Yujing Guan, RML Technology Co., Ltd, China

High Gain Planar Antenna Array

Session Chair: Mohammod Ali, University of South Carolina

TUP-A1.4P.1 **Board A.30**

A Wideband, High-Gain, CPW-Fed, Circularly-Polarized, L-Shaped Slot Antenna Array

Mehrdad Nosrati, Negar Tavassolian, Stevens Institute of Technology, United States

TUP-A1.4P.2 **Board A.31**

A Broadband High-Gain Aperture Coupled Patch Array for Communication and Radar Applications

Dhruva Poduval, Mohammod Ali, University of South Carolina, United States

TUP-A1.4P.3 **Board A.32**

4× 2-Slot Element for 30-GHz Planar Array Antenna Realized Using SIW Cavity and fed by Microstrip Line Line-Ridge Gap Waveguide

Mohamed Ali, Abdel Razik Sebak, Concordia University, Canada

TUP-A1.4P.4 **Board A.33**

A Novel Broadband Aperture-Coupled Microstrip Patch Array Antenna for AiP solutions

En-Yi Hsueh, Hung-Chia Chang, Ken-Huang Lin, National Sun Yat-sen University, Taiwan

TUP-A1.4P.5 **Board A.34**

Series-Fed Planar Dipole Array Antenna

Matthew Straughn, Chi-Chih Chen, The Ohio State University, United States

TUP-A1.4P.6 **Board A.35**

Waveguide fed Microstrip Antenna Array using I-shaped slots at Ka-band

Pratigya Mathur, Girish Kumar, Indian Institute of Technology Bombay, India

TUP-A1.4P.7 **Board A.36**

Compact Planar Log-Periodic dipole Array Based Yagi-Uda Antenna

Hemant Kumar, Girish Kumar, Indian Institute of Technology Bombay, India

TUP-A1.4P.8 **Board A.37**

Design and Study of an Aperture Coupled Patch Antenna Array with Hyperbolic Lens in C-band

Wei Shi, Xiaoqiang Li, Huafeng Sheng, Yixin Li, Guangli Yang, Shanghai University, China

TUP-A1.4P.9 **Board A.38**

Design of 2 by 2 dual-polarized antenna array with high isolation, wideband and low cross polarization

Wei Wang, Jing Wang, Aimeng Liu, Meng Guo, Harbin Engineering University, China

Multi-Functional Antennas and Novel Applications

Session Chair: Yingsong Li, Harbin Engineering University

TUP-A1.5P.1 **Board A.39**

A Tunable SIW Integrated Filter/Antenna

Ricardo Lovato, Xun Gong, University of Central Florida, United States

TUP-A1.5P.2 **Board A.40**

Circularly-Polarized, Unidirectional Antennas for Simultaneous Transmit and Receive (STAR) Applications

Jie Wu, University of Electronic Science and Technology of China, University of Wisconsin-Madison, China; Yujian Cheng, University of Electronic Science and Technology of China, China; Mingjian Li, Nader Behdad, University of Wisconsin-Madison, United States

TUP-A1.5P.3 **Board A.41**

Artistic Textile Antennas

Muhammad Mustafa Tahseen, Barbara Layne, Ahmed A. Kishk, Concordia University, Canada

TUP-A1.5P.4 **Board A.42**

Phaser-Based Polarization-Dispersive Antenna and Application to Encrypted Communication

Xiaoyi Wang, Christophe Caloz, Polytechnique Montréal, Canada

TUP-A1.5P.5 **Board A.43**

Optically Transparent Patch Antennas Based on Silver Nanowires for mm-Wave Applications

Quang Huy Dao, Rodrigue Tchuigoua, Bernd Geck, Dirk Manteuffel, Leibniz University of Hannover, Germany; Philipp von Witzendorff, Ludger Overmeyer, Laser Zentrum Hannover e.V., Germany

TUP-A1.5P.6 **Board A.44**

Low Cost X-band Phased Array for Wireless Applications

Dongjin Jung, Skyworks Solutions, United States; Kai Chang, Texas A&M University, United States

TUP-A1.5P.7 **Board A.45**

Improvement on the Multi-Mode Beams Divergence of OAM Array by Using Fabry-Perot Cavity

Xudong Bai, Yuntao Sun, Pengcheng Hu, Jinping Chen, Weizhong Yan, Shanghai Scientific Instrument Factory, China; Xianling Liang, Chong He, Junping Geng, Ronghong Jin, Shanghai Jiao Tong University, China

TUP-A1.5P.8 **Board A.46**

Aperture Controlled Substrate Integrated H-plane Horn Antenna

Nima Bayat-Makou, Ahmed A. Kishk, Concordia University, Canada

TUP-A1.5P.9 **Board A.47**

A Compact Multi-Band Antenna for Mobile Devices and its Impedance Matching Limit Study

Junqiang Wu, Xiaoju Yu, University of Arizona, United States; Ahmed Abdelrahman, University of Colorado Boulder, United States; Min Liang, Hao Xin, University of Arizona, United States

TUP-A1.5P.10 **Board A.48**

New Fractal Compact Printed Antennas

Albert Sabban, Ort Braude College, Israel

(Continued)

TUP-A1.5P.11 **Board A.49**

Rapid Statistical Analysis and Tolerance-Aware Design of Antennas By Response Feature Surrogates

Slawomir Koziel, Adrian Bekasiewicz, Reykjavik University, Iceland

TUP-A1.5P.12 **Board A.50**

Rapid Dimension Scaling of Triple-Band Antennas By Means of Inverse Surrogate Modeling

Slawomir Koziel, Adrian Bekasiewicz, Reykjavik University, Iceland

TUP-A1.5P.13 **Board A.51**

A Modal Current Correlation Approach for Designing Dual-Frequency Slotted Cavity Antennas

Abhijit Bhattacharya, Rodney G Vaughan, Simon Fraser University, Canada

TUP-A1.5P.14 **Board A.52**

Super High Frequency Reflective Biquad Antenna

Andre Arguelles, Florida International University, United States

Broadband and Tunable Arrays

Session Co-Chairs: Nader Behdad, University of Wisconsin-Madison; Andrea Neto, Delft University of Technology

TUP-UB.4P.1 **Board A.53**

Monolithic Realization and Characterization of On-chip UWB Phased Arrays for mmW and THz Connectivity

Seckin Sahin, Cosan Caglayan, Niru K. Nahar, Kubilay Sertel, The Ohio State University, United States

TUP-UB.4P.2 **Board A.54**

A Wideband Tightly Coupled Dipole Array with Novel Differential Feeding Network

Alexander Johnson, Elias Alwan, John L. Volakis, The Ohio State University, United States

TUP-UB.4P.3 **Board A.55**

A Tunable Biomimetic Antenna Array with a Wide Tuning Range

Mohammad Ranjbar Nikkhah, Kasra Ghaemi, Nader Behdad, University of Wisconsin-Madison, United States

TUP-UB.4P.4 **Board A.56**

A Design of 1-D Tightly Coupled Dipole Array

Hakjune Lee, Electronics and Telecommunications Research Institute (ETRI), Republic of Korea; Sangwook Nam, Seoul National University, Republic of Korea

TUP-UB.4P.5 **Board A.57**

A 7-to 15-GHz Wide-Scan Dual-Polarized Array of Connected Slots with Artificial Dielectrics

Daniele Cavallo, Waqas Syed, Andrea Neto, Delft University of Technology, Netherlands

(Continued)

Planar Antenna Design and Analysis

Session Chair: Enver Adas, University of California, Irvine

TUP-A1.6P.1 **Board A.58**

A Novel Method to Analyze Substrate Waves in Microstrip Antenna Arrays

Enver Adas, Franco De Flaviis, University of California, Irvine, United States; Nicolaos G. Alexopoulos, Broadcom Foundation, United States

TUP-A1.6P.2 **Board A.59**

Characteristic Mode Analysis of Microstrip Patch Shapes

Mohamed Elsewe, Deb Chatterjee, University of Missouri-Kansas City, United States

TUP-A1.6P.3 **Board A.60**

Time-Domain Design of a Linear Antenna Array for Wideband Shaped Beams

Alberto Reyna, Luz Idalia Balderas, Universidad Autónoma de Tamaulipas, Mexico

TUP-A1.6P.4 **Board A.61**

Comparison of the Radiation Characteristics Calculated Using MoM and FDTDM for a Printed Grid Array Antenna

Toru Kawano, National Defense Academy, Japan; Hisamatsu Nakano, Hosei University, Japan

TUP-A1.6P.5 **Board A.62**

Efficient Tolerance Analysis on a Low Cost, Compact Size, Wideband Multilayer Patch Antenna

Giorgio Giunta, Chiara Novi, Rheinmetall S.p.A., Italy; Stefano Maddio, Giuseppe Pelosi, Monica Righini, Stefano Selleri, University of Florence, Italy

TUP-A1.6P.6 **Board A.63**

Multilayer Cavity Backed Antenna with Backside Radiation Suppression for 79-GHz Applications

Mohammad Mosalanejad, KU Leuven & IMEC, Belgium; Steven Brebels, IMEC, Belgium; Ilja Ocket, KU Leuven & IMEC, Belgium; Charlotte Soens, IMEC, Belgium; Guy Vandenbosch, KU Leuven, Belgium

TUP-A1.6P.7 **Board A.64**

A Multi-Slot Printed Antenna Excited with a Microstrip Line for 4G Wireless Systems

Kendrick Henderson, Saeed Latif, Georgios Lazarou, University of South Alabama, United States

TUP-A1.6P.8 **Board A.65**

Weight Reduction Procedure for Avionic Patch Antennas

Cheng-Nan Chiu, Yu-Chou Chuang, Yuan Ze University, Taiwan; Jheng-Yu Chen, Da-Yeh University, Taiwan

TUP-A1.6P.9 **Board A.66**

All-metallic Dual-beam Antenna with a Low Profile

Changjiang Deng, Weihua Yu, Xin Lv, Beijing Institute of Technology, China

TUP-A1.6P.10 **Board A.67**

Wideband Printed Loop-dipole Antenna with Magnetic-Electric Coupling

Fei Liu, Kuiwen Xu, Peng Zhao, Shichang Chen, Gaofeng Wang, Hangzhou Dianzi University, China

TUP-A1.6P.11 **Board A.68**

A MIMO Implementation of Triple Wideband Tablet Computer Antenna

Aqsa Ahmad, Farooq Ahmad Tahir, National University of Sciences & Technology, Pakistan

TUP-A1.6P.12 **Board A.69**

A 4-Element MIMO Implementation for Laptop Computers

Aqsa Ahmad, Farooq Ahmad Tahir, National University of Sciences & Technology, Pakistan; Rifaqat Hussain, University of Petroleum and Minerals, Dhahran, Saudi Arabia

TUP-A1.6P.13 **Board A.70**

A Novel Polarization Independent Angularly Stable High Impedance Surface for Antenna Miniaturization

M. Ismail Khan, Farooq Ahmad Tahir, Munir Ahmad Tarar, National University of Sciences & Technology, Pakistan

Reconfigurable Reflectarrays and Holographic Surfaces

Session Chair: Fan Yang, Tsinghua University

TUP-A1.7P.1 **Board A.71**

Reconfigurable Reflectarray Antenna for Microwave Detection and Imaging

Ahmed Abdelrahman, University of Colorado Boulder, United States; Min Liang, Hao Xin, University of Arizona, United States

TUP-A1.7P.2 **Board A.72**

Liquid-crystal reconfigurable metasurface reflectors

Senglee Foo, Huawei Technologies Canada, Canada

TUP-A1.7P.3 **Board A.73**

Active Metasurface for a Reconfigurable Reflectarray Antenna

Badreddine Ratni, André de Lustrac, Université Paris-Saclay, France; Gérard-Pascal Piau, AIRBUS Group Innovations, France; Shah Nawaz Burokur, Université Paris Ouest, France

TUP-A1.7P.4 **Board A.74**

Planar Metasurface for Parabolic Reflector Antenna: Frequency Agility and Beam Steering

Badreddine Ratni, André de Lustrac, Université Paris-Saclay, France; Gérard-Pascal Piau, AIRBUS Group Innovations, France; Shah Nawaz Burokur, Université Paris Ouest, France

TUP-A1.7P.5 **Board A.75**

Design of a C-band Beam-scanning Reflectarray Antenna for Satellite Communications

Xiangfei Xu, Fan Yang, Shenheng Xu, Tsinghua National Laboratory of Information Science and Technology, Tsinghua University, China

TUP-A1.7P.6 **Board A.76**

An X-Band Binary Reflectarray with Sub-Wavelength ELC Resonator Elements

Ra'id Awadallah, David Shrekenhamer, Robert Schmid, Amanda Mills, Johns Hopkins Applied Physics Laboratory, United States; Jeffrey Nanzer, Michigan State University, United States

TUP-A1.7P.7 **Board A.77**

Radiation Hazards (RADHAZ) Considerations for Holographic Synthetic Phased Array Sensors

Eugene Ngai, Hann-Jann (RF-Tech) Consultancy, United States

TUP-A1.7P.8 **Board A.78**

12.6 GHz Off-set Fed Multilayer Reflectarray

Daniel Belo, Pedro Pinho, Nuno B. Carvalho, Instituto de Telecomunicações, Portugal

TUP-A1.7P.9 **Board A.79**

Design of Beam-Steerable Dual-Beam Reflectarray

Ping-Hsueh Wu, Shih-Yuan Chen, National Taiwan University, Taiwan

TUP-A1.7P.10 **Board A.80**

A Novel 2-Bit Reconfigurable Reflectarray Element for Both Linear and Circular Polarizations

Xue Yang, Shenheng Xu, Fan Yang, Maokun Li, Tsinghua University, China

Array Design and Optimization

Session Co-Chairs: Karl Warnick, Brigham Young University; Randy Haupt, Colorado School of Mines

TUP-UB.1P.1 **Board A.81**

Assessment of FETI DDM methodologies for the simulation of High Gain Ka-Band Transmit arrays

André Barka, ONERA The French Aerospace Lab, France; Sérgio A. Matos, Jorge R. Costa, Carlos A. Fernandes, Instituto de Telecomunicações/Instituto Superior Técnico, Portugal; Vincent Gobin, ONERA The French Aerospace Lab, France

TUP-UB.1P.2 **Board A.82**

Universal Radio for Beamforming and Signal Detection without Carrier Knowledge

Markus Novak, Satheesh Bojja Venkatakrishnan, John L. Volakis, The Ohio State University, United States

TUP-UB.1P.3 **Board A.83**

A Rational Function Model for Mutual Coupling in Vivaldi Antenna Arrays

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

TUP-UB.1P.4 **Board A.84**

A Study of Coherent Gain Degradation due to Node Vibrations in Open Loop Coherent Distributed Arrays

Pratik Chatterjee, Jeffrey Nanzer, Michigan State University, United States

TUP-UB.1P.5 **Board A.85**

Optimization of Rotated Tiled Aperiodic Array Antennas

Junming Diao, Jakob Kunzler, Karl F. Warnick, Brigham Young University, United States

TUP-UB.1P.6 **Board A.86**

Convex Optimization of Endfire Array Antenna Feeding

Daniel Sjöberg, Jakob Helander, Doruk Tayli, Lund University, Sweden

TUP-UB.1P.7 **Board A.87**

Investigation of Analytical Solution for Radiated Fields of Slot Yagi-Uda Array through Mutual Coupling Analysis

Stephen Bass, Jessica Ruyle, The University of Oklahoma, United States

TUP-UB.1P.8 **Board A.88**

Optimized 2-Dimensional Platform Placement for Sidelobe Mitigation in Coherent Distributed Arrays

Sean Ellison, Jeffrey Nanzer, Michigan State University, United States

TUP-UB.1P.9 **Board A.89**

Beam Scan Angle Dependence of Array Antenna Loss and Receiving Efficiency

Junming Diao, Karl F. Warnick, Brigham Young University, United States

Arrays for Space, Satellite and Optical Applications

Session Chair: Ashwin Iyer, University of Alberta

TUP-UB.2P.1 **Board A.91**

Phased Array Antenna Design for L-Band GEO Satellite Communication Ground Terminal Applications

Xiao Xiao, Yilong Lu, Nanyang Technological University, Singapore

TUP-UB.2P.2 **Board A.92**

Design and fabricate CubeSat Antenna for High-Performance Communication

Fahad Alsabr, Mohammed Alanazi, Abdulrahman Sheikh, Awad Sabban, Abas Sabouni, Wilkes University, United States

TUP-UB.2P.3 **Board A.93**

Construction and Testing of a Solar Panel with an X-band Optically Transparent Reflectarray Antenna Integrated on Top of It

Taha Yekan, Muhammadeziz Tursunniyaz, Reyhan Baktur, Charles Swenson, Utah State University, United States; Serhat Altunc, Eleanya Onuma, Harry Shaw, NASA Goddard Space Flight Center, United States

TUP-UB.2P.4 **Board A.94**

Waveguide Loss Compensation in Resonant Slot Array Design

Jacob Coetzee, Soumya Sheel, Queensland University of Technology, Australia

TUP-UB.2P.5 **Board A.95**

Optical Implementation of a Miniaturized ENNZ-Metamaterial-Lined Aperture Array

Mitchell Semple, Elham Baladi, Justin Pollock, Ashwin K. Iyer, University of Alberta, Canada

Beamforming Networks for Antennas and Arrays

Session Co-Chairs: Vakur Erturk, Bilkent University; Lorena Basilio, Sandia National Labs

TUP-UB.3P.1 **Board A.96**

Design of one-body 64×64-way 2-D beam-switching Butler matrix

Dong-Hun Kim, Jiro Hirokawa, Tokyo Institute of Technology, Japan; Kentaro Nishimori, Niigata University, Japan

TUP-UB.3P.2 **Board A.97**

A Butler Matrix Design for Directional Antenna

Shuguang Chen, Mahmoud Khalil, Steven Goodall, US Army, United States

TUP-UB.3P.3 **Board A.98**

Design of a Metasurface-Based Beam-Steering System

Bowen Zheng, University of Massachusetts Lowell, United States; Han Ren, The University of North Texas, United States; Sensong An, Jun Ding, Hualiang Zhang, University of Massachusetts Lowell, United States

TUP-UB.3P.4 **Board A.99**

A SMILE Array Using a Single ADC for Digital Beamforming

Lindsay Light, Mathew Biedka, Yikun Huang, Yuanxun Ethan Wang, University of California, Los Angeles, United States

TUP-UB.3P.5 **Board A.100**

Beamforming with Dynamic Metasurface Antennas Using Euclidean Modulation

Michael Boyarsky, Patrick Bowen, Laura Pulido-Mancera, Timothy Sleasman, David R. Smith, Duke University, United States

Conformal Antennas

Session Chair: Roshank Zabihi, Simon Fraser University

TUP-A1.10P.1 **Board C.1**

Preliminary Design of A Quasi-Omni-Directional Beacon Antenna for MARS Sample Return Canister

Vahraz Jamnejad, Hungsheng Lin, Jet Propulsion Laboratory, California Institute of Technology, United States

TUP-A1.10P.2 **Board C.2**

Optimizing Signal Coverage in the Azimuth Plane of Conformal Microstrip Antennas by Widening their Sectorial Beamwidths

Pawel Kabacik, Arkadiusz Byndas, Mariusz Hofman, Wroclaw University of Science and Technology, Poland

TUP-A1.10P.3 **Board C.3**

Effect of Ground Plane Size on a Rectangular Microstrip Patch Antenna Based on TE Modes Supported by Perfect Magnetic Conducting Surface

Tanzeela Mitha, Maria Pour, University of Alabama in Huntsville, United States

TUP-A1.10P.4 **Board C.4**

Conformal Cavity-Backed Slot Antenna Embedded in a Conical Platform for End-Fire Radiation

Zhuozhu Chen, Zhongxiang Shen, Nanyang Technological University, Singapore

TUP-A1.10P.5 **Board C.5**

Closed-form model of extremely thin conformal magnetic antenna with high Gain-Bandwidth Product

Tara Yousefi, Rodolfo Diaz, Arizona State University, United States

TUP-A1.10P.6 **Board C.6**

A Conformal Dual-polarized All-Metal Vivaldi Array for Feeding Broadband Luneburg Lens

Gitansh Gulati, Min Liang, Hao Xin, University of Arizona, United States

TUP-A1.10P.7 **Board C.7**

A Conformal Rotman Lens

Naftali Herscovici, Lance Griffiths, Ryan Chilton, John D'Angelo, Michelle Champion, Air Force Research Laboratory, United States

TUP-A1.10P.8 **Board C.8**

RCS Reduction and Gain Enhancement for Slot Antenna Array

Hao Jiang, Zhenghui Xue, Weiming Li, Wu Ren, Beijing Institute of Technology, China

TUP-A1.10P.9 **Board C.9**

Broadband Polarization Reconfigurable Microstrip Antenna Array

Kun Wang, Xianling Liang, Weiren Zhu, Ziheng Ding, Yu Yao, Jianping Li, Junping Geng, Ronghong Jin, Shanghai Jiao Tong University, China

Impact of Mutual Coupling

Session Chair: Dimitris Anagnostou, Heriot Watt University

TUP-A1.11P.1 **Board C.11**

Theoretrical Derivation of Mutual Coupling and Radiation Properties of Loop Antenna Arrays Valid from RF to Optical

Jogender Nagar, The Pennsylvania State University, United States; Mario Pantoja, University of Granada, Spain; Bing Qian Lu, Douglas H. Werner, The Pennsylvania State University, Spain

TUP-A1.11P.2 **Board C.12**

Modeling and Measuring of Antenna Array S-parameters and Radiation Efficiency

Obinamuni Supun De Silva, Leonid Belostotski, Michal Okoniewski, University of Calgary, Canada

TUP-A1.11P.3 **Board C.13**

Array Pattern Synthesis Using Numerical Pattern Synthesis Algorithm Including Mutual Coupling

Shu-Lin Chen, Pei-Yuan Qin, Jay Guo, University of Technology Sydney, Australia; Yanhui Liu, Pengfei You, Xiamen University, China

TUP-A1.11P.4 **Board C.14**

Assessment of Asymptotic Methods for Mutual Coupling Estimation

Andrej Konforta, Thomas Bertuch, Peter Knott, Fraunhofer FHR, Germany

Microwave Circuits for Antennas

Session Co-Chairs: Gregor Lasser, University of Colorado Boulder; Juan Sebastian Gomez-Diaz, University of California Davis

TUP-A1.12P.1 **Board C.21**

Compact TM01 toTE11 Mode Converter Designed with Matching Sections

Ashutosh Patri, State University of New York at Oswego, United States; Ashish Chittora, Jayanta Mukherjee, Indian Institute of Technology Bombay, India

TUP-A1.12P.2 **Board C.22**

Mutual Coupling Reduction Using Grounded Strip Line with Diamond Slots

Ali Hammoodi, Ayman Isaac, University of Arkansas at Little Rock, United States; Haider Raad, Xavier University, United States

TUP-A1.12P.3 **Board C.23**

A Single-Pole-Double-Throw Switch Based on the Ring Structure

Liang Liu, Xianling Liang, Han Zhou, Yifeng Chen, Yuliang Liang, Ronghong Jin, Junping Geng, Weiren Zhu, Guanshen Chenhu, Jianping Li, Yu Yao, Shanghai Jiao Tong University, China

TUP-A1.12P.4 **Board C.24**

Novel Overmode circular waveguide bend For High Power TM01 mode transmission

Xiao Meng Li, Xiang Qiang Li, Qing Xiang Liu, Jian Qiong Zhang, Si Xu Chen, Southwest Jiaotong University, China

TUP-A1.12P.5 **Board C.25**

A Compact Microtrip Filtering Power Divider Made Of Novel Coupled Resonators

Yifeng Chen, Xianling Liang, Weiren Zhu, Liang Liu, Junping Geng, Ronghong Jin, Maohua Zhu, Guanshen Chenhu, Shanghai Jiao Tong University, China

TUP-A1.12P.6 **Board C.26**

Compact ultra-wide stopband lowpass filter using transformed stepped impedance hairpin resonator

Fan Zhang, Shuai Liu, Peng Zhao, Ming Du, Xiaochuan Zhang, Jun Xu, University of Electronic Science and Technology of China, China

TUP-A1.12P.7 **Board C.27**

A novel wideband TE01-TE11 mode converter with elliptical section

Qiang Wang, Song Zhang, Jian Ye, Wentao Zhang, Chun Yang, Institute of Engineering electronics, CAEP, China

TUP-A1.12P.8 **Board C.28**

Resistors-Loaded Substrate Integrated Waveguide Power Combiner/Divider

Yong Mao Huang, Yuanhua Sun, Haiyan Jin, University of Electronic Science and Technology of China, China; Tengxing Wang, University of South Carolina, United States; Yuliang Zhou, Supeng Leng, University of Electronic Science and Technology of China, China; Guoan Wang, University of South Carolina, United States

TUP-A1.12P.9 **Board C.29**

Design of RF/Microwave Planar Crossovers Using Pure-Series-Connected Lumped Elements

Xi Yu, Sheng Sun, University of Electronic Science and Technology of China, China

Impedance Enhancement Techniques for Planar Antennas

Session Chair: Xun Gong, University of Central Florida

TUP-A1.13P.1 **Board C.31**

A Technique to Enhance the Impedance Response of Probe-fed Stacked Patch Antennas

Rod Waterhouse, Dalma Novak, Pharad, LLC, United States

TUP-A1.13P.2 **Board C.32**

A Broadband Dual-Circular Polarization Patch Antenna Using Quadruple L-probe Feed

Sing Wai Cheung, Bo Wang, Di Wu, Qinlong Li, Changfei Zhou, The University of Hong Kong, Hong Kong SAR of China

TUP-A1.13P.3 **Board C.33**

Design of Notch-Enhanced Compact Printed Antennas for 5G Communications

Fabrizio Robol, Giorgio Gottardi, Marco Salucci, Giacomo Oliveri, Andrea Massa, University of Trento, Italy

TUP-A1.13P.4 **Board C.34**

Design of Monopole Antennas for UWB Applications

Waqas Ahmad, Andrzej Tarczynski, Djuradj Budimir, University of Westminster, United Kingdom

TUP-A1.13P.5 **Board C.35**

Dual-Band Broadside Slot Array with Corporate-Series-Feed Based on CRLH Microstrip Line

Jen-Kuei Tsai, Shih-Yuan Chen, National Taiwan University, Taiwan

TUP-A1.13P.6 **Board C.36**

Enhancement of Reflection Coefficient via Modified Ground Plane of a Multilayer Microstrip Patch Antenna for X-Band Application

Noppasin Pornprachatham, Thorin Theeradejvanichkul, King Mongkut's University of Technology Thonburi, Thailand

TUP-A1.13P.7 **Board C.37**

Broadband Dual-Polarized Cavity-Backed Slot Antennas

Yao Niu, Yuehui Cui, RongLin Li, South China University of Technology, China

TUP-A1.13P.8 **Board C.38**

A Broadband SIW-Integrated Circular Polarized Antenna

Wael Abdel-Wahab, University of Waterloo, Canada; Ying Wang, University of Ontario Institute of Technology, Canada; Hussam Al-Saedi, University of Waterloo, Canada; Hesham A. Mohamed, Electronic Research Institute, Egypt; Safieddin Safavi-Naeini, University of Waterloo, Canada

Microwave Passive Components

Session Co-Chairs: Khair Al Shamaileh, Purdue University Northwest; Maria Pour, University of Alabama in Huntsville

TUP-A1.14P.1 **Board C.41**

E-plane RWG-to-SIW Transition Power Splitter for Ka-Band SATCOM Application

Wael Abdel-Wahab, Hussam Al-Saedi, Safieddin Safavi-Naeini, University of Waterloo, Canada

TUP-A1.14P.2 **Board C.42**

Quad-band Multi-section Multi-way Power Divider and its Miniaturization Using Coupled Lines

Michael Knizek, Christopher Nicholl, Craig Popovich, Khair Al Shamaileh, Purdue University Northwest, United States

TUP-A1.14P.3 **Board C.43**

Graded Index Substrate Integrated Waveguide based Directional Coupler

*Karthik T Chandrasekaran, Arokiaswami Alphones, Nanyang Technological University, Singapore; Muhammad Karim Faeyz, Nasimuddin Nasimuddin, Agency for Science, Technology and Research (A*STAR), Singapore*

TUP-A1.14P.4 **Board C.44**

A Planar 8-Way Radial Power-Splitter Combined Flat AP-Antenna With Increased H-Plane Gain

Changhyeong Lee, Dajung Han, Heejoon Park, Sungtek Kahng, Muhammad Kamran Khattak, Incheon National University, Republic of Korea

TUP-A1.14P.5 **Board C.45**

A Novel High-Performance DMS/DGS Low-Pass Filter for Radar Applications

Ahmed Boutejdar, German Research Foundation, Germany; Ahmed Ibrahim, Minia University, Egypt; Raed Shubair, Khalifa University & MIT, United Arab Emirates

TUP-A1.14P.6 **Board C.46**

A Novel Narrowband Filter with Cross-coupling Used for System-in-Package Applications

Mengkui Shen, Xianqi Lin, Jing Ai, University of Electronic Science and Technology of China, China; Tianye Ma, William Thomas Joines, Duke University, United States

TUP-A1.14P.7 **Board C.47**

An Ultra Wide Band Filter with High Selective Dual Notching

Yasmin Hammad, Zeinab Fouda, October University for Modern Sciences and Arts, Egypt; Mahmoud A. Abdalla, Military Technical College, Egypt

TUP-A1.14P.8 **Board C.48**

A New Diamond-shape planar ultra-wideband bandpass filter with super wide stopband

Maoxu Wnag, Jie Cui, Yubing Han, Nanjing University of Science and Technology, China; Xiaofeng Ma, Renli Zhang, NanJing Universtiy of Science & Technology, China

TUP-A1.14P.9 **Board C.49**

Miniaturized Quad-band Bandstop Filter with Controllable Frequencies Using Multiple-Mode Resonator

Jing Ai, Yong Hong Zhang, Kai Da Xu, Meng Kui Shen, University of Electronic Science and Technology of China, China; Tian Ye Ma, William Thomas Joines, Duke University, United States

TUP-A1.14P.10 **Board C.50**

On Controlling the Propagation Characteristics of Microstrip Transmission Lines using Embedded Micron-sized Particles and Static H-Fields

Jacob Parrow, Adnan Iftikhar, Sajid Asif, Benjamin Braaten, North Dakota State University, United States; Jeffery Allen, Monica Allen, Brett Wenner, Air Force Research Laboratory, United States

Mitigation of Mutual Coupling

Session Co-Chairs: Ahmed Abdelrahman, University of Colorado Boulder; Ozlem Ozgun, Hacettepe University

TUP-A1.15P.1 **Board C.51**

Wideband Electromagnetic Soft Surfaces with Non-Foster Circuit Loading

Chao Wang, University of Electronic Science and Technology of China, University of California at San Diego, United States; En Li, University of Electronic Science and Technology of China, China; Daniel F. Sievenpiper, University of California, San Diego, United States

TUP-A1.15P.2 **Board C.52**

Isolation Enhancement Between Two Closely Spaced Circular Patches Using DGS

Ali Hammoodi, Ayman Isaac, University of Arkansas at Little Rock, United States; Haider Raad, Xavier University, United States

TUP-A1.15P.3 **Board C.53**

Effect of Axial Rotation on Mutual Coupling between Helical Antennas in a Doppler Radar

Herbert Aumann, Nuri Emanetoglu, University of Maine, United States

TUP-A1.15P.4 **Board C.54**

Isolation Enhancement Between Two Vertical Monopole Antennas Using Two Printed Strips

Ayman Isaac, Molex, United States; Hussain Al-Rizzo, University of Arkansas at Little Rock, United States; Said Abushamleh, University of Nebraska at Kearney, United States; Haider Raad, Xavier University, United States

TUP-A1.15P.5 **Board C.55**

Low-latency 2D non-line-of-sight positioning using single-anchor magnetoquasistatic systems

Darmindra Arumugam, California Institute of Technology, United States

TUP-A1.15P.6 **Board C.56**

The Effect of Antenna Mutual Coupling in a MIMO Radar System

Benjamin Arnold, Michael Jensen, Brigham Young University, United States

TUP-A1.15P.7 **Board C.57**

Comparative Study of Evolutionary Algorithms for Design of Linear Array of Mutually Coupled Parallel Dipole Antennas Including Wide Null Placement

Hemant Patidar, Gautam Kumar Mahanti, National Institute of Technology, India

TUP-A1.15P.8 **Board C.58**

Mutual Coupling Reduction by using tilted Variable Length SRR like structure in UWB MIMO Antennas

Shilpa Kharche, Gopi S Reddy, Jayanta Mukherjee, Indian Institute of Technology Bombay, India; Rajiv Gupta, Terna Engineering College, Nerul, India

TUP-A1.15P.9 **Board C.59**

Mutual Coupling Reduction of Microstrip Patch Antenna Array Using Modified Split Ring Resonator Metamaterial Structures

Kai Yu, Harbin Engineering University, China; Xiaoguang "Leo" Liu, University of California, Davis, United States; Yingsong Li, Harbin Engineering University, China

TUP-A1.15P.10 **Board C.60**

Electrical Compensation for Shape Distortion of Large Phased Array under Combined Loads

Shunxi Lou, Wei Wang, Naigang Hu, Hong Bao, Xidian University, China; Xiangtao Hu, Zhihai Wang, 38th Institute of Chinese Electron in Science and Technology Combine, China

Pattern Reconfigurable Antennas

Session Co-Chairs: Sima Noghanian, University of North Dakota; Payam Nayeri, Colorado School of Mines

TUP-A1.16P.1 **Board C.61**

A Wideband, Pattern Reconfigurable, Compact Yagi

Md Rakibul Islam, Sungkyun Lim, Georgia Southern University, United States

TUP-A1.16P.2 **Board C.62**

Multiple Characteristic Modes Excitation for Pattern Reconfigurable Antennas Design

Francesco Alessio Dicandia, Simone Genovesi, Agostino Monorchio, University of Pisa, Italy

TUP-A1.16P.3 **Board C.63**

Microfluidic Near-Field Beam-Splitting Frequency Selective Surface for Fabry-Perot Cavity Antenna System

Chanjoon Lee, Robert Sainati, Rhonda Franklin, University of Minnesota, United States

TUP-A1.16P.4 **Board C.64**

A Reconfigurable Beam Swhitching Antenna using active Cylindrical FSS structure

Mukendi Leingthone Muamba, Hakem Nadir, Université du Québec en Abitibi-Témiscamingue, Canada

TUP-A1.16P.5 **Board C.65**

Performance Analysis of a switched Beam Square Loop Antenna in a Multipath Environment

Arpan Pal, Amit Mehta, Swansea University, United Kingdom; Dariush Mirshekar-Syahkal, University of Essex, United Kingdom

TUP-A1.16P.6 **Board C.66**

Low-Profile Beam-Steerable Microstrip Antenn with Metamaterial

Wei Zhang, Arpan Pal, Amit Mehta, Swansea University, United Kingdom; Dariush Mirshekar-Syahkal, University of Essex, United Kingdom

TUP-A1.16P.7 **Board C.67**

Design of a Steerable Indoor Repeater Antenna

In Kwang Kim, James Qiu, Michiel Lotter, Nextivity, Inc., United States

TUP-A1.16P.8 **Board C.68**

Two-Layer Three-Beam-Generating Matrix for Broadband Beamforming with Microstrip

Joseph Poujiong Wang, Wei-Ji Chen, Industrial Technology Research Institute (ITRI), Taiwan; Shih-Hsun Hsu, Wha Yu Industrial Co. Ltd, Taiwan

TUP-A1.16P.9 **Board C.69**

A Novel Design of Omnidirectional Pattern Reconfigurable Antenna

Ke Li, Yuhui Ren, Northwest University, China; Yuanming Cai, Xidian University, China

TUP-A1.16P.10 **Board C.70**

Pattern Reconfigurable Patch Antenna with Differential Feeding

Jiajia Guo, Shaoqiu Xiao, University of Electronic Science and Technology of China, China; Shaowei Liao, Quan Xue, City University of Hong Kong, Hong Kong SAR of China

Polarization Reconfigurable Antennas

Session Chair: Christophe Fumeaux, University of Adelaide

TUP-A1.17P.1 **Board C.71**

Segmented Helical Antenna with Reconfigurable Polarization

Shun Yao, Xueli Liu, Stavros V. Georgakopoulos, Florida International University, United States

TUP-A1.17P.2 **Board C.72**

Multi-linear polarization reconfigurable center-fed circular patch antenna with shorting posts

Shu-Lin Chen, Pei-Yuan Qin, Jay Guo, University of Technology Sydney, Australia

TUP-A1.17P.3 **Board C.73**

Switchable Quadri-Polarization Slot Antenna Using a Single Feed Port

Pei-Ling Chi, En Deng, National Chiao Tung University, Taiwan

TUP-A1.17P.4 **Board C.74**

A Polarization Reconfigurable RFID Reader Antenna

Xiao Ding, You-Feng Cheng, Wei Shao, Tu-Lu Liang, Bing-Zhong Wang, University of Electronic Science and Technology of China, China; Dimitris E. Anagnostou, Heriot Watt University, United Kingdom

TUP-A1.17P.5 **Board C.75**

A Novel Polarization Reconfigurable Circularly Polarized Antenna

Panpan Zhang, Yuehui Cui, RongLin Li, South China University of Technology, China

Active, Reconfigurable and Smart Antennas

Session Chair: Phil Buskohl, Air Force Research Laboratory

TUP-A1.8P.1 **Board C.76**

H-plane SIW active horn antenna

Nuria Esparza, Pablo Alcón, Luis Fernando Herrán, Fernando Las-Heras Andres, University of Oviedo, Spain

TUP-A1.8P.2 **Board C.77**

Power Amplifier and Antenna Integration Utilizing Capacitively Coupled Feeding Mechanism

Hengyi Zhou, Arpan Pal, Amit Mehta, Swansea University, United Kingdom; Elango Nagasundaram, Jonathan Lees, Cardiff University, United Kingdom; Dariush Mirshekar-Syahkal, University of Essex, United Kingdom

TUP-A1.8P.3 **Board C.78**

A Non-Foster Matched Dipole for A Low-VHF Mobile Transmitter System

Jihun Choi, University of Michigan, United States; Fikadu Dagefu, Brian Sadler, U.S. Army Research Laboratory, United States; Kamal Sarabandi, University of Michigan, United States

TUP-A1.8P.4 **Board C.79**

Physical Reconfiguration of an Origami-Inspired Deployable Microstrip Patch Antenna Array

Steven Seiler, Giorgio Bazzan, UES, Inc., United States; Kazuko Fuchi, University of Dayton, United States; Edward Alanyak, Andrew Gillman, Air Force Research Laboratory, United States; Gregory Reich, Texas A&M University, United States; Philip Buskohl, Air Force Research Laboratory, United States; Sumanna Pallampati, Deanna Sessions, David Grayson, Gregory Huff, Texas A&M University, United States

TUP-A1.8P.5 **Board C.80**

DRA with Rat-race Hybrid Fed pHEMT Differential LNA for X-band Receiver Front-end Application

Srikanth Sistla, Moitreya Adhikary, Abhishek Sharma, Prasun Chongder, Anirban Sarkar, Animesh Biswas, Mohammad Jaleel Akhtar, Indian Institute of Technology Kanpur, India

Circularly-Polarized Patch Antennas

Session Co-Chairs: Rafael Rodriguez Solis, University of Puerto Rico; David R. Jackson, University of Houston

TUP-A1.9P.1 **Board C.81**

Wideband LHCP Truncated-Circular-Shape Microstrip Antenna for SAR Application

Farohaji Kurniawan, Josaphat Tetuko Sri Sumantyo, Chiba University, Japan; Achmad Munir, Institut Teknologi Bandung, Indonesia

TUP-A1.9P.2 **Board C.82**

Linearly and Circularly Polarized Elements on Sequentially Rotated 2x2 Arrays for 60 GHz BANs

Rubén Delgado-Castillo, Rafael Rodríguez-Solís, University of Puerto Rico at Mayaguez, Puerto Rico

TUP-A1.9P.3 **Board C.83**

Circularly Polarized PIFA Array for Simultaneous Transmit and Receive Applications

Andrew Kee, Mohamed Elmansouri, Dejan Filipovic, University of Colorado Boulder, United States

TUP-A1.9P.4 **Board C.84**

A Dual-Mode Circularly-Polarized Microstrip Antenna

Xinyu Liu, David R. Jackson, Ji Chen, University of Houston, United States

TUP-A1.9P.5 **Board C.85**

Broadband Circularly Polarized Microstrip Antenna for Airborne X Band CP-SAR

Cahya Edi Santosa, Josaphat Tetuko Sri Sumantyo, Chiba University, Japan

TUP-A1.9P.6 **Board C.86**

Design of a V-Band Wideband Circularly Polarized Microstrip Patch Array Element for Applications in Body Area Networks

Rubén Delgado-Castillo, Rafael Rodríguez-Solís, University of Puerto Rico, Mayaguez, Puerto Rico

TUP-A1.9P.7 **Board C.87**

Integrated Two-Beam Antenna Array Featuring Dual-Circular Polarization

Izabela Slomian, Szczepan Odrobina, Slawomir Gruszczynski, Krzysztof Wincza, AGH University of Science and TechnologyAGH, Poland

TUP-A1.9P.8 **Board C.88**

Planar Endfire Circularly Polarized Antenna With Unidirectional Radiation

Mao Ye, Xin-Rong Li, Xidian University, China; Qing-Xin Chu, Xidian University; South China University of Technology, China

TUP-A1.9P.9 **Board C.89**

Circularly Polarized Omnidirectional Microstrip Antenna Array

Kun Wei, Jianying Li, Rui Xu, Guang-Wei Yang, Northwestern Polytechnical University, School of Electronics and Information, China

Measurement of Antenna Performance

Session Co-Chairs: Sembiam Rengarajan, University of California, Northridge; Ronald Pogorzelski, California State University, Northridge

TUP-UA.1P.1 **Board C.91**

On the Back Hemisphere Far Fields of an Aperture Antenna

Ronald J. Pogorzelski, California State University, Northridge, United States

TUP-UA.1P.2 **Board C.92**

The Impact of Higher Order Modes on the Cross Polarization Levels of a Rectangular Patch Antenna

Nafati Aboserwal, Jorge Salazar-Cerreno, Javier Ortiz, José Díaz, Advanced Radar Research Center, United States

TUP-UA.1P.3 **Board C.93**

Antenna Impedance Extraction Technique Based on Far-field Measurement

Zhenchao Yang, Ezdeen Elghannai, Beau Polinske, Starkey Hearing Technologies, United States

TUP-UA.1P.4 **Board C.94**

A Systematic Investigation on Patch Antenna Bending Effects for Wearable Applications

Lingnan Song, Yahya Rahmat-Samii, University of California, Los Angeles, United States

TUP-UA.1P.5 **Board C.95**

A Co-Excited Self-Complementary Bow-Tie and Half-Loop Antenna

Arseni Yalouskikh, Yikun Huang, Yuanxun Ethan Wang, University of California, Los Angeles, United States

TUP-UA.1P.6 **Board C.96**

Locating the Beam Pointing Direction Using a Few Probes

Sembiam Rengarajan, California State University, United States

TUP-UA.1P.7 **Board C.97**

Reflectarray Antennas for Plane Wave Generation in the Near-Field

Payam Nayeri, Colorado School of Mines, United States

TUP-UA.1P.8 **Board C.98**

A Compact, Low-Profile, UWB Simultaneous Transmit and Receive (STAR) Antenna with Monopole-Like Radiation Characteristics

Ruina Lian, Ting-Yen Shih, Nader Behdad, University of Wisconsin-Madison, United States

TUP-UA.1P.9 **Board C.99**

A Low Profile Broadband UHF Canted Turnstile Antenna Phasing Network

Avinash Sharma, Robert Stilwell, Johns Hopkins Applied Physics Laboratory, United States

TUP-UA.1P.10 **Board C.100**

Electrically small antenna by Coupled magnetic resonances

Liang Peng, Pei W Chen, Gao F. Wang, Hangzhou Dianzi University, China

Multi-band Antennas II

Session Co-Chairs: Negar Tavassolian, Stevens Institute of Technology; Sawyer Campbell, The Pennsylvania State University

THP-A1.2P.1 **Board A.1**

Using USB Connector to Generate 5th-Resonant Mode in Loop Antenna

Sing Wai Cheung, Di Wu, Changfei Zhou, Min Li, The University of Hong Kong, Hong Kong SAR of China

THP-A1.2P.2 **Board A.2**

A Compact Dual-Band Flexible CPW-fed Antenna for Wearable Applications

Mohamed El Atrash, Kirolos Bassem, October University for Modern Sciences and Arts, Egypt; Mahmoud A. Abdalla, Military Technical College, Egypt

THP-A1.2P.3 **Board A.3**

A Novel Arrangement of Cross-Shape Loop Antenna for Wider Circular Polarization Band-Width

Mayumi Matsunaga, Ehime University, Japan

THP-A1.2P.4 **Board A.4**

A Single feed Dual-band, Linearly/Circularly Polarized Cross-Slot Millimeter-Wave Antenna for Future 5G Networks

Mehrdad Nosrati, Negar Tavassolian, Stevens Institute of Technology, United States

THP-A1.2P.5 **Board A.5**

Miniaturized Quadruple-Band Ground Radiation Antenna for Mobile Devices

Min-Gi Kim, Longyue Qu, Hongkoo Lee, Jihwan Jeon, Hyunwoong Shin, Hanyang University, Republic of Korea; Hyunghoon Kim, Kwangju Women's University, Republic of Korea; Hyeongdong Kim, Hanyang University, Republic of Korea

THP-A1.2P.6 **Board A.6**

Compact Dual-band Dual-polarized Antenna Enabled by a CSRR Loaded Metasurface

Taiwei Yue, Douglas H. Werner, The Pennsylvania State University, United States

THP-A1.2P.7 **Board A.7**

A Compact Dual-band Dual-mode Metasurface-Enabled Antenna

Taiwei Yue, Douglas H. Werner, The Pennsylvania State University, United States

THP-A1.2P.8 **Board A.8**

Multiband Coplanar Monopole Antenna for Energy Harvesting

Mina Farouk, Ain Shams University, Egypt; Dalia Elsheakh, Hala Elsadek, Microstrip Dept. Electronics Research Institute, Egypt; Hani Ghali, Ain Shams University, Egypt

THP-A1.2P.9 **Board A.9**

Study on 12/21-GHz Dual-circularly Polarized Feed Antenna for Satellite Broadcasting Reception

Masafumi Nagasaka, Susumu Nakazawa, Shoji Tanaka, Japan Broadcasting Corporation, Japan

THP-A1.2P.10 **Board A.10**

A Triple-Band Antenna Based on Bowtie and Meander-Line Structures

Jiaran Qi, Jie Ren, Jinghui Qiu, Harbin Institute of Technology, China

Interactive Forum

Interactive Forum Reception
Thursday, July 13, 16:00 - 18:00 , Grand Hall A/C

Multi-band Antennas III

Session Co-Chairs: Ryan Adams, University of North Carolina at Charlotte; Mahmoud Abdalla, Military Technical College

THP-A1.3P.1 **Board A.11**

Dual-Band Ground Radiation Antenna Using Ground-Mode Tuning Technique for IoT Applications

Longyue Qu, Hyeongdong Kim, Hanyang University, Republic of Korea; Hyunghoon Kim, Kwangju Women's University, Republic of Korea

THP-A1.3P.2 **Board A.12**

A Multiband Ringed Rectangular Patch Antenna

Kathryn Smith, Ryan Adams, University of North Carolina at Charlotte, United States

THP-A1.3P.3 **Board A.13**

VHF/UHF Kapton supported antenna for cubesat applications

Alexandru Takacs, Samuel Charlot, Pierre-Francois Calmon, Daniela Dragomirescu, LAAS-CNRS, France

THP-A1.3P.4 **Board A.14**

Design of Dual-frequency HMSIW Cavity Antenna for Ka Band Application

Soumava Mukherjee, Indian Institute of Technology Jodhpur, India; Animesh Biswas, Indian Institute of Technology Kanpur, India

THP-A1.3P.5 **Board A.15**

A Triple-Band Deep-tissue Implantable Antenna Incorporating Biotelemetry and Unidirectional Wireless Power Transfer System

Rupam Das, Hyoungsuk Yoo, University of Ulsan, Republic of Korea

THP-A1.3P.6 **Board A.16**

Dual-band Omnidirectional/Unidirectional Patch Antenna Based on Multiconductor Transmission Line Theory

Yifeng Qin, Douglas H. Werner, The Pennsylvania State University, United States

THP-A1.3P.7 **Board A.17**

Design of A Compact Triple-Band Planar Double Inverted-F Antenna

Dan Wang, Mei Song Tong, Tongji University, China

THP-A1.3P.8 **Board A.18**

Horizon Nulling Helix Antennas for GPS Timing

Ian McMichael, Erik Lundberg, Drayton Hanna, Steven Best, MITRE Corporation, United States

THP-A1.3P.9 **Board A.19**

Novel Millimeter-Wave Flexible Antenna for RF Energy Harvesting

Muhammad Talha Hafeez, Bahauddin Zakariya University, Pakistan; Syeda Fizzah Jilani, Queen Mary University of London, United Kingdom

THP-A1.3P.10 **Board A.20**

A Surface Plasmon Polariton Inspired Patch Antenna

Dong Wang, Junping Geng, Ronghong Jin, Xianling Liang, Weiren Zhu, Xuan Wang, Chaofan Ren, Department of Electronics Engineering, China; Richard W. Ziolkowski, Global Big Data Technologies Centre, Australia

Remote Sensing and Chipless RFID

Session Co-Chairs: Maokun Li, Tsinghua University; Dean Arakaki, Cal Poly State University

THP-A5.2P.1 **Board A.21**

A Dual-feed Antenna for Passive UHF RFID Tag-based Sensor Applications

Abdulhadi E. Abdulhadi, Zouhair Briqechand, Tayeb A. Denidni, Institut National de la Recherche Scientifique (INRS), Canada; Yassin Belaizi, Arnaud Vena, Brice Sorli, Université de Montpellier, France

THP-A5.2P.2 **Board A.22**

Design of a low-cost wireless reader for an electromagnetic passive temperature sensor

José Juan Martínez-Martínez, Gabriel Galindo-Romera, Francisco Javier Herraiz-Martínez, Universidad Carlos III de Madrid, Spain

THP-A5.2P.3 **Board A.23**

Miniaturized SIW Filter Antenna with Loadable Sensor for Various Microwave Sensing Applications

Moitreya Adhikary, Anirban Sarkar, Abhishek Sharma, Animesh Biswas, Mohammad Jaleel Akhtar, Indian Institute of Technology Kanpur, India

THP-A5.2P.4 **Board A.24**

DESIGN OF A RFID PATCH ANTENNA INTEGRATED WITH MERCURY SWITCHES FOR WIRELESS TILT SENSING

Xianwei Shi, Fan Yang, Shenheng Xu, Maokun Li, Tsinghua University, China

THP-A5.2P.5 **Board A.25**

A Compact Two-bit Metamaterial Inspired Phase Modulated Chipless RFID

Karthik T Chandrasekaran, NTU, Singapore; Muhammad Faeyz Karim, Institute for Infocomm Research, Singapore; Arokiaswami Alphones, NTU, Singapore; Nasimuddin Nasimuddin, L. C. Michael Ong, Institute for Infocomm Research, Singapore

THP-A5.2P.6 **Board A.26**

Ultra-Low Power Reflection Amplifier using Tunnel Diode for RFID applications

Farhad Farzami, Seiran Khaledian, Besma Smida, Danilo Erricolo, University of Illinois at Chicago, United States

THP-A5.2P.7 **Board A.27**

A Depolarizing Chipless RFID Tag with Quasi-Loop Resonators

Han Bao, XiongYing Liu, South China University of Technology, China

THP-A5.2P.8 **Board A.28**

A Compact Dual-Polarized Chipless RFID Tag Using ±45° Polarization Excitation

ZeZhong Wang, XiongYing Liu, School of Electronic and Information Engineering South China University of Technolog, China

THP-A5.2P.9 **Board A.29**

On the Backscattering From RFID Tags Installed on Vehicular Glasses

John J. Pantoja, Angélica Parra, Ernesto Neira, Félix Vega, Departamento de Ingeniería Eléctrica y Electrónica, Facultad de Ingeniería. Universidad Nacional de Colombia., Colombia

THP-A5.2P.10 **Board A.30**

Frequency-Coded Chipless RFID Tag Based on Hybrid Coding Technique

Guo Chun Wan, Quan Gu, Xin Rui Zhang, Mei Song Tong, Tongji University, China

Microstrip Antennas and Printed Devices

Session Co-Chairs: Loic Markley, University of British Columbia; Jacob Adams, North Carolina State University

THP-UB.1P.1 **Board A.31**

Embedded Antenna for Smart Pavement Monitoring System

Shuo Liu, Jennifer T. Bernhard, University of Illinois at Urbana-Champaign, United States

THP-UB.1P.2 **Board A.32**

An X-Band Multiband Patch Antenna for Spectrally Sparse Waveforms

John Doroshewitz, Christopher Oakley, Jeffrey Nanzer, Michigan State University, United States

THP-UB.1P.3 **Board A.33**

Investigations of an Aperture Coupled Circular Polarized Via Walls Backed Microstrip Patch Linear Array Antenna for Beam Steering Performance

Roshin Rose George, Alejandro Castro, Satish Kumar Sharma, San Diego State University, United States

THP-UB.1P.4 **Board A.34**

A Model for Proximity Coupled Patch Antennas in mm-Wave Antenna-in-Package Design

Munirah Boufarsan, Jacob Adams, North Carolina State University, United States

THP-UB.1P.5 **Board A.35**

A Slotting Technique for Probe-Fed Rectangular Patch Antennas Providing Probe Compensation and Reduced Cross Polarization

Patrick Donohoe, Mississippi State University, United States

THP-UB.1P.6 **Board A.36**

Design Approach for Insertion Loss Reduction of Varactor-Based Frequency Agile Microstrip Circuits

Nan-Wei Chen, Yuan Ze University, Taiwan

THP-UB.1P.7 **Board A.37**

Hamiltonian-Path Based Partially Reflected Surfaces for High Gain Circularly Polarized Printed Antennas

Xueqin Zhang, Beijing Institute of Pharmaceutical and Chemical, China; Ahmad Hoorfar, Villanova University, United States

THP-UB.1P.8 **Board A.38**

Microwave multi-beam generation using an anisotropic metasurface

Ioannis Iliopoulos, Mauro Ettorre, Ronan Sauleau, IETR - University of Rennes 1, France; Mounir Teniou, Massimiliano Casaletti, University Pierre and Marie Curie, France; Patrick Potier, Information Superiority, Direction Générale de l'Armement, France; Philippe Pouliguen, Strategy Directorate, Direction Générale de l'Armement, France

THP-UB.1P.9 **Board A.39**

End-fire Microstrip Antenna with Negative Permittivity Substrate

Masoud Ahmadi, Loïc Markley, The University of British Columbia, Okanagan Campus, Canada

THP-UB.1P.10 **Board A.40**

Wideband Nonfoster Microstrip Patch Antenna

Atieh Talebzadeh, Ali Foudazi, Kristen M. Donnell, David Pommerenke, Missouri University of Science and Technology, United States

FDTD Advances

Session Co-Chairs: Mike Potter, University of Calgary; Dan Jiao, Purdue University

THP-A3.1P.1 **Board A.41**

A Spatially-Filtered FDTD Sub-Gridding Scheme for Ground Penetrating Radar Scenarios

Xiao-Kun Wei, University of Electronic Science and Technology of China, China; Xingqi Zhang, University of Toronto, Canada; Nectaria Diamanti, Sensors & Software Inc., Canada; Costas D. Sarris, University of Toronto, Canada

THP-A3.1P.2 **Board A.42**

A Leapfrog Alternating-Direction Hybrid Implicit-Explicit FDTD Method

Arne Van Londersele, Daniël De Zutter, Dries Vande Ginste, Ghent University, Belgium

THP-A3.1P.3 **Board A.43**

Reduced-Order Modeling in FDTD Subgridding with Complexity Independent of the Grid Refinement Ratio

Xinyue Zhang, Piero Triverio, University of Toronto, Canada

THP-A3.1P.4 **Board A.44**

Realizing PEC boundary conditions on Lebedev grid

Mahbod Salmasi, Mike Potter, Michal Okoniewski, University of Calgary, Canada

THP-A3.1P.5 **Board A.45**

A Symmetric Positive Semi-definite 3-D FDTD Subgridding Algorithm for Arbitrary Grid Settings without Compromising Accuracy

Jin Yan, Dan Jiao, Purdue University, United States

THP-A3.1P.6 **Board A.46**

A Dissipation Theory for 3-D FDTD with Application to Stable Subgridding

Fadime Bekmambetova, Piero Triverio, University of Toronto, Canada

THP-A3.1P.7 **Board A.47**

A General Approach to Ensuring the Stability of Unsymmetrical FDTD Subgridding Schemes

Jin Yan, Dan Jiao, Purdue University, United States

THP-A3.1P.8 **Board A.48**

OAM 3D Vector Field Visualization with CFDTD on CUDA GPUs.

Gary Junkin, Universidad Autónoma de Barcelona, Spain; Alan Tennant, The University of Sheffield, United Kingdom

THP-A3.1P.9 **Board A.49**

Numerical Dispersion and Stability Proof of the WLP-FDTD method

Wei-Jun Chen, Qi-Yuan Zhu, Lingnan Normal University, China; Tu-Lu Liang, Li-Ye Xiao, University of Electronic Science and Technology of China, China

THP-A3.1P.10 **Board A.50**

FDTD Simulation of Very Large Domains Applied to Radar Propagation over the Ocean

Brandon Dowd, Rodolfo Diaz, Arizona State University, United States

(Continued)

THP-A3.1P.11 **Board A.51**

Wideband Adjoint Sensitivity of Dispersive Structures using FDTD Method

Mohamed Bakr, McMaster University, Canada; Atef Elsherbeni, Colorado School of Mines, United States; Veysel Demir, Northern Illinois University, United States

THP-A3.1P.12 **Board A.52**

Complex-Envelope LOD-FDTD for Wave Propagation in Dispersive Metallic Gratings

Tu-Lu Liang, Wei Shao, Li-Ye Xiao, University of Electronic Science and Technology of China, China

THP-A3.1P.13 **Board A.53**

3-D Unified FLOD-FDTD Method Incorporated with Lumped Elements

Zaifeng Yang, Eng Leong Tan, Nanyang Technological University, Singapore

THP-A3.1P.14 **Board A.54**

A FDTD Formulation for Dispersive Bi-isotropic Media

Fei Wang, Xidian University, China; Qingsheng Zeng, Shanxi University, China

THP-A3.1P.15 **Board A.55**

Fast Algorithm for Lossless Anisotropic Simulations using the FDTD Method

Fatih Kaburcuk, Erzurum Technical University, Turkey; Atef Elsherbeni, Colorado School of Mines, United States

THP-A3.1P.16 **Board A.56**

Reduced-Order Stochastic Electromagnetic Macro-Models for Uncertainty Characterization of 3-D Band-Gap Structures, in FDTD

Ata Zadehgol, University of Idaho, United States

THP-A3.1P.17 **Board A.57**

SO-DGTD method for dispersive media

Qian Yang, Bing Wei, Linqian Li, Renxian Li, Debiao Ge, Xidian University, China

THP-A3.1P.18 **Board A.58**

CPML Discretization Error Enhancement Using Second Order of Higdon's Annihilation Equation

Amirashkan Darvish, Bijan Gatabi Zakeri, Nafiseh Radkani, Babol Noshirvani University of Technology, Iran; Reza Gholami, University of Manitoba, Canada

Inverse Scattering and Imaging: Methods II

Session Chair: Hiroyuki Arai, Yokohama National University

THP-A4.2P.1 **Board A.59**

Super-resolution Far-field Imaging of Structured Objects Using Superoscillations

Xiao Han Dong, Alex Wong, George Eleftheriades, University of Toronto, Canada

THP-A4.2P.2 **Board A.60**

Decomposition reconstruction of internal source using dual surface electromagnetic field

Yoshiki Sugimoto, Hiroyuki Arai, Yokohama National University, Japan

Inverse Scattering and Imaging: Methods I

Session Co-Chairs: Mahta Moghaddam, University of Southern California; Weng Cho Chew, University of Illinois at Urbana-Champaign

THP-A4.1P.1 **Board A.61**

A Microwave Tomographic Technique to Enhance Real-Imaginary Permittivity Image Quality

Md Asiful Islam, Asimina Kiourti, John L. Volakis, The Ohio State University, United States

THP-A4.1P.2 **Board A.62**

Comparative results for multiple-reflection physical optics (MRPO) and iterative physical optics (IPO)

Michael Richardson, Matthys Botha, Stellenbosch University, South Africa

THP-A4.1P.3 **Board A.63**

On the singular spectrum of the radiation operator in near reactive zone

Raffaele Solimene, Maria Antonia Maisto, Rocco Pierri, Università degli studi della Campania Luigi Vanvitelli, Italy

THP-A4.1P.4 **Board A.64**

SVD-based Clutter Removal Technique for GPR

Maria Garcia-Fernandez, Yuri Alvarez-Lopez, University of Oviedo, Spain; Yolanda Rodriguez-Vaqueiro, Borja Gonzalez-Valdes, University of Vigo, Spain; Ana Arboleya-Arboleya, Fernando Las-Heras Andres, University of Oviedo, Spain; Antonio Pino-Garcia, University of Vigo, Spain

THP-A4.1P.5 **Board A.65**

Microwave Imaging of Dielectric Objects Using a Combination of Simulated Annealing and Multi-Directional Search

Aslan Etminan, Mahta Moghaddam, University of Southern California, United States

THP-A4.1P.6 **Board A.66**

A Microwave Imaging Model for Biomedical Applications

Ozlem Ozgun, Hacettepe University, Turkey; Mustafa Kuzuoglu, Middle East Technical University, Turkey

THP-A4.1P.7 **Board A.67**

Remote Reconstruction of Dielectric Objects Based on the Extrapolation of Limited Observation Data

Chun Xia Yang, Jian Zhang, Yao Lin Qi, Mei Song Tong, Tongji University, China

Multi-band Antennas I

Session Chair: Mohammad Sharawi, King Fahd University of Petroleum and Minerals

THP-A1.1P.1 **Board A.69**

A Dual-Band Dual-Polarization Antenna Using Unequal Crossed Slots on Metallic Cavity

Abhijit Bhattacharya, Rodney G Vaughan, Simon Fraser University, Canada

THP-A1.1P.2 **Board A.70**

A Dual Band Circularly Polarized Square Patch for Indoor Positioning Systems

Stefano Maddio, Giuseppe Pelosi, Monica Righini, Stefano Selleri, Viola Sorrentino, University of Florence, Italy

THP-A1.1P.3 **Board A.71**

Multi-Wideband Corrugated Horn

Kwok Kee Chan, Chan Technologies Inc., Canada

THP-A1.1P.4 **Board A.72**

A Miniaturized Multi-Wideband Quasi-Yagi Antenna with Rectangular Loop Excitation

Syed Shahan Jehangir, Mohammad Said Sharawi, King Fahd University of Petroleum and Minerals, Saudi Arabia; Muhammad Umar Khan, National University of Sciences & Technology, Pakistan

THP-A1.1P.5 **Board A.73**

SRR Loaded Slot Antenna for Multiband Applications

Princy Paul, Krishnamoorthy Kandasamy, NITK, India; Mohammad Said Sharawi, King Fahd University of Petroleum and Minerals, Saudi Arabia

THP-A1.1P.6 **Board A.74**

Design of Multiband Antennas Using Asymmetric E-CRLH TL Unit Cells

Hien Chu Ba, Hiroshi Shirai, Graduate School of Science and Engineering, Chuo University, Japan

THP-A1.1P.7 **Board A.75**

Tri-band Planar Monopole Antenna With Dual Band Circular Polarization

Kwame Oteng Gyasi, Yongjun Huang, Guangjun Wen, Affum Emmanuel Ampoma, Hu Wei, University of Electronic Science and Technology of China, China

THP-A1.1P.8 **Board A.76**

A Triple-Band Planar Monopole Antenna for GPS/LTE/WLAN/Wi-Fi/WiMAX systems

Qian Li, Yanyu Wei, Chong Ding, Luqi Zhang, Fei Wang, Xia Lei, Zhaoyun Duan, Minzhi Huang, Yubin Gong, University of Electronic Science and Technology of China, China; Mingtao Tan, Hunan University of Arts and Science, China

RFID Tag Antenna design

Session Co-Chairs: Andrea Michel, University of Pisa; Alberto Toccafondi, University of Siena

THP-A5.3P.1 **Board A.77**

A Conformal Antenna on a Passive UHF RFID tag using 97% Carbon Content Graphene-Based Conductors and Paper Substrates

Sayeed Sajal, Minot State University, United States; Benjamin Braaten, North Dakota State University, United States

THP-A5.3P.2 **Board A.78**

Experimental Study on UHF RFID Tags Integrated in Medical Bandage and Paper-Based Materials

Hasan Habib, Muhammad Rizwan, Johanna Virkki, Leena Ukkonen, Tampere University of Technology, Finland

THP-A5.3P.3 **Board A.79**

Analysis of Planar RFID Tag Antenna for Metallic Objects by Varying Length of Parasitic Element

Yasumitsu Ban, Manabu Kai, Fujitsu Laboratories Limited, Japan

THP-A5.3P.4 **Board A.80**

UHF RFID Antenna Impedance Matching Techniques

Kamron Sockolov, Maxim Integrated, United States; Dean Arakaki, California Polytechnic State University, United States

THP-A5.3P.5 **Board A.81**

RFID off-body tag antenna for underground environment

Iyadh Gammoudi, Mourad Nedil, Université du Québec en Abitibi-Témiscamingue, Canada; Tayeb A. Denidni, INRS, Canada; Larbi Talbi, UQO, Canada

THP-A5.3P.6 **Board A.82**

Experimental Validation of a Design Criterion for UHF Ungrounded Wearable Antennas for RFID Applications

Paolo Nepa, Andrea Michel, Giuliano Manara, University of Pisa, Italy; Riccardo Colella, Luca Catarinucci, Luciano Tarricone, University of Salento, Italy; Giovanni Andrea Casula, Giuseppe Mazzarella, Giorgio Montisci, University of Cagliari, Italy

THP-A5.3P.7 **Board A.83**

Design of ground radiation antenna for RFID Tag Mountable on Metallic Plane

Chia-Te Liao, Hua-Ming Chen, National Kaohsiung University of Applied Sciences, Taiwan; Chow-Yen-Desmond Sim, Feng Chia University, Taiwan; Yi-Fang Lin, National Kaohsiung University of Applied Sciences, Taiwan

THP-A5.3P.8 **Board A.84**

A Novel Design Method for Metallically and Airily Mountable RFID Tag Antennas

Yun Jing Zhang, Mei Song Tong, Tongji University, China

Antenna for RFID Reader

Session Co-Chairs: Jorge Costa, Instituto Superior de Ciências do Trabalho e da Empresa - Instituto Universitário de Lisboa; George Shaker, University of Waterloo

THP-A5.1P.1 **Board A.86**

An Ellipse-Shaped with Slanted Slot Circularly Polarized Monopole Antenna for UHF RFID Readers

Hsin-Lung Su, National Pingtung University, Taiwan; Sung-Lin Chen, China Steel Corporation, Taiwan; Hong-Sheng Huang, Hong-Sheng Huang, National Pingtung University, Taiwan; Chow-Yen-Desmond Sim, Feng Chia University, Taiwan

THP-A5.1P.2 **Board A.87**

Printed Single-feed Circularly Polarized UHF Reader Antenna for RFID Applications

Pouya Aflaki, George Xiao, National Research Council of Canada, Canada; Aidin Taeb, University of Waterloo, Canada; Tao Ye, Christophe Py, National Research Council of Canada, Canada

THP-A5.1P.3 **Board A.88**

An Octahedron Shaped Planar Antenna for IoT Applications

Kumud Jha, Shri Mata Vaishno Devi University, India; Ghanshyam Mishra, Satish Kumar Sharma, San Diego State Univeristy, United States

THP-A5.1P.4 **Board A.89**

Compact CP Antenna Based on Resonant Quadrifilar Spiral Structure for UHF RFID Handheld Reader

Jian Li, Yongjun Huang, Guangjun Wen, University of Electronic Science and Technology of China, China

THP-A5.1P.5 **Board A.90**

High Gain Linearly Polarized Wideband UHF Antenna based on Substrate Integrated Coaxial Line Feeding Network

Wei Hu, Daniele Inserra, Yongjun Huang, Guangjun Wen, University of Electronic Science and Technology of China, China

THP-A5.1P.6 **Board A.91**

Design of Planar Near-Field RFID Reader Antenna for Liquid Tagging

Chia-Te Liao, National Kaohsiung University of Applied Sciences, Taiwan; Yi-Ying Chen, National Cheng Kung University, Taiwan; Yang-Kai Wang, Advanced Connection Technology Inc, Taiwan; Hua-Ming Chen, National Kaohsiung University of Applied Sciences, Taiwan

THP-A5.1P.7 **Board A.92**

Design of Zero-Phase-Shift-Line (ZPSL) Loop Antennas Using Full Dispersion Characteristics

Yunjia Zeng, Institute for Infocomm Research, Singapore; Zhi Ning Chen, National University of Singapore, Singapore; Xianming Qing, Institute for Infocomm Research, Singapore; Jian-Ming Jin, University of Illinois at Urbana-Champaign, United States

THP-A5.1P.8 **Board A.93**

Wearable-free Wireless Fall Detection System

Fezza Haider, George Shaker, University of Waterloo, Canada

THP-A5.1P.9 **Board A.94**

Miniaturized Microstrip Patch Antenna Using Electromagnetic Band Gap (EBG) structures for Multiport Passive UHF RFID-Tag Applications

Jamal Zaid, Mohammadmahdi Farahani, Arun Kesavan, Tayeb A. Denidni, Institut National de la Recherche Scientifique (INRS), Canada

Inverse Scattering and Imaging: Systems

Session Co-Chairs: Yoshihiko Kuwahara, Shizuoka University; Miguel Navarro-Cia, University of Birmingham

THP-A4.3P.1 **Board A.95**

Alignment Correction for Antenna Scans in Imaging

Okan Yurduseven, Jonah N. Gollub, Daniel L. Marks, David R. Smith, Duke University, United States

THP-A4.3P.2 **Board A.96**

Synthesizing a Frequency-Diverse Aperture for Security-Screening Applications

Okan Yurduseven, Daniel L. Marks, Jonah N. Gollub, David R. Smith, Duke University, United States

THP-A4.3P.3 **Board A.97**

An Analysis of Microwave Imaging using a Combination of Multi-static Radar Imaging and Inverse Scattering Tomography Methods

Yuuki Ono, Yoshihiko Kuwahara, Shizuoka University, Japan

THP-A4.3P.4 **Board A.98**

Experimental Microwave Near-field Detection with Moveable Antennas

Wenyi Shao, Arezou Edalati, Todd McCollough, William McCollough, Ellumen Inc, United States

THP-A4.3P.5 **Board A.99**

Joint DoA and Bandwidth Estimation of Unknown Signals through Single Snapshot Data and MT-BCS Approach

Mohammad Abdul Hannan, Nicola Anselmi, Giacomo Oliveri, Paolo Rocca, University of Trento, Italy

Planar Antennas for Mobile Applications

Session Co-Chairs: Giacomo Oliveri, University of Trento; Jiang Xiong, University of Electronic Science and Technology of China

THP-A1.4P.1 **Board C.1**

Antenna design for ultra-compact Bluetooth devices

Felisberto Pereira, Pedro Pinho, Ricardo Gonçalves, Nuno B. Carvalho, Instituto de Telecomunicações, Portugal; João Lobato, FEUP - Faculdade de Engenharia da Universidade do Porto, Portugal; Sérgio I. Lopes, Instituto Politécnico de Viana do Castelo, Portugal

THP-A1.4P.2 **Board C.2**

Axial Ratio Correction for GNSS Antennas in Asymetrically Coupled Environments

Adam Narbudowicz, Max Ammann, Dublin Institute of Technology, Ireland; Dirk Heberling, RWTH Aachen University, Germany

THP-A1.4P.3 **Board C.3**

A Dual-Polarized Dual-Mode Annular Ring Microstrip Antenna for GPS Interference Suppression

Navid Rezazadeh, Lotfollah Shafai, University of Manitoba, Canada

THP-A1.4P.4 **Board C.4**

Design of Dual-Polarization Antennas for 5G Base Stations

Fabrizio Robol, Giorgio Gottardi, Marco Salucci, Giacomo Oliveri, University of Trento, Italy

THP-A1.4P.5 **Board C.5**

Design of UAV and ground station antennas for communications link budget improvement

Andreia Costa, Ricardo Gonçalves, Instituto de Telecomunicações, Portugal; Pedro Pinho, Instituto Superior de Engenharia de Lisboa, Portugal; Nuno B. Carvalho, Instituto de Telecomunicações, Portugal

THP-A1.4P.6 **Board C.6**

Size Reduction of Metamaterial Antenna using Extra Conducting Layer for Bluetooth, Wi-Fi and WiMAX

Sameer Sharma, Indian Institute of Technology Kanpur, India; Mahmoud A. Abdalla, Military Technical College, Egypt

THP-A1.4P.7 **Board C.7**

Asymmetric CRLH Cells for Compact/Wide Band Triple Band Antenna for Different Wireless Services

Mahmoud A. Abdalla, Military Technical College, Egypt; Sameer Sharma, Indian Institute of Technology Kanpur, India; Zhirun Hu, University of Manchester, United Kingdom

THP-A1.4P.8 **Board C.8**

Investigation and Comparsion of Wearable Bluetooth Antennas on Different Textile Substrates

M. I. Ahmed, Electronics Research Institute, Egypt; M. F. Ahmed, A. A. Shaalan, Zagazig University, Egypt

THP-A1.4P.9 **Board C.9**

A Low-Profile Dual Polarized Antenna With Enhanced Bandwidth for 2.4 GHz WLAN Application

Fa Huang, Jiang Xiong, University of Electronic Science and Technology of China, China

Metamaterial Based mmWave Antennas

Session Chair: Ahmed Kishk, Concordia University

THP-A5.10P.1 **Board C.11**

Millimeter-wave TTD Metamaterial Fresnel lens

Senglee Foo, Huawei Technologists Canada, Canada

THP-A5.10P.2 **Board C.12**

Improving the Gain and Directivity of CPW Antenna by Using a Novel AMC surface

Ghada Elzwawi, Mohamad Mantash, Tayeb A. Denidni, Instituit National de la Recherche Scientifique (INRS), Canada

THP-A5.10P.3 **Board C.13**

An all Textile H-Plane SIW Horn Antenna with Metameterial Absorber for Millimeter-wave WBAN Applications

Seongkyu Lee, Jaehoon Choi, Hanyang University, Republic of Korea

THP-A5.10P.4 **Board C.14**

A highly-efficient flat graded-index dielectric lens for millimeter-wave application

Yuchu He, George Eleftheriades, University of Toronto, Canada

THP-A5.10P.5 **Board C.15**

Mutual Coupling Reduction in Orthogonally Fed Aperture-Coupled Patch Antennas via an Integrated Metasurface

Ali Foudazi, Kristen M. Donnell, Missouri University of Science and Technology, United States

THP-A5.10P.6 **Board C.16**

Wideband Single-layer Fabry-Pérot Cavity Antenna with a Radial Variation of the Cavity Permittivity

Alister Hosseini, Ahmad Almutawa, Filippo Capolino, University of California, Irvine, United States; David R. Jackson, The University of Houston, United States

THP-A5.10P.7 **Board C.17**

A Reactive Impedance Surface for Enhancing Antenna Isolation on Cylindrical Platforms

Bradley Allen, Nathan Jastram, Dejan Filipovic, University of Colorado Boulder, United States

THP-A5.10P.8 **Board C.18**

Passive Approaches for Improvement of TX to RX Antenna Isolation in Millimeter Wave Repeaters

Sara Manafi, Muhannad Al-Tarifi, Dejan Filipovic, University of Colorado Boulder, United States

THP-A5.10P.9 **Board C.19**

SIGW Dual Level H-plane Horn Antenna for Millimeter Waves

Nima Bayat-Makou, Ahmed A. Kishk, Concordia University, Canada

THP-A5.10P.10 **Board C.20**

Diplexer Integration Into a Ka-Band High-Gain Gap Waveguide Corporate-Fed Slot Array Antenna

Abbas Vosoogh, Chalmers University, Sweden; Milad Sharifi Sorkherizi, Concordia University, Canada; Ashraf Uz Zaman, Jian Yang, Chalmers University, Sweden; Ahmed A. Kishk, Concordia University, Canada

mmWave and Subwavelength Antennas

Session Co-Chairs: Nader Behdad, University of Wisconsin-Madison; kirill klionovski, King Abdullah University of Science andTechnology (KAUST)

THP-A5.11P.1 **Board C.21**

Low Frequency Surface Plasmon Waves Guided on Metal Structured Surface with Periodic Subwavelength Rectangular Grooves Partially Loaded with an Optically Plasma Induced Semiconductor

Kazuo Nishimura, Ryukoku University, Japan

THP-A5.11P.2 **Board C.22**

Back Radiation Suppression through a Semi-Transparent Round Ground Plane for a mm-Wave Monopole Antenna

Kirill Klionovski, Muhammad Fahad Farooqui, Atif Shamim, King Abdullah University of Science and Technology, Saudi Arabia

THP-A5.11P.3 **Board C.23**

Design of Photoconductive Antenna Using Spatially Dispersive Graphene Strips

Ramin Emadi, Reza Safian, Abolghasem Zeidaabadi Nezhad, Isfahan University of Technology, Iran; Navid Barani, University of Michigan, United States

THP-A5.11P.4 **Board C.24**

Pharaonic Ankh-Key Millimeter Wave Broadband Antenna Design and Fabrication for 5G Applications

Noha Rashad, October University for Modern Sciences and Arts, Egypt; Wael Swelam, Mohamed Hassan Abd El Azeem, Arab Academy for Science, Technology & Maritime Transport, Egypt

Wideband Antennas for High Frequency Communications

Session Co-Chairs: Mohammod Ali, University of South Carolina; Deb Chatterjee, University of Missouri, Kansas city

THP-A5.12P.1 **Board C.26**

Center-fed Traveling-wave Microstrip Array Antenna Using Elliptically-shaped Radiating Elements in Quasi millimeter-wave Band

Kunio Sakakibara, Kazumasa Shida, Yuta Mouri, Nobuyoshi Kikuma, Nagoya Institute of Technology, Japan

THP-A5.12P.2 **Board C.27**

Ultra-Broadband V-band Fractal T-Square Antenna

Ousama Abu Safia, University of Quebec, Canada; Mourad Nedil, Université du Québec en Abitibi-Témiscamingue, Canada

THP-A5.12P.3 **Board C.28**

16x8 Wideband Microstrip Planar Array Antenna for E-Band Millimeter-Wave 5G High Speed WLAN and Broadband Internet Applications

Ahmed Hassanien, Misr University for Science and Technology, Egypt; Wael Swelam, Mohamed Hassan Abd El Azeem, Arab Academy for Science, Technology & Maritime Transport, Egypt

THP-A5.12P.4 **Board C.29**

Improved Design of Balanced Antipodal Vivaldi for MMW Applications

Nannan Wang, Mu Fang, Jinghui Qiu, Liyi Xiao, Harbin Institute of Technology, China

THP-A5.12P.5 **Board C.30**

A 28 GHz Beam-Switching Yagi-Uda Array Using Rotman Lens for 5G Wireless Communications

Mohammadreza Ranjbar Naeini, Mohammad Fakharzadeh, Sharif University of Technology, Iran

60 GHz Radars and Communications

Session Co-Chairs: Yoshihiko Kuwahara, Shizuoka University; Emilio Arnieri, University of Calabria

THP-A5.5P.1 **Board C.36**

A Frequency-Scanning Substrate-Integrated-Waveguide Meanderline Antenna for Radar Applications at 60 GHz

Marcus Walden, Plextek, United Kingdom

THP-A5.5P.2 **Board C.37**

Low-Cost 60 GHz 3D Printed Lens Fed by a Planar Source with WR15 Transition integrated on FR4 PCB

Nour Nachabe, Cyril Luxey, Diane Titz, University Nice-Sophia Antipolis, France; Jorge R. Costa, Sérgio A. Matos, Instituto Universitário de Lisboa (ISCTE-IUL), Portugal; Frédéric Gianesello, STMicroelectronics, France; Carlos A. Fernandes, Universidade de Lisboa, Portugal

THP-A5.5P.3 **Board C.38**

60 GHz, 8 Elements Linear Antenna Array Loaded by Electric and Magnetic Resonators

Abdolmehdi Dadgarpour, Ahmed A. Kishk, Milad Sharifi Sorkherizi, Concordia University, Canada; Tayeb A. Denidni, Institut National de la Recherche Scientifique (INRS), Canada; Abdel Razik Sebak, Concordia University, Canada

THP-A5.5P.4 **Board C.39**

Stacked Shorted Circular Patch Antenna in SIW technology for 60-GHz Band Arrays

Emilio Arnieri, Giandomenico Amendola, Luigi Boccia, University of Calabria, Italy

THP-A5.5P.5 **Board C.40**

V-Band Circularly Polarized Wire-Bond Antenna Design

Ta-Yeh Lin, Tsenchieh Chiu, National Central University, Taiwan; Chaoping Hsieh, Da-Chiang Chang, Chip Implementation Center, Taiwan

3D Printed Antennas and Structures

Session Co-Chairs: Jorge Costa, Instituto Superior de Ciências do Trabalho e da Empresa - Instituto Universitário de Lisboa; Vesna Radisic, Northrop Grumman Corporation

THP-A5.4P.1 **Board C.41**

3D Printed Membrane Microstrip Patch Antenna

Lee Harle, John Papapolymerou, Michigan State University, United States

THP-A5.4P.2 **Board C.42**

A Novel 3D-Printing-Enabled "Roller Coaster" Transmission Line

Jimmy G.D. Hester, Evan Nguyen, Jesse Tice, Vesna Radisic, Northrop Grumman Corporation, United States

THP-A5.4P.3 **Board C.43**

A Fractal Tetrahedron Antenna Fabricated using Metal 3D printing

Sung Yun Jun, Benito Sanz-Izquierdo, Ted Parker, University of Kent, United Kingdom; Juan Franco, Eichenberger Futuretech A.g.,, Switzerland

THP-A5.4P.4 **Board C.44**

Transmit Array as a Viable 3D Printing Option for Backhaul Applications at V-band

Jorge P. Teixeira, Instituto de Telecomunicações, Instituto Universitário de Lisboa, (ISCTE-IUL),, Portugal; Sérgio A. Matos, Jorge R. Costa, Instituto de Telecomunicações, Instituto Universitário de Lisboa, (ISCTE-IUL), Portugal; Carlos A. Fernandes, Instituto de Telecomunicações, Universidade de Lisboa, Portugal; Nour Nachabe, Cyril Luxey, Diane Titz, EpOC, Université Nice-Sophia, France; Frédéric Gianesello, STMicroelectronics, France

THP-A5.4P.5 **Board C.45**

Characterization of Variable Density 3D Printed Materials for Broadband GRIN Lenses

Karina Hoel, Stein Kristoffersen, FFI, Norway

THP-A5.4P.6 **Board C.46**

Fused Deposition Modelling of Composite Meta-Atom 3D Structures

J(Yiannis) Vardaxoglou, Shiyu Zhang, William Whittow, Darren Cadman, Loughborough University, United Kingdom

THP-A5.4P.7 **Board C.47**

An X-Band Lightweight 3-D Printed Slotted Circular Waveguide Dual-Mode Bandpass Filter

Cheng Guo, University of Birmingham, United Kingdom; Jin Li, Jun Xu, University of Electronic Science and Technology of China, China; Hongjun Li, The 13th Research Institute of China Electronics Technology Group Corporation, China

THP-A5.4P.8 **Board C.48**

Lightweight Low-Cost Ka-Band 3-D Printed Slotted Rectangular Waveguide Bandpass Filters

Jin Li, Cheng Guo, University of Electronic Science and Technology of China, China; Lijian Mao, Shanghai Reeyun Electronics Co., Ltd., China; Jun Xu, University of Electronic Science and Technology of China, China

Additively Manufactured Antennas

Session Co-Chairs: Pedram Mousavi, University of Alberta; Sima Noghanian, University of North Dakota

THP-A5.6P.1 **Board C.51**

A Novel Investigation on Printed Stretchable WLAN Antennas

Hossein Saghlatoon, Mohammad Mahdi Honari, Rashid Mirzavand, Pedram Mousavi, Amit Kumar, Thang Giang La, Hyun-Joong Chung, University of Alberta, Canada

THP-A5.6P.2 **Board C.52**

Additively Manufactured Profiled Conical Horn Antenna with Dielectric Loading

Shiyu Zhang, Darren Cadman, William Whittow, J(Yiannis) Vardaxoglou, Loughborough University, United Kingdom

THP-A5.6P.3 **Board C.53**

Additive Manufactured Tripolar Antenna System for Link Improvement in High Multipath Environments

Ramiro Ramirez, University of South Florida, United States; Marcia Golmohamadi, University of Vermont, United States; Denise Lugo, University of South Florida, United States; Jeff Frolik, University of Vermont, United States; Thomas Weller, University of South Florida, United States

THP-A5.6P.4 **Board C.54**

A Miniaturized 3D Printed Quadrifilar Helix Antenna with a Conical Ground Plane

Michel Chahoud, Youssef Tawk, Notre Dame University, Lebanon; Joseph Costantine, American University of Beirut, Lebanon; Christos Christodoulou, University of New Mexico, United States

THP-A5.6P.5 **Board C.55**

Inkjet Printed Dual-Band Origami Frog Antenna

Sung Yun Jun, Anshuman Shastri, Benito Sanz-Izquierdo, University of Kent, United Kingdom; Alan McClelland, The Centre for Process Innovation, United Kingdom

THP-A5.6P.6 **Board C.56**

3D Printed Antenna Using Biocompatible Dielectric Material and Graphene

Milad Mirzaee, Sima Noghanian, University of North Dakota, United States

THP-A5.6P.7 **Board C.57**

Analysis of Structural Effects on Conformal Antenna Performance

David Zeppettella, U.S. Air Force Research Laboratory, United States; Mohammod Ali, University of South Carolina, United States

THP-A5.6P.8 **Board C.58**

A 3D Printed Low Profile Magnetic Dipole Antenna

Myeongjun Kong, Ick-Jae Yoon, Chungnam National University, Republic of Korea

THP-A5.6P.9 **Board C.59**

Experimental Verification of Ground-Plane Cloak Composed of Random Pattern Unit-Cell Fabricated by 3D Printer

Hyunsoo Lee, Il-Suek Koh, Inha University, Republic of Korea; Yongjune Kim, National University of Singapore, Singapore; Yongshik Lee, Yonsei University, Republic of Korea; Ilsung Seo, Agency for Defence Development, Republic of Korea

THP-A5.6P.10 **Board C.60**

OLED-embedded Antennas for 2.4 GHz Wi-Fi and Bluetooth Applications

Wonbin Hong, Pohang University of Science and Technology (POSTECH), Republic of Korea; Sangho Lim, Agency for Defense Development, Republic of Korea; Seungtae Ko, Yoongeon Kim, Samsung Electronics, Republic of Korea

Antennas for THz and 5G Communications

Session Co-Chairs: John Volakis, Ohio State University; Stavros Koulouridis, University of Patras

THP-A5.7P.1 **Board C.61**

Circularly-Polarized Horn Antennas for Terahertz Communication using Differential-Mode Dispersion in Hexagonal Waveguides

Shubhendu Bhardwaj, John L. Volakis, The Ohio State University, United States

THP-A5.7P.2 **Board C.62**

A 28 GHz Compact Vertically-Polarized Dipole for 5G Smartphone Edge

Waleed El-Halwagy, University of Alberta, Canada; Jordan Mezler, TELUS Communications, Canada; Masum Hossain, Pedram Mousavi, University of Alberta, Canada

THP-A5.7P.3 **Board C.63**

A Low profile, Wideband and High Gain Beam-steering Antenna for 5G Mobile Communication

Muhammad Kamran Khattak, Sungtek Kahng, Muhammad Salman Khattak, Abdul Rehman, Changhyeong Lee, Dajung Han, Incheon National University, Republic of Korea

THP-A5.7P.4 **Board C.64**

Millimeter-wave MIMO Antennas with Polarization and Pattern Diversity for 5G Mobile Communications

He-Sheng Lin, Yi-Cheng Lin, National Taiwan University, Taiwan

THP-A5.7P.5 **Board C.65**

Vertically Stacked Folded Dipole Antenna using Multi-Layer for mm-Wave Mobile Terminals

In-June Hwang, Hye-Won Jo, Jin-Woo Kim, Ghoo Kim, Jong-Won Yu, Korea Advanced Institute of Science and Technology (KAIST), Republic of Korea; Won-Woo Lee, LG Electronics, Republic of Korea

THP-A5.7P.6 **Board C.66**

Dual-band Planar Spiral Monopole Antenna for 28-38 GHz Frequency Bands

Hidayat Ullah, Farooq Ahmad Tahir, Muhammad Umar Khan, National University of Sciences & Technology, Pakistan

THP-A5.7P.7 **Board C.67**

A Fractal Dual-Band Polarization Diversity Antenna for 5G Applications

Syed S. Haider, Muhammad R. Wali, Farooq Ahmad Tahir, Muhammad Umar Khan, National University of Sciences & Technology, Pakistan

THP-A5.7P.8 **Board C.68**

A Compact Broadband Circularly Polarized WSS Antenna for Future 5G Communication Systems

Muhammad R. Wali, Syed S. Haider, Farooq Ahmad Tahir, Muhammad Umar Khan, National University of Sciences & Technology, Pakistan

Antennas, Applications and Relevant Issues

Session Chair: Khair Shamaileh, Purdue University Northwest

THP-A5.8P.1 **Board C.71**

A Systematic Software-based Radar System Simulation Method

Huan Lei Chen, Mei Song Tong, Libo Huang, Tongji University, China

THP-A5.8P.2 **Board C.72**

A Simulation Model of Correlated Shadow Fading in Ultra Dense Networks

Lifei Zhang, Gang Zhu, Siyu Lin, Beijing Jiaotong University, China

THP-A5.8P.3 **Board C.73**

A Compact Circularly Polarized Antenna for In-Body Wireless Communications

JiMing Li, TianHai Chang, XiongYing Liu, South China University of Technology, China

THP-A5.8P.4 **Board C.74**

Design of a Filtering Rectifier for Characterizing Dielectric Properties of An Aqueous Solution

Wanli Chen, Xiaosheng Guo, Yifan Chen, Qingfeng Zhang, Louis WY Liu, Southern University of Science and Technology, China

THP-A5.8P.5 **Board C.75**

Impedance-Ground Modulated Coplanar Waveguide Matching Transformers with Applications to Miniaturized Wilkinson Power Dividers

Khair Al Shamaileh, Purdue University Northwest, United States; Nihad Dib, Jordan University of Science and Technology, Jordan

THP-A5.8P.6 **Board C.76**

Modeling and Dielectric Characterization of EMI/EMC Ground Test for the Evaluation of the Electric Propulsion Thruster Emissions

Matteo Albani, Federico Puggelli, Alberto Toccafondi, University of Siena, Italy; Gianfranco Meniconi, Fabrizio Scortecci, Aerospazio Tecnologie srl, Italy

THP-A5.8P.7 **Board C.77**

Practical Analysis of Wireless Signals Propagation in Single- and Multi-Panel Glass-Windows

Irfan Sohail Syed, IQRA University, Pakistan

THP-A5.8P.8 **Board C.78**

A low-cost mechanical beam scanning waveguide slot antenna array

Xiaochuan Fang, Yongjun Huang, Guangjun Wen, University of Electronic Science and Technology of China, China

THP-A5.8P.9 **Board C.79**

Small-Reflected Substrate Integrated Waveguide Termination with Multi-Step Shape and Absorbing Material

Yong Mao Huang, University of Electronic Science and Technology of China, China; Tengxing Wang, University of South Carolina, United States; Haiyan Jin, Yuanhua Sun, Supeng Leng, University of Electronic Science and Technology of China, China; Guoan Wang, University of South Carolina, United States

THP-A5.8P.10 **Board C.80**

Measuring Potential EMI Fields from Electrostatic Sources

Galba Falcão Aragão, Instituto Federal de Educação, Ciência e Tecnologia do Rio Grande do Norte, Brazil; Glauco Fontgalland, Federal University of Campina Grande, Brazil; Humberto Dionisio de Andrade, Universidade Federal Rural do Semi-Árido, Brazil

Arrays for mmWave Applications

Session Co-Chairs: Satish Sharma, San Diego State Univeristy; Joseph Costantine, American University of Beirut

THP-A5.9P.1 **Board C.81**

2-D Cross Slotted W-Band Waveguides Array

Firas Ayoub, Youssef Tawk, Joseph Costantine, Christos Christodoulou, Configurable Space Microsystems Innovations & Applications Center (COSMIAC), United States; Emil Ardelean, Steven Lane, Space Vehicles Directorate, United States

THP-A5.9P.2 **Board C.82**

W-Band Circular Polarized Series Fed Single Plane Beamsteering Array Antenna with 4-Bit Phase Shifter for CubeSat Applications

Ghanshyam Mishra, Satish Kumar Sharma, San Diego State University, United States; Jia-Chi S. Chieh, Jason Rowland, SPAWAR Systems Center Pacific, United States

THP-A5.9P.3 **Board C.83**

A Wide Axial Ratio Beamwidth Circularly Polarized Antenna for Ka-Band Satellite On The Move (SOTM) Phased Array Applications

Hussam Al-Saedi, Wael Abdel-Wahab, S. Mohsen Raeis-Zadeh, Suren Gigoyan, Safieddin Safavi-Naeini, University of Waterloo, Canada

THP-A5.9P.4 **Board C.84**

Wideband End-fire Phased Array for WiGig Applications

Armaghan Eshaghi, Mihai Tazlauanu, Marc Supinski, Peraso Technologies Inc., Canada

THP-A5.9P.5 **Board C.85**

Printed Circularly Polarized Open Loop Antenna Array for Millimeter-Wave Applications

Qian Zhu, Kung Bo Ng, Chi Hou Chan, City University of Hong Kong, Hong Kong SAR of China

THP-A5.9P.6 **Board C.86**

A Broadband Microstrip Array Antenna with Rectangular Waveguide Mode Transition at Millimeter-wave Band

Ryohei Hosono, Yusuke Uemichi, Xu Han, Yusuke Nakatani, Kiyoshi Kobayashi, Ning Guan, Fujikura, Ltd., Japan

THP-A5.9P.7 **Board C.87**

Two-Dimensional Multi-beam End-Fire Antenna Array of Magneto-Electric Dipoles with Horizontal Polarization

Jingxue Wang, Yujian Li, Junhong Wang, Beijing Jiaotong University, China

THP-A5.9P.8 **Board C.88**

A Broadband Patch Antenna Array for Q-band Applications

Jia-Tian Weng, Qing-Xin Chu, South China University of Technology, China

THP-A5.9P.9 **Board C.89**

A Dual-Polarized SIW Cavity Backed Slot Antenna

Wenxun Li, University of Electronic Science and Technology of China, China; Kai Da Xu, Xiamen University, China; Xiaohong Tang, University of Electronic Science and Technology of China, China; Yanhui Liu, Xiamen University, China

Antenna Fabrication Techniques

Session Co-Chairs: Steven Weiss, US Army Research Laboratory; Paola Pirinoli, Politecnico di Torino

THP-UA.1P.1 **Board C.91**

New unit-cell elements for Perforated Dielectric Transmitarray

Andrea Massaccesi, Paola Pirinoli, Politecnico di Torino, Italy

THP-UA.1P.2 **Board C.92**

5G Vertical and Horizontal Polarized Antenna Integrated with a Metallic Frame of the Cellular Phone

Hyunjin Kim, Junsig Kum, Youngju Lee, Jungyub Lee, Taesik Yang, Samsung Electronics, Republic of Korea; Sangwook Nam, Seoul National University, Republic of Korea

THP-UA.1P.3 **Board C.93**

Design and fabrication of a light weight Luneburg Lens operating at X-band

Min Liang, Hao Xin, University of Arizona, United States

THP-UA.1P.4 **Board C.94**

Simulations and Measurement of Lateral Waves on a Grounded Magneto-Dielectric Slab

Steven Weiss, U.S. Army Research Laboratory, United States

THP-UA.1P.5 **Board C.95**

Quantum Antenna Theory

Said Mikki, University of New Haven, United States

THP-UA.1P.6 **Board C.96**

Multi-functional Humanoid Structure Art Antenna Series

Jiahe Mei, Xiaochao Jiang, Tao Jiang, Harbin Engineering University, China

THP-UA.1P.7 **Board C.97**

A Dual Band MIMO PIFA for WLAN Application

Sonika Biswal, Sushrut Das, Indian Institute of Technology (Indian School of Mines), Dhanbad, India

THP-UA.1P.8 **Board C.98**

A 2.45 GHz DGS Based Harmonic Rejection Antenna For Rectenna Application

Udaybhaskar Pattapu, Sonika Biswal, Sushrut Das, Indian Institute of Technology (ISM) Dhanbad, India

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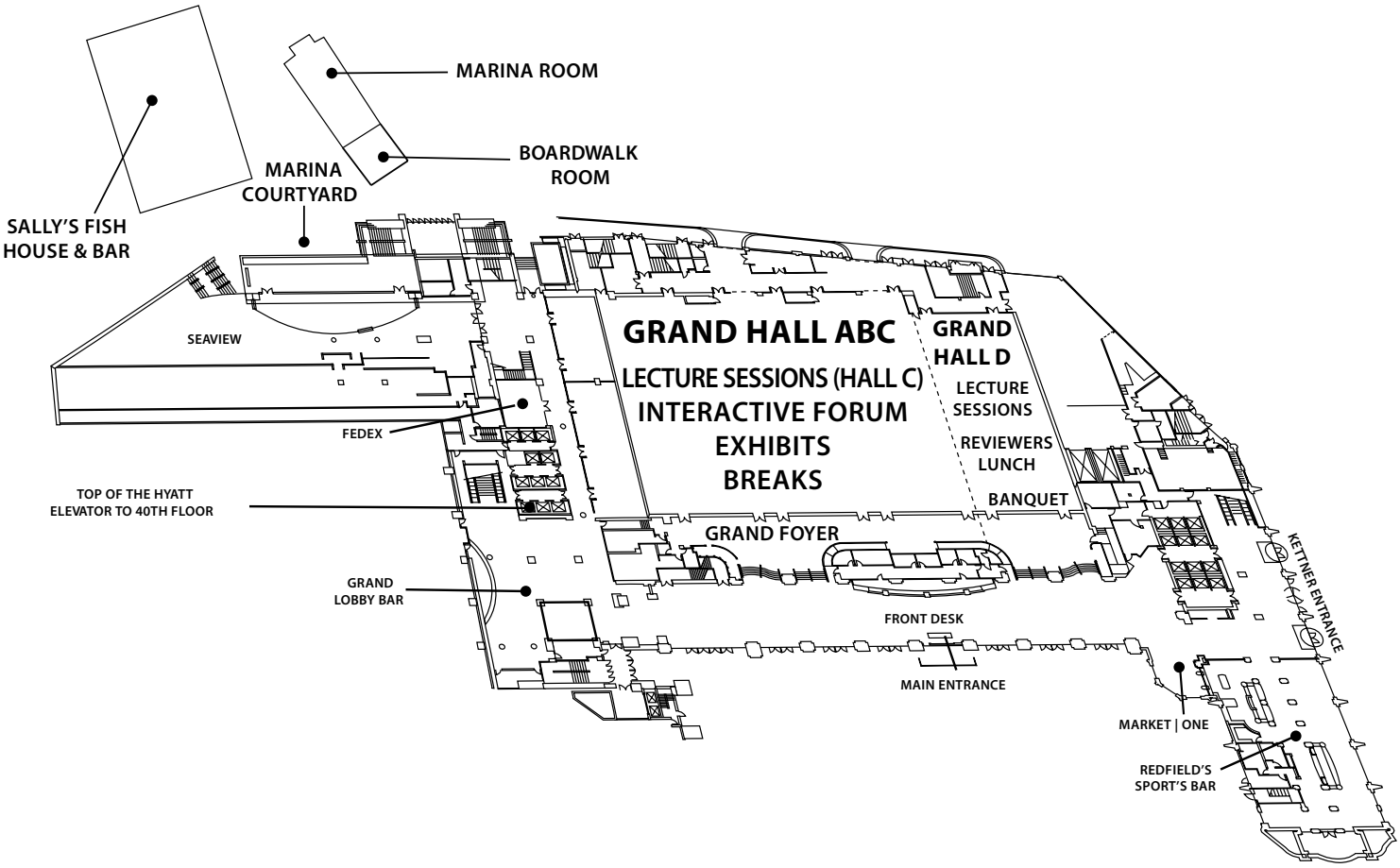
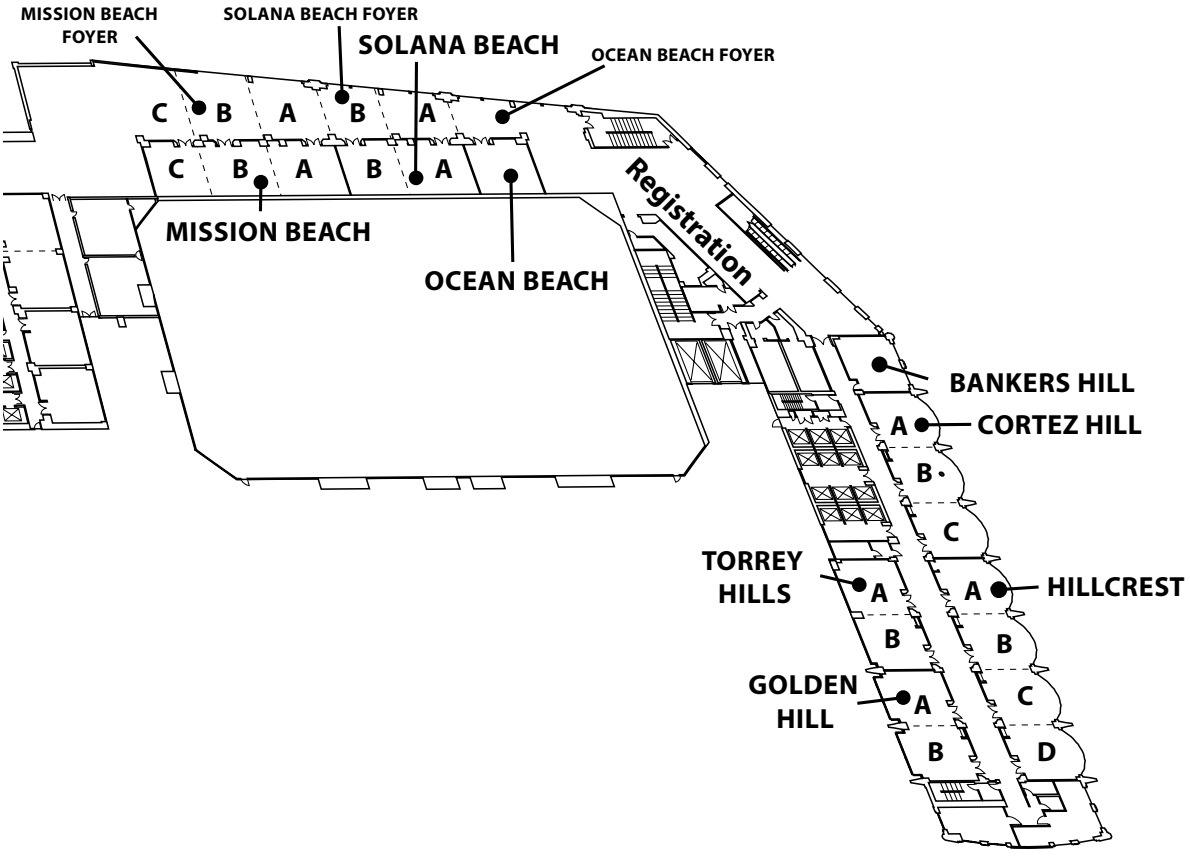
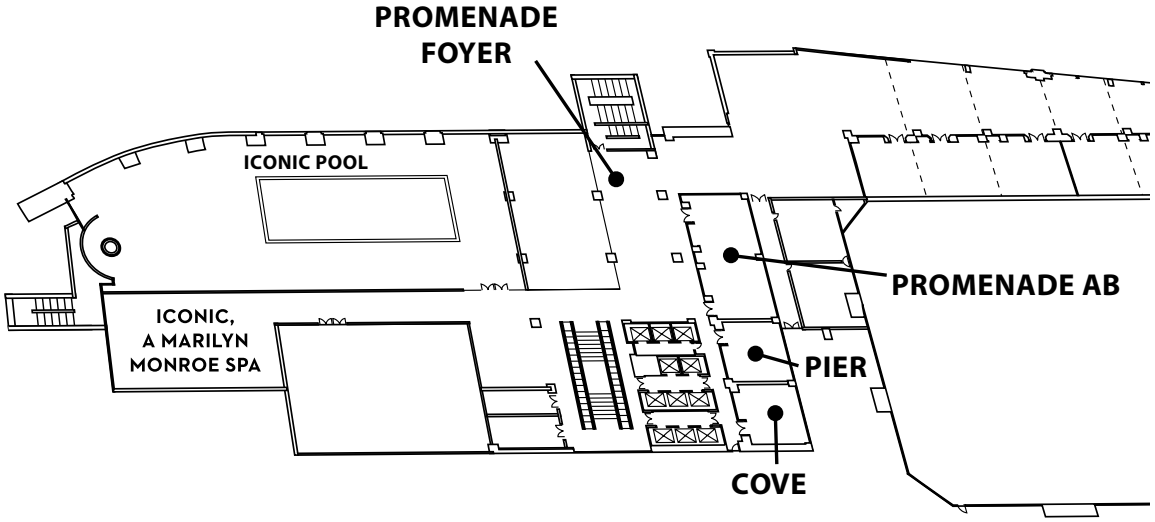
Map: Manchester Grand Hyatt — Lobby Level



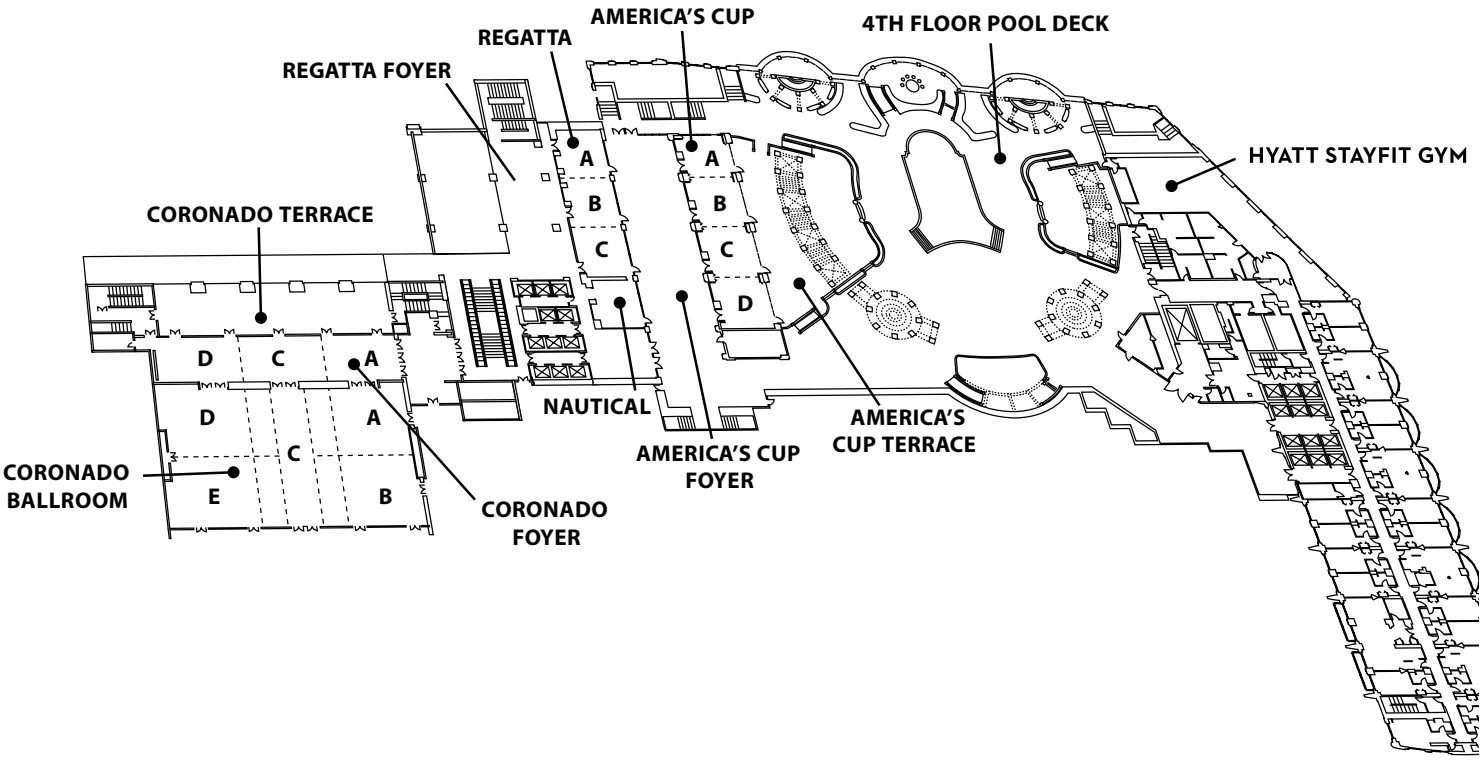
Map: Manchester Grand Hyatt — Seaport Tower, Level 3



Map: Manchester Grand Hyatt — Harbor Tower, Level 3



Map: Manchester Grand Hyatt — Level 4



Map: Grand Hall ABC — Poster and Exhibit Detail