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A. B. Yakovlev<sup>1</sup>, M. G. Silveirinha<sup>2</sup>, S. I. Maslovski<sup>2</sup>, C. S. R. Kaipa<sup>1</sup>, P. A. Belov<sup>3,4</sup>, G. W. Hanson<sup>5</sup>, O. Luukkonen<sup>6</sup>, I. S. Nefedov<sup>7</sup>, C. R. Simovski<sup>7</sup>, S. A. Tretyakov<sup>7</sup>, Y. R. Padooru<sup>1</sup>  
<sup>1</sup>*University of Mississippi, United States*; <sup>2</sup>*University de Coimbra, Instituto de Telecomunicacoes, Portugal*; <sup>3</sup>*National Research University of Information Technologies, Mechanics and Optics, Russia*; <sup>4</sup>*Queen Mary University of London, UK*; <sup>5</sup>*University of Wisconsin-Milwaukee, United States*; <sup>6</sup>*Nokia Research Center, Finland*; <sup>7</sup>*Aalto University, Finland*

**IF13.11 Magnetoinductive Waves in 2D Periodic Arrays of Split Ring Resonators** \*\*\*\*\* -

S. Campione<sup>1</sup>, F. Mesa<sup>2</sup>, E. Capolino<sup>1</sup>  
<sup>1</sup>*University of California Irvine, United States*; <sup>2</sup>*University of Seville, Spain*

**IF13.12 Light-Controllable Magnetic Metamaterials Based on Loaded Split-Ring Resonators** \*\*\*\*\*%

P. Kapitanova<sup>1</sup>, S. Maslovski<sup>2</sup>, I. Shadrivov<sup>3</sup>, P. Voroshilov<sup>1</sup>, D. Filonov<sup>1</sup>, P. Belov<sup>1,4</sup>, Y. Kivshar<sup>1,3</sup>  
<sup>1</sup>*National Research University of Information Technologies, Mechanics and Optics, Russian Federation*; <sup>2</sup>*Instituto de Telecomunicacoes, Universidade de Coimbra, Portugal*; <sup>3</sup>*Nonlinear Physics Centre, Research School of Physics and Engineering, Australian National University, Australia*; <sup>4</sup>*Queen Mary University of London, UK*

### IF14. Metamaterials and Metastructures

Session Chairs: Nader Engheta, Silvio Hrabar

**IF14.1 Metamaterial-Based Slow Wave Structures for Travelling Wave Tubes** \*\*\*\*B#5

N. Apaydin, K. Sertel, J. L. Volakis, *The Ohio State University, ElectroScience Laboratory, United States*

**IF14.2 Microwave Surface Plasmon Effect Realized by Uniaxial Wire Medium** \*\*\*\*B#5

L.-Y. Ou-Yang, S.-Y. Chen, *National Taiwan University, Taiwan*

**IF14.3 Dielectric-Backed Subwavelength Hole Arrays for Terahertz Polarization Conversion** \*\*\*\*B#5

P. Rodriguez-Ullibarrri, V. J. Torres, M. Beruete, *Universidad Pública de Navarra, Spain*; M. Navarro, *Imperial College London, UK*

**IF14.4 Epsilon-near-Zero Waveguides for Graded Index Lenses at Terahertz Frequencies** \*\*\*\*B#5

V. J. Torres<sup>1,2</sup>, M. Navarro-Cia<sup>3</sup>, M. Beruete<sup>1</sup>, M. Sorolla<sup>1</sup>, N. Engheta<sup>2</sup>  
<sup>1</sup>*Universidad Pública de Navarra, Spain*; <sup>2</sup>*University of Pennsylvania, USA*; <sup>3</sup>*Imperial College London, UK*

**IF14.5 Focusing of Ultra-Broadband Radiation in Subwavelength Slits at the 'Plasmonic Brewster Angle'** \*\*\*\*B#5

A. Alu<sup>1</sup>, C. Argyropoulos<sup>1</sup>, G. D'Aguanno<sup>2,3</sup>, N. Mattiucci<sup>2,3</sup>, N. Akozbek<sup>2,3</sup>, M. Bloemer<sup>3</sup>  
<sup>1</sup>*The University of Texas at Austin, United States*; <sup>2</sup>*AEgis Tech., United States*; <sup>3</sup>*Dept. of the Army, United States*

**IF14.6 Overcoming the Bandwidth Limitations of Optical Nanoparticles and Metamaterials Using Nonlinearities** \*\*\*\*B#5

C. Argyropoulos, A. Alu, *University of Texas at Austin, United States*

**IF14.7 Eigen-Modal Propagation in 3-D Magnetodielectric Particle Arrays and Metamaterials at Oblique Incidence** \*\*\*\*B#5

A. N. Askarpour, *University of Tehran, Iran*; X.-X. Liu, A. Alu, *The University of Texas at Austin, United States*

**IF14.8 Modeling the Optical Performance of an Array of Plasmonic Nanorods Illuminated by an Obliquely Incident Plane Wave by Using the Characteristic Basis Function Method** \*\*\*\*B#5

A. Rashidi, H. Mosallaei, *Northeastern Univ., United States*; R. Mittra, *Penn State Univ., United States*

**IF14.9 Practical Realization of DB Surface Using Resonant MENZ Inclusions** \*\*\*\*B#5

D. Zaluski, D. Muha, S. Hrabar, L. Drpic, I. Szalaj, *University of Zagreb, Croatia*

**IF14.10 Design of Building Blocks with Positive Epsilon Mimicking Negative Epsilon** \*\*\*\*B#5

N. Jankovic<sup>1,2</sup>, A. Vakil<sup>1</sup>, A. Alves<sup>1</sup>, N. Engheta<sup>1</sup>  
<sup>1</sup>*University of Pennsylvania, United States*; <sup>2</sup>*University of Novi Sad, Serbia*

**IF14.11 Performance Enhancement of RF Absorbers by Using Resistively-Loaded Periodic Screens** \*\*\*\*\*%

Y. Zhou, R. Mittra, *The Pennsylvania State University, United States*

**IF14.12 Investigation of Image Formation Properties of 3-D Dielectric DNG and Wire Mesh ENZ Metamaterials at Microwave Frequencies** .....%)  
D. Pulito, J. Venkataraman, Z. Lu, *Rochester Institute of Technology, United States*

## IF15. Small Antennas: Wideband, Multiband, High-Frequency and On-Body Applications

Session Chairs: Richard Ziolkowski, Nader Behdad

- IF15.1 Metamaterial-Inspired Wideband Circular Monopole Antenna** \*\*\*\*%+  
Y. He, G. V. Eleftheriades, *University of Toronto, Canada*
- IF15.2 Novel Multiband Autonomous Impedance Restoration Antenna System by Using a Probe** \*\*\*\*%-  
M. Higaki, S. Obayashi, H. Shoki, *Corporate Research & Development Center, TOSHIBA corp., Japan*
- IF15.3 Wideband, Electrically-Small, Planar, Coupled Subwavelength Resonator Antenna with an Embedded Matching Network** \*\*\*\*%%  
J. Bai<sup>1</sup>, S. Shi<sup>1</sup>, R. Nelson<sup>2</sup>, D. W. Prather<sup>1</sup>  
<sup>1</sup>*University of Delaware, United States*; <sup>2</sup>*Air Force Research Laboratory, United States*
- IF15.4 AAMC-Loaded Cavity-Backed Slot Antennas** \*\*\*\*%  
D. J. Gregoire, J. S. Colburn, C. R. White, *HRL Laboratories, United States*
- IF15.5 Designing a Quad-Band Antenna for Mobile Phone Applications Including Metal Ring and Hand Effects** \*\*\*\*%  
Q. Guo, *Communication University of China, China*; R. Mitra, *Pennsylvania State University, USA*; J. Byun, *Samsung Electronics Co., Ltd, S.korea*
- IF15.6 A Highly-Efficient Single-Feed Planar Fabry-Pérot Cavity Antenna for 60 GHz Technology** \*\*\*\*%+  
S. A. Hosseini, F. De Flaviis, F. Capolino, *University of California, United States*
- IF15.7 60-GHz CMOS on-Chip Corrugated Linear Tapered Slot Antenna** \*\*\*\*B#  
Y.-H. Chuang<sup>1</sup>, K.-H. Tsai<sup>2</sup>, H.-R. Chuang<sup>1</sup>  
<sup>1</sup>*National Cheng Kung University, Taiwan*; <sup>2</sup>*HTC Corporation, Taiwan*
- IF15.8 Design of a V-Band Active Integrated Antenna (AIA) with Voltage Controlled Oscillator** \*\*\*\*%  
Y.-C. Liu, H.-Y. Chang, *National Central University, Taiwan*
- IF15.9 A 77 GHz on-Chip Strip Dipole Antenna Integrated with Balun Circuits for Automotive Radar** \*\*\*\*%&  
I. Tekin, *Sabancı University, Turkey*; M. Kaynak, *IHP, Germany*
- IF15.10 Semiconductor-Substrate Integrated 3D-Micromachined W-Band Helical Antennas** \*\*\*\*%&  
N. Somjit, J. Oberhammer, *KTH-Royal Institute of Technology, Sweden*
- IF15.11 Miniaturization Vs Gain and Safety Considerations of Implantable Antennas for Wireless Biotelemetry** \*\*\*\*%&  
A. Kiourtli, K. S. Nikita, *National Technical University of Athens, Greece*
- IF15.12 An Implantable Miniature Microstrip Disk Antenna** \*\*\*\*%+  
R. S. Salama, S. Kharkovsky, R. Liyanapathirana, U. Gunawardana, *University of Western Sydney, Australia*
- IF15.13 Design of an Implantable Antenna to Acquire Physiological Signals in Rats** \*\*\*\*%&-  
S. Islam, K. Esselle, *Macquarie University, Australia*; D. Bull, *BCS Innovations, Australia*; P. M. Pilowsky, *Australian School of Advanced Medicine, Australia*
- IF15.14 Performance Enhancement of Super-Resolving Biomimetic Antenna Arrays** \*\*\*\*% %  
A. Masoumi, N. Behdad, *University of Wisconsin - Madison, United States*
- IF15.15 Compact Size Antenna on Thin Flexible Substrate for WLAN Applications** \*\*\*\*%  
C. Y. D. Sim, Y.-N. Lai, *Feng Chia University, Taiwan*; H.-D. Chen, *National Kaohsiung Normal University, Taiwan*; J.-S. Row, *National Changhua University of Education, Taiwan*; T.-Y. Han, *Chienkuo Technology University, Taiwan*
- IF15.16 Simulation Methodology to Model the Behavior of Wearable Antennas Composed of Embroidered Conductive Threads** \*\*\*\*B#  
S. Zhang<sup>1</sup>, A. Chauraya<sup>1</sup>, W. Whittow<sup>2</sup>, R. Seager<sup>1</sup>, T. Acti<sup>3</sup>, T. Dias<sup>3</sup>, Y. C. Vardaxoglou<sup>1</sup>  
<sup>1</sup>*Loughborough University, United Kingdom*; <sup>2</sup>*Antrum Ltd, United Kingdom*; <sup>3</sup>*Notttingham Trent University, United Kingdom*

## IF16. Remote Sensing, Imaging, and Inverse Scattering

Session Chairs: Mahta Moghaddam, Lotfollah Shafai

- IF16.1 Scattering Simulation and Reconstruction of a 3D Complex Target above Background Surface Using SIMO Downward-Looking Radar** \*\*\*B#  
Y.-Q. Jin, W. Li, *Fudan University, China*
- IF16.2 Feasibility Study of a Dual-Polarized Near-Field Imaging System Based on the Scattering Probe Technique** \*\*\*B#  
M. Ostadrahimi, J. LoVetri, L. Shafai, *University of Manitoba, Canada*
- IF16.3 A Joint Inversion Scheme and Its Applications for Resistivity Logging Response** \*\*\*B#  
T. Wei, M. Ma, *China Oilfield Services Limited, China*; Z. Zhang, *Zhejiang University, China*
- IF16.4 Correction of Frequency Uncertainty in the Interferometric Measurement of Moving Humans** \*\*\*B#  
J. A. Nanzer, *Johns Hopkins University, United States*; A. H. Zai, *University of Colorado at Boulder, United States*
- IF16.5 Comparison of Reconstruction Algorithms for Microwave Tomography, with Applications to Experimental Data** \*\*\*B#  
V. Picco<sup>1</sup>, T. Negishi<sup>1</sup>, S. Nishikata<sup>2</sup>, D. Erricolo<sup>1</sup>  
<sup>1</sup>*University of Illinois at Chicago, United States*; <sup>2</sup>*Mitsubishi Heavy Industries, Ltd., Japan*
- IF16.6 Microwave Imaging Using the FDTD Time-Reversal Method** \*\*\*\*B#  
C. Bardak, M. Saed, *Texas Tech University, United States*
- IF16.7 Directed Wave Propagators and Microwave Tomographic Imaging of Forward-Scattering Objects** \*\*\*B#  
G. Samelsohn, *Holon Institute of Technology, Israel*
- IF16.8 Characterization of Lossy Dielectric Targets Using Time Reversal Arrays** \*\*\*\*%)  
M. H. Hosseini, R. Safian, *Isfahan University of Technology, Iran*





### 153 Electrodynamics and Applications of Carbon Nanotube and Graphene Systems

Session Chairs: George Hanson, Christophe Caloz

Session Organizers: George Hanson, Christophe Caloz

- 153.1 **Advanced Conductive Carbon Fiber Composite Materials for Antenna and Microwave Applications** (\*\*\*\*\*)  
A. Mehdipour, *INRS-EMT, Canada*; A. R. Sebak, C. W. Trueman, I. D. Rosca, S. V. Hoa, *Concordia University, Canada*
- 153.2 **High Frequency (Microwave to THz) Study of Carbon Based Nano-Materials** (\*\*\*\*\*)  
H. Xin, M. Tuo, M. Liang, *University of Arizona, United States*
- 153.3 **Electrodynamics of Multiwall Carbon Nanotubes** (\*\*\*\*\*)  
G. Miano, *University of Naples Federico II, Italy*; A. Maffucci, *University of Cassino, Italy*; S. Maksimenko, G. Slepyan, *Belarus State University, Belarus*
- 153.4 **Multiphysics Techniques for the Electromagnetic/Coherent-Transport Problem in Carbon Nanodevices: Analysis of the Metal-Carbon Transition** (\*\*\*\*\*)  
L. Pierantoni, D. Mencarelli, A. Di Donato, T. Rozzi, *Universita' Politecnica delle Marche, Italy*
- 153.5 **Graphene for Highly Tunable Non-Reciprocal Electromagnetic Devices** (\*\*\*\*\*)  
D. L. Sounas, C. Caloz, *École Polytechnique de Montréal, Canada*
- 153.6 **Excitation of Discrete and Continuous Spectrum of Graphene** (\*\*\*\*\*)  
G. W. Hanson, *University of Wisconsin, Milwaukee, United States*; A. B. Yakovlev, *University of Mississippi, United States*
- 153.7 **Semi-Analytical Approach to Study in-Plane Reflection of Surface Plasmon Polariton Surface Waves Propagating along Graphene** (\*\*\*\*\*)  
A. Vakili, N. Engheta, *University of Pennsylvania, United States*
- 153.8 **Simulation of High-Frequency Carrier Dynamics in Graphene** (\*\*\*\*\*)  
N. Sule, K. J. Willis, S. C. Hagness, I. Knezevic, *University of Wisconsin-Madison, United States*
- 153.9 **Electrodynamic Modeling of Nanostructured Graphene Metasurfaces and Their Applications** (\*\*\*\*\*)  
P. Y. Chen, A. Alù, *University of Texas at Austin, United States*
- 153.10 **Dispersion Analysis of Graphene Nanostrip Lines** (\*\*\*\*\*)  
R. Araneo, G. Lovat, P. Burghignoli, "Sapienza" *University of Rome, Italy*
- 153.11 **An Effective Medium Approach to Matter Waves** (\*\*\*\*\*)  
M. G. Silveirinha<sup>1,2</sup>, N. Engheta<sup>1</sup>  
<sup>1</sup>*University of Pennsylvania, United States*; <sup>2</sup>*University of Coimbra, Portugal*

## 154 The Legacy of Harold A. Wheeler

Session Chairs: Ted Simpson, Walter Kahn

Session Organizers: Ted Simpson, Walter Kahn

- 154.1 **Expanding H. A. Wheeler's Legacy: Wheeler's Work as a Graduate Teaching Tool** .....% '   
J. T. Bernhard, *University of Illinois, Urbana Champaign, United States*
- 154.2 **The Hemisphere Chart: Wheeler's Ideas on the Reflection Coefficient Plane**.....% )   
W. K. Kahn, *George Washington University, United States*
- 154.3 **HAROLD WHEELER and PHASED ARRAYS** .....% +   
R. Hansen, *R. C. HANSEN, INC., USA*
- 154.4 **WHEELER's CURRENT SHEET CONCEPT and MUNK'S WIDEBAND ARRAYS**.....% -   
I. Tzanidis, J. P. Doane, K. Sertel, J. L. Volakis, *Ohio State University, United States*
- 154.5 **Impedance Matching Equation: Developed Using Wheeler's Methodology** .....% %   
A. R. Lopez, *ARL Associates, United States*
- 154.6 **Small Antennas and Wheeler's Radian Sphere** .....% '   
C. A. Balanis, *Arizona State University, United States*
- 154.7 **Wheeler's Insightful Approach to Small Antennas** .....% )   
G. V. Eleftheriades, *University of Toronto, Canada*
- 154.8 **Understanding the Bandwidth Limitations of Small Antennas: Wheeler, Chu, and Today**.....% +   
H. R. Stuart, *LGS, Bell Labs Innovations, United States*
- 154.9 **On the Design of VLF Transmitting Antennas, Then and Now** .....% -   
T. Simpson, *University of South Carolina, United States*
- 154.10 **Electrically Small Antennas: Historical Developments - Linking Present to Past** .....% B#   
S. R. Best, *MITRE, United States*
- 154.11 **High Power VLF/LF Transmitting Antennas – Wheeler's Circuit Approximations Applied to Power Limitations** .....% &\$%   
P. M. Hansen, D. Rodriguez, *SPAWAR SYSTEMS CENTER PACIFIC, United States*



**155 Beamforming, Nulling, and Direction of Arrival Estimation**

Session Chairs: Yikun Huang, Michael Chryssomallis

**155.1 Stochastic Beamforming via Compact Antenna Arrays:20''''''&\$'**

Q. N. Alrabadi, G. F. Pedersen, *AAU, Denmark*

**155.2 RF Emitter Location Estimation in the Presence of Antenna Array Manifold Mismatch ''''''&\$)**

A. Kintz, I. J. Gupta, *The Ohio State University, United States*

''''''%)" <UFXk UFY8 YgJ| b'UbX'-a d'Ya YbHJcb`cZU8 JfYWJcb`cZ5 ffj| U'9 gHja UJcb'6`cW| ''''''&\$+  
''''''&\$&@|a@|` ) @|aU|@| ) @|aV@|a \* ^|

**155.4 A Survey on the Effect of Small Snapshots Number and SNR on the Efficiency of the MUSIC Algorithm ''''&\$-**

G. A. Ioannopoulos<sup>1</sup>, D. E. Anagnostou<sup>2</sup>, M. T. Chryssomallis<sup>1</sup>  
<sup>1</sup>*Democritus University of Thrace, Greece;* <sup>2</sup>*South Dakota School of Mines and Technology, USA*

**155.5 Mainbeam Nulling Through Singular Element for Adaptive Array ''''&%%**

H. Wang<sup>1</sup>, X. Ruan<sup>2</sup>, Z. Zhang<sup>1</sup>, Z. Feng<sup>1</sup>  
<sup>1</sup>*Tsinghua University, China;* <sup>2</sup>*Institute of Chinese Electronic Equipment System Engineering Corporation, China*

**155.6 Virtual Receiving Array (VRA) Method for Direction of Arrival (DOA) Estimation ''''&%**

C. Wu<sup>1</sup>, E. Poliakov<sup>2</sup>, A. Young<sup>1</sup>, Y. Antar<sup>2</sup>  
<sup>1</sup>*Defence R&D Canada, Canada;* <sup>2</sup>*Royal Military College of Canada, Canada*

**155.7 A System-Oriented Convex Beam Synthesis ''''B#5**

M. Yilmaz, *Texas A&M University-Kingsville (TAMUK), United States;* H. Liu, *University of Nebraska-Lincoln, USA*

**155.8 An in-Situ Optimized anti-Jamming Beamformer for Mobile Signals ''''''&%)**

J. M. Becker, J. D. Lohn, D. Linden, *Carnegie Mellon University, United States*

**155.9 Spatial Selective (S2) MUSIC Performance Analysis ''''&#4**

A. Khallaayoun, *Al Akhawayn University in Ifrane, Morocco;* Y. Y. Huang, *Montana State University, MONTANA*

## 156 Biomedical Systems

Session Chairs: Dimitris Psychoudakis, Francisco Ares-Pena

- 156.1 Microwave Stethoscope, a New Noninvasive Multiple Vital Signs Sensor: Human Clinical Trials** \*\*\*\*\*&%  
R. R. Gagarin, N. Celik, G. C. Huang, M. F. Iskander, *University of Hawaii at Manoa, United States*
- 156.2 Wireless Performance of a Fully Passive Neurorecording Microsystem Embedded in Dispersive Human Head Phantom** \*\*\*\*\*&%  
H. N. Schwerdt, J. Chae, *Arizona State University, United States*; F. A. Miranda, *NASA Glenn Research Center, United States*
- 156.3 Computing Mutual Inductance Between Spatially Misaligned Coils for Wireless Power Transmission** \*\*\*\*&&  
R. Jegadeesan, Y.-X. Guo, *National University of Singapore, Singapore*; M. Je, *Agency for Science, Technology and Research (A\*STAR), Singapore*
- 156.4 Experimental Analysis of HSP 90 and 70 in-Vivo Changes Induced in the Thyroid by Exposure to Microwave Electromagnetic Fields** \*\*\*\*\*&&  
M. J. Misa Agustiño, J. M. Leiro, M. T. Jorge Mora, J. A. Rodríguez-González, F. J. Jorge-Barreiro, F. J. Ares-Pena, E. López-Martín, *University of Santiago de Compostela, Spain*
- 156.5 Experimental Detection of the Leukemia Using UWB** \*\*\*\*\*&&+  
M. A. A. Eldosoky, H. M. Moustafa, *Helwan University, Egypt*
- 156.6 Wideband EM Coupler/Applicator Design and Characterization for the Clinical Benchmarking Tests of Microwave Stethoscope (MiSt)** \*\*\*\*\*&&-  
G. C. Huang, R. Gagarin, N. Celik, H.-S. Youn, M. F. Iskander, *University of Hawaii at Manoa, United States*
- 156.7 Determining the Relative Permittivity of Masses in the Human Body** \*\*\*\*\*&' %  
S. Salman, D. Psychoudakis, J. L. Volakis, *The Ohio State University, United States*
- Numerical Analysis of High-Voltage Pulsed Thermo-Acoustic System** \*\*\*\*\*B#5  
A. Hajjaboli, *Safe Engineering and Services, Canada*
- 156.9 A 2.5 GHz Wireless ECG System for Remotely Monitoring Heart Pulses** \*\*\*\*\*&' '  
E. Palantej, M. Baharuddin, A. Achmad, D. Utami, A. E. A. Febriani, W. Umar, M. Agus, N. K. Nauman, *Universitas Hasanuddin, Makassar, Indonesia*

## 157 Microstrip antennas

Session Chairs: Joseph Costantine, Ali Kabiri

- 157.1 RF Power Extraction from a Quantum Dot Mode Locked Laser Connected to an Antenna** ( )  
G. Atmatzakis, C. G. Christodoulou, D. Murell, L. F. Lester, *The University of New Mexico, United States*
- 157.2 A Compact Multi-Band Antenna for Worldwide Mobile Handset Applications** B#  
Y.-J. Ren, S. Jeong, J. Warden, *Research In Motion Corp., United States*
- 157.3 Low Frequency Patch Antenna Miniaturization Based on Topology and Implementation over a Two-Layer Mushroom-like Reactive Impedance Surface** B#  
J. Wu, K. Sarabandi, *University of Michigan, United States*
- 157.4 Application of a Dielectric Puck for a High Gain-Bandwidth Resonant Cavity Antenna** & +  
M. A. Al-Tarifi, A. K. Amert, D. E. Anagnostou, K. W. Whites, *South Dakota School of Mines and Technology, United States*
- 157.5 Compact Circularly Polarized Microstrip Antenna with Corner Slit and Multiple Added Squares on the Patch** B#  
A. Azadi, M. M. Fakharian, *semnan University, Iran*
- 157.6 A Planar Delta-Patch Antenna with a Surface Mode Radiating Characteristic** & -  
M. G. S. Hossain, Y. Ohashi, *Fujitsu Laboratories Limited, Japan*
- 157.7 Design of Two-Arm Spiral Antennas for Dual-CP Multi-Beam Applications at Ku-Band** & %  
H.-T. Chou, P.-H. Hsueh, L.-R. Kuo, Y.-T. Lin, *Yuan Ze University, Taiwan*
- 157.8 Wideband Bi-Directional High-Power Planar Antennas** B#  
M. Perez<sup>1</sup>, J. R. Mruk<sup>2</sup>, M. Radway<sup>1</sup>, D. S. Filipovic<sup>1</sup>  
<sup>1</sup>University of Colorado, United States; <sup>2</sup>First RF Corp, United States
- 157.9 Controlling Reconfigurable Antennas via Neural Network Embedded into an FPGA** & ('  
E. T. Al Zuraiqi, Y. Tawk, H. Pollard, C. Christodoulou, *University of New Mexico, United States*
- 157.10 Patch Antennas with Heterogeneous Substrates and Reduced Material Consumption Enabled by Additive Manufacturing Techniques** B#  
W. G. Whittow, C. C. Njoku, Y. C. Vardaxoglou, *Loughborough University, United Kingdom*
- 157.11 Modulation of Substrate Fields: Key to Realize Universal DGS Configuration for Suppressing Cross-Polarized Radiations from a Microstrip Patch Having Any** ( )  
Geometry  
D. Guha, *University of Calcutta, India*; C. Kumar, *ISRO Satellite Centre, India*

## 158 Modeling for Wireless Propagation Channels

Session Chairs: Paolo Nepa, Vittorio Degli-Esposti

**158.1 Accuracy of Parabolic Wave Equation Method in Short Propagation Range** +  
N. Omaki, Z. Yun, M. F. Iskander, *University of Hawaii, United States*

**158.2 Height Pattern Estimation for Macro Cells with 800MHz Band in NLOS Environment** -  
Y. Hirota, S. Nanba, Y. Kishi, *KDDI R&D Laboratories Inc., Japan*

**158.3 Characterization of Medium Frequency Propagation on a Twin-Lead Transmission Line with Earth Return** %  
D. E. Brocker, P. L. Werner, D. H. Werner, *The Pennsylvania State University, United States*; J. Waynert, J. Li, N. W. Damiano, *The National Institute for Occupational Safety and Health (NIOSH), United States*

**158.4 A Study on the Energy Efficiency of Urban Cellular Radio Deployment Solutions** ' & '  
V. Degli-Esposti, V. Petrini, M. Barbiroli, *University of Bologna, Italy*; C. Carciofi, *Fondazione Ugo Bordononi, Italy*

**158.5 Measurements and Analysis of the Directional Antenna Bottom Area in High Speed Rail** ' & )  
R. He, Z. Zhong, B. Ai, J. Ding, *Beijing Jiaotong University, China*

## 159 High Frequency and Asymptotic Methods

Session Chairs: Weng Cho Chew, Jin-Fa Lee

- 159.1 **El-MoM-PO Method for Wire Antenna Array with Large-Scale Platform above Infinite Ground** \*\*\*\*&+  
Z.-L. Liu, C.-F. Wang, *National University of Singapore, Singapore*
- 159.2 **Surface Impedance Characterization for Mutual Coupling Calculation of Patches on a Dielectric-Coated PEC Circular Cylinder** \*\*\*\*&-  
A. Garcia-Aguilar<sup>1</sup>, Z. Sipus<sup>2</sup>, M. Sierra-Perez<sup>1</sup>  
<sup>1</sup>*Technical University of Madrid, Spain*; <sup>2</sup>*University of Zagreb, Croatia*
- 159.3 **High-Accuracy Localization Based on the Dominant Rays of Ray-Tracing over Fingerprinting Techniques** \*\*\*\*&%  
A. del Corte Valiente, O. Gutierrez Blanco, J. M. Gomez Pulido, *University of Alcala, Spain*
- 159.4 **Efficient Ray-Optical Scheme for Radiation of Incoherent Sources in Flexible Layered Formations** \*\*\*\*&+  
A. Epstein, N. Tessler, P. D. Einziger, *Technion - Israel Institute of Technology, Israel*
- 159.5 **Comparison of Image Method and Refined Ray Tracing Method for Aircraft Cabin Application** \*\*\*\*&+  
B. Choudhury, G. Hiremath, R. M. Jha, *CSIR-National Aerospace Laboratories, India*; J. P. Bommer, *Boeing Research & Technology, India*
- 159.6 **Comparison of Intersection Algorithms for SBR Ray Tracing on NURBS** \*\*\*\*&+  
F. Weinmann, *Fraunhofer FHR, Germany*
- 159.7 **Analysis of On-Body Propagation at W Band by Using Ray Tracing Model and Measurements** \*\*\*\*&-  
P. Usaj, A. Monorchio, *University of Pisa, Italy*; A. Brizzi, A. Pellegrini, L. Zhang, Y. Hao, *Queen Mary University of London, United Kingdom*
- 159.8 **On the Location of Creeping Wave Poles** \*\*\*\*&+%  
C. Tokgoz, *United Technologies Research Center, United States*
- 159.9 **An Efficient Method for Highly Oscillatory Physical Optics Integrals** \*\*\*\*&+  
Y. M. Wu<sup>1</sup>, L. J. Jiang<sup>1</sup>, W. C. Chew<sup>1,2</sup>  
<sup>1</sup>*The University of Hong Kong, China*; <sup>2</sup>*University of Illinois at Urbana-Champaign, USA*
- 159.10 **Fast Physical Optics Calculation for SAR Imaging of Complex Scatterers** \*\*\*\*&+  
M. Stephanson, J.-F. Lee, *The Ohio State University, United States*
- 159.11 **Bending-Enhanced Side-Lobe Emission of Flexible Organic Light-Emitting Diodes** \*\*\*\*B#5  
A. Epstein, N. Tessler, P. D. Einziger, *Technion - Israel Institute of Technology, Israel*

## 160 Antenna Theory

Session Chairs: Majid Manteghi, Rodney Vaughan

- 160.1 Reactively Loaded Antenna Array Design with Characteristic Modes and DE Algorithm** \*\*\*\*&+  
Y. Chen, C. F. Wang, *National University of Singapore, Singapore*
- 160.2 Structural Scattering and the Virtual Aperture of a Half-Wavelength Dipole Antenna** \*\*\*\*&+  
R. Kastner, T. Avraham, L. Sternfeld, E. Socher, *Tel Aviv University, Israel*
- 160.3 Physical Bounds on Small Antennas as Convex Optimization Problems** \*\*\*\*B#  
M. Gustafsson, M. Cismasu, *Lund University, Sweden*; S. Nordebo, *Linnaeus University, Sweden*
- 160.4 Theoretical Zero-Gap Dipole Impedance** \*\*\*\*&, %  
M. Dehghani Estarki, R. G. Vaughan, *Simon Fraser University, Canada*
- 160.5 Design of a Dual-Band Metallic Fabry-Perot Cavity Antenna Using Dual-Mode Resonances** \*\*\*\*&, '  
Y. Zhao, F. Liu, Z. Zhang, Z. Feng, *Tsinghua University, China*
- 160.6 Design of a Compact Patch Antenna Backed by a Multi-Layer EBG Structure Using Multi-Conductor Transmission Line Modeling** \*\*\*\*&, )  
K. Payandehjoo, R. Abhari, *McGill University, Canada*
- 160.7 Bounds on Q for the Short Dipole** \*\*\*\*&, +  
M. Dehghani Estarki, R. G. Vaughan, *Simon Fraser University, Canada*
- 160.8 Microstrip Fractal Patch Antennas Using High Permittivity Ceramic Substrate** \*\*\*\*&, -  
L. M. Mendonça, A. G. Assunção, J. L. G. Medeiros, *Federal University of Rio Grande do Norte, Brazil*
- 160.9 Coupling Similarities Between Ridged Circular Apertures and Half Wavelength Dipoles** \*\*\*\*&, %  
J.-E. Park, K. Y. Kim, H.-C. Kim, H. Kim, J.-W. Song, *Kyungpook National University, South Korea*
- 160.10 Miniaturization of Meander Line Slot Antenna** \*\*\*\*B#  
D. Mitra, D. Das, S. R. Bhadra Chaudhuri, *Bengal Engineering and Science University, India*
- 160.11 Compact High Gain Stacked Offset Broadband Microstrip Antennas as an Alternative to Normal Stacked and Array Configurations** \*\*\*\*&, '  
S. V. p., V. Kesavath, *Dept. of Electronics, Cochin University of Science and Technology, India*

## 161 Multiband Antennas

Session Chairs: Ronald Johnston, Laila Salman

### 161.1 Wide Band Dual Polarized Antenna Array for Base Stations ""B#5

A. Elsherbini, J. Wu, K. Sarabandi, *University of Michigan, United States*

### 161.2 A Unidirectional Antenna Element with Very Wide Bandwidth ""& )

L. Ge, K. M. Luk, *City University of Hong Kong, China*

### 161.3 Dual Band Dual Polarized Reflectary Antenna with Close Frequencies in Ku Band ""B#5

H. Hasani, C. Peixeiro, *Instituto de Telecomunicações, Instituto Superior Técnico, Technical University of Lisbon, Portugal*

### 161.4 A Dual-Band Circularly Polarized Antenna for RFID Tag Applications ""B#5

C.-F. Chen, M.-C. Chang, W.-C. Weng, *National Chi Nan University, Taiwan*

### 161.5 A Compact Dual-Band Aperture-Coupled Microstrip Antenna for Ku Band Applications ""B#5

M. Sorouri, P. Rezaei, *Semnan University, Iran*

## 162 Parallel and Special-Processor Based Numerical Methods

Session Chairs: Elia Attardo, Leo Kempel

- 162.1 A GPU Implementation of Time Domain Integral Equation Solution for Finite Conducting Bodies** \*\*\*\*\* +  
V. Q. Dang, *The Catholic University of America, United States*; S. M. Rao, *Naval Research Laboratory, United States*
- 162.2 GPU Acceleration of Algebraic Multigrid for Low-Frequency Finite Element Methods** \*\*\*\*\* -  
E. A. Attardo, A. Borsic, *Dartmouth College, USA*
- 162.3 Impact of GPU Memory Access Patterns on FDTD** \*\*\*\*\* \$%  
M. Livesey, *Accenture, United Kingdom*; J. F. Stack, *Remcom, Inc., USA*; F. Costen, *the University of Manchester, United Kingdom*; T. Nanri, N. Nakashima, S. Fujino, *Kyushu University, Japan*
- 162.4 OpenMP-CUDA Implementations of the Moment Method and Multilevel Fast Multipole Algorithm on Multi-GPU Computing Systems** \*\*\*\*\* B#  
J. Guan, S. Yan, J.-M. Jin, *University of Illinois at Urbana-Champaign, United States*
- 162.5 Double Precision Performance of Streaming SIMD Extensions Instructions for the FDTD Computation** \*\*\*\*\* \$'  
M. Livesey, *Accenture, United Kingdom*; F. Costen, *the University of Manchester, United Kingdom*; X. Yang, *rPenn State University, USA*
- 162.6 FETI-LEAP: Making Domain Decomposition Robust** \*\*\*\*\* \$)  
G. N. Paraschos, M. N. Vouvakis, *University of Massachusetts, United States*
- 162.7 On Securing Green's Function-Based Field Simulation on Public Computing Clouds** \*\*\*\*\* \$+  
A. R. Yu, V. Jandhyala, *University of Washington, United States*
- 162.8 On Real-Time Method-of-Moments Analysis Using Graphics Processing Unit** \*\*\*\*\* \$-  
Z. B. Zubac, D. I. Olcan, A. R. Djordjevic, *University of Belgrade, Serbia*; D. P. Zoric, B. M. Kolundzija, *WIPL-D d.o.o., Serbia*
- 162.9 Acceleration of the Discrete Green's Function Computations** \*\*\*\*\* %%  
T. P. Stefanski, *Gdansk University of Technology, Poland*



## 163 Antenna Measurements and Measurement Systems

Session Chairs: Perry Wilson, Per-Simon Kildal

- 163.1 Efficiency Comparison Method** ..... %  
B. R. Mehta, C. S. Lee, M. Ezzat, *Southern Methodist University, United States*; Y. Zhu, G. Chang, *Allwave Corporation, USA*
- 163.2 Radiation Efficiency of a Coplanar-fed Ultra-Wideband Antenna** ..... %  
N. Pires<sup>1,2</sup>, C. Mendes<sup>1,3</sup>, M. Koohestani<sup>1</sup>, A. K. Skrivervik<sup>2</sup>, A. A. Moreira<sup>1</sup>  
<sup>1</sup>*Instituto Superior Técnico, Portugal*; <sup>2</sup>*École Polytechnique Fédérale de Lausanne, Switzerland*; <sup>3</sup>*Instituto Politécnico de Lisboa, Portugal*
- 163.3 A Fast and Accurate Method to Measure the Radiation Characteristics of Probe-fed Circularly-Polarized Antennas in Mm-Wave Bands** ..... %  
D. Titz, F. Ferrero, C. Luxey, G. Jacquemod, *Université de Nice-Sophia Antipolis, France*
- 163.4 An Enhanced Method to Measure Pulse Dispersion in UWB Antennas** ..... %  
A. Dumoulin, M. John, P. McEvoy, M. Ammann, *Dublin Institute of Technology, Ireland*
- 163.5 A Single-Antenna Wireless Passive Temperature Sensing Mechanism Using a Dielectrically-Loaded Resonator** ..... %  
X. Ren, S. Ebadi, X. Gong, *University of Central Florida, United States*
- 163.6 Experiment Results of a Two-by-Two Diverse Antenna System over Sea Surface in NLOS Scenario** ..... %  
F. Dong, Y. H. Lee, *Nanyang Technological University/School of EEE, Singapore*
- 163.7 A Wireless Pressure Sensor Design Using a Microwave Cavity Resonator** ..... %  
H. Cheng, S. Ebadi, X. Gong, *University of Central Florida, United States*
- 163.8 Design of a Small MST Probe for EM-Field Measurements and Sensing Applications** ..... %  
S. Capdevila<sup>1</sup>, J. Romeu<sup>1</sup>, J.-C. Bolomey<sup>2</sup>, L. Jofre<sup>1</sup>  
<sup>1</sup>*Universitat Politècnica de Catalunya, Spain*; <sup>2</sup>*Supélec, France*
- 163.9 A Study of Uncertainty Models in a Reverberation Chamber at NIST** ..... %  
E. Engvall<sup>1</sup>, P.-S. Kildal<sup>2</sup>, C. L. Holloway<sup>1</sup>, J. M. Ladbury<sup>1</sup>  
<sup>1</sup>*National Institute of Standards and Technology, United States*; <sup>2</sup>*Chalmers University of Technology, Sweden*
- 163.10 Inaccuracies Decrease in Retransmission Meter with Homodyne Conversion** ..... %  
I. I. Vdovychenko, D. A. Velychko, A. Y. Usikov *Institute of Radiophysics and Electronics NAS of Ukraine, Ukraine*

## 164 Radio Communication Systems

Session Chairs: Trevor Bird, Inder Gupta

- 164.1 Software Defined Payloads: a European Perspective** ""B#5  
*P. Angeletti, European Space Agency, Netherlands*
- 164.2 A Hybrid Wireless Positioning System** ""B#5  
*K. C. Guo<sup>1</sup>, Y. J. Guo<sup>2</sup>, X. Huang<sup>2</sup>, E. Dutkiewicz<sup>1</sup>*  
*<sup>1</sup>Macquarie University, Australia; <sup>2</sup>CSIRO, Australia*
- 164.3 New Method Based on RSSI for Passive UHF RFID Localization System** ""B#5  
*Y. Duroc, G. Andia Vera, Polytechnic National Institute of Grenoble, LCIS, France*
- 164.4 Impact of Morphology in the Estimation of Power Delay Profiles in Future Indoor Femtocell Scenarios** ""B#5  
*A. Satostegui, S. Larripa, L. Azpilicueta, F. Falcone, Universidad Publica de Navarra, Spain*
- 164.5 Estimation of Wireless Coverage for Utilities in Complex Tunnel Environments** ""B#5  
*S. Larripa, A. Satostegui, L. Azpilicueta, F. Falcone, Universidad Publica de Navarra, Spain*
- 164.6 Total Radiated Power of Wireless Devices in a Dielectrically Loaded Reverberation Chamber** ""B#5  
*W. F. Young, C. Dunlap, J. Ladbury, The National Institute of Standards and Technology, United States*
- 164.7 Introduction to Reconfigurable Sensing Antennas** ""B#5  
*F. Yang<sup>1,2</sup>, Q. Qiao<sup>2</sup>, Z. Jiang<sup>1</sup>, A. Elsherbeni<sup>2</sup>*  
*<sup>1</sup>Tsinghua University, China; <sup>2</sup>The University of Mississippi, USA*
- 164.8 TCM-4D Decoder Implementation for 64 and 128-QAM in Limited Logic Area** ""B#5  
*E. Murat, A. Eksim, S. Kahraman, M. S. Sagiroglu, TUBITAK-BILGEM, Turkey*
- 164.9 Traffic Load Balancing and Efficient Carrier Utilization in Cellular Radio Communication Networks** ""B#5  
*O. W. Ata, Palestine Polytechnic University, via Israel*
- 164.10 A Novel Approach to Realize Flat Gain Response in Beam-Switching Array** ""B#5  
*H. Wang<sup>1</sup>, X. Ruan<sup>2</sup>, Z. Zhang<sup>1</sup>, Z. Feng<sup>1</sup>*  
*<sup>1</sup>Tsinghua University, China; <sup>2</sup>Institute of Chinese Electronic Equipment System Engineering Corporation, China*

## 165 Integral Equation Solvers for Large and Multi-Scale Problems

Session Chairs: Meisong Tong, Dan Jiao

- 165.1 **A New Integral Equation Based Domain Decomposition Method for Electromagnetic Analysis of Large Multi-Scale Problems** \*\*\*\*\* ' )  
X. Wang, Z. Peng, J.-F. Lee, *The Ohio State University, United States*
- 165.2 **Wave Propagation in Complex Structures with LEGO** \*\*\*\*\* ' +  
V. Lancellotti, B. P. de Hon, A. G. Tijhuis, *Eindhoven University of Technology, Netherlands*
- 165.3 **Efficient Analysis of Scattering from Large-Scale Aperiodic Tilings by Use of the Characteristic Basis Function Method Combined with the Adaptive Integral** \*\*\*\*\* ' -  
**Method**  
X. Wang, D. H. Werner, *The Pennsylvania State University, United States*
- 165.4 **Fast H2-Based Integral Equation Solvers with an Optimal H2-Representation for Large-Scale Electromagnetic Analysis** \*\*\*\*\* ( %  
W. Chai, D. Jiao, *Purdue, United States*
- 165.5 **A Novel Approach for Evaluating Singular Integrals in Electromagnetic Integral Equations** \*\*\*\*\* ( '  
W. T. Sheng, Z. Y. Zhu, M. S. Tong, *Tongji University, China*
- 165.6 **Reformulation and Combination of Two Fast Integral Equation Solvers for Planar 3D Structures** \*\*\*\*\* ( )  
T. Vaupel, *Fraunhofer FHR, Germany*
- 165.7 **Analysis of Scattering from Complex, Electrically Large Structures Using the Generalized Method of Moments** \*\*\*\*\* ( +  
N. V. Nair, M. Vikram, B. Shanker, *Michigan State University, United States*
- 165.8 **Integral Equation Solution of 3-D Anisotropic Lossy Dielectrics in Uniaxial Layered Media** \*\*\*\*\* ( -  
K. Yang, A. E. Yilmaz, *The University of Texas at Austin, United States*
- 165.9 **A Novel Volume Integral Formulation for Wideband Impedance Extraction of Arbitrarily-Shaped 3-D Lossy Conductors in Multiple Dielectrics** \*\*\*\*\* ( ) %  
S. Omar, D. Jiao, *Purdue, United States*
- 165.10 **Hierarchical LU Decomposition and Its Application in Tangential Equivalence Principle Algorithm** \*\*\*\*\* ( ) '  
H. Shao, J. Hu, H. Guo, F. Ye, W. Lu, Z. Nie, *University of Electronic Science and Technology of China, China*

## 166 Wireless Communications and Propagation Effects

Session Chairs: Magdalena Salazar-Palma, David Michelson

### 166.1 Numerical Estimation of RF Propagation Characteristics of Cellular Radio in a Crowded Aircraft Cabin ""B#

T. Hikage, M. Shirafune, T. Nojima, *Hokkaido University, Japan*; S. Futatsumori, A. Kohmura, N. Yonemoto, *Electronic Navigation Research Institute, Japan*

### 166.2 Effect of Terminal Height on Shadow Fading of Fixed Wireless Channels at 1.9 GHz in Suburban Macrocell Environments ""B#

D. G. Michelson, S. Mashayekhi, *University of British Columbia, Canada*

### 166.3 Real-Time Agile Impedance Tuner Maximizing Radiation Efficiency ""B#

N. J. Smith, C.-C. Chen, J. L. Volakis, *The Ohio State University, United States*

### 166.4 Propagation in Cellular Wireless Systems Takes Place Through the Elusive Sommerfeld Surface Waves ""B#

T. K. Sarkar, W. Dyab, *SYRACUSE UNIVERSITY, United States*; M. Salazar, *Universidad Carlos III de Madrid, Spain*; M. Prasad, *National Physical Laboratory, India*

### 166.5 Simultaneous Information Transfer and Power Transfer/Harvesting over a Transmit/Receive Antenna System ""B#

T. K. Sarkar, E. Caspers, *SYRACUSE UNIVERSITY, United States*; M. Salazar, *Universidad Carlos III de Madrid, Spain*

### 166.6 Analysis and Evaluation of Metropolitan Mesh Machine Networks Performance in Smart Grid and Smart Metering Scenarios ""B# )

V. Degli-Esposti, M. Barbiroli, R. Bottura, *University of Bologna, Italy*; C. Carciofi, D. Guiducci, G. Riva, *Fondazione Ugo Bordoni, Italy*

## 167 Microwave Lens Antennas

Session Chairs: Raj Mittra, Ronan Sauleau

- 167.1 A Surface Micromachined High Gain Dielectric Lens Antenna for Millimeter Wave Applications** \*\*\*\*\* ) +  
C. Kim, X. Cheng, D. E. Senior, K. T. Kim, Y.-K. Yoon, *University of Florida, United States*
- 167.2 Ultra-Wideband, True-Time-Delay, Metamaterial-Based Microwave Lenses** \*\*\*\*\* ) -  
M. Li, N. Behdad, *University of Wisconsin Madison, United States*
- 167.3 Compact Rotman Lens Multibeam Antenna in SIW Technology** \*\*\*\*\* \* %  
K. Tekkouk, M. Ettore, R. Sauleau, M. Casaletti, *IETR-University of Rennes1, France*
- 167.4 A Novel Two Dimensional Circular Lens for Beam Steering Applications** \*\*\*\*\* \* '  
A. Mirkamali, J.-J. Laurin, *Ecole Polytechnique de Montreal, Canada*
- 167.5 A Comparative Study of Flat and Profiled Lenses** \*\*\*\*\* \* )  
T. McManus, R. Mittra, C. Pelletti, *The Pennsylvania State University, United States*
- 167.6 Analysis and Design of Luneberg Lens Antenna with Simultaneous Ku/K/Ka-Band Feed-System** \*\*\*\*\* \* +  
M. Huang, S. Yang, R. Yao, P. Li, Z. Nie, *University of Electronic Science and Technology of China, China*

## 201. Spiral and Sinuous Antennas

Session Chairs: Roberto Rojas, Steve Weiss

### 201.1 Inkjet Printed Ultra Wideband Spiral Antenna Using Integrated Balun on Liquid Crystal Polymer (LCP) \*\*\*\*\* \*

S. Kim<sup>1</sup>, G. Jin<sup>2</sup>, S. Nikolaou<sup>3</sup>, M. M. Tentzeris<sup>1</sup>

<sup>1</sup>Georgia Institute of Technology, United States; <sup>2</sup>South China University of Technology, China; <sup>3</sup>Frederick University, Cyprus

### 201.2 5:1 Wideband High-Power Spiral-Helix Antenna \*\*\*\*\* +%

J. Barger, M. Radway, D. S. Filipovic, *University of Colorado, United States*

### 201.3 Flexible Spiral Antenna with Microstrip Tapered Infinite Balun for Wearable Applications \*\*\*\*\* +

H. Lee<sup>1</sup>, J. Geiger<sup>2</sup>, M. M. Tentzeris<sup>1</sup>

<sup>1</sup>Georgia Institute of Technology, United States; <sup>2</sup>IEEE, Germany

### 201.4 Quasi Frequency Independent High Power Sinuous Antenna \*\*\*\*\* +)

R. Sammata, D. Filipovic, *University of Colorado Boulder, United States*

### 201.5 A Study on Conical Spiral Antennas for UHF SATCOM Terminals \*\*\*\* ++

A. I. Zaghloul<sup>1,2</sup>, T. K. Anthony<sup>1</sup>, W. O. Coburn<sup>1</sup>

<sup>1</sup>US Army Research Laboratory, United States; <sup>2</sup>Virginia Tech, United States

## 202. Dosimetry and EM Exposure Assessment

Session Chairs: John Volakis, Francisco Falcone

### 202.1 SAR Sensitivity Analysis Using Polynomial Chaos Expansions \*\*\*B#5

A. Ghanmi, N. Varsier, A. Hadjem, E. Conil, J. Wiart, *Orange Labs, France*; O. Picon, *Université Paris\_Est, France*

### 202.2 Analysis of Dosimetry Estimation in Large Enclosed Vehicles \*\*\*\*B#5

J. Arpon<sup>1</sup>, E. Aguirre<sup>1</sup>, L. Azpilicueta<sup>1</sup>, V. Ramos<sup>2</sup>, F. Falcone<sup>1</sup>

<sup>1</sup>Universidad Publica de Navarra, Spain; <sup>2</sup>Instituto de Salud Pública Carlos III, Spain

### 202.3 SAR in a Human Head Phantom Analyzed under 3T MRI \*\*\*\*\*B#5

E. Colebeck, R. Bertucci, K. Sharp, E. Topsakal, *Mississippi State University, United States*

### 202.4 Specific Absorption Rate (SAR) Distribution in Human Tissue with Magnetic Resonance \*\*\*\*\* +-

O. Jonah, S. Georgakopoulos, *FIU, United States*

### 202.5 An Antenna for Dynamic Environment \*\*\*\*B#5

S. Seran, J. P. Donohoe, E. Topsakal, *Mississippi State University, United States*

### 203. Electronic Devices, Circuits, and Applications II

Session Chairs: Vitaliy Lomakin, Meysam Moallem

#### 203.1 A Size-Reduced Ring Hybrid Using Common DGS \*\*\*\*B#5

J. Lim<sup>1</sup>, J. Lee<sup>1</sup>, K. Kwon<sup>1</sup>, Y. Jeon<sup>1</sup>, Y. Jeong<sup>2</sup>, K. Choi<sup>1</sup>, S.-M. Han<sup>1</sup>, D. Ahn<sup>1</sup>  
<sup>1</sup>Soonchunhyang University, South Korea; <sup>2</sup>Chonbuk National University, South Korea

#### 203.2 A Broadband Micromachined Cavity-Backed CPW to Rectangular Waveguide Transition for J-Band Applications \*\*\*\*B#5

M. Moallem, K. Sarabandi, *University of Michigan, United States*

#### 203.3 Electromagnetic Design of Heat-Assisted Magnetic Recording System \*\*\*\*\*B#5

Q. Ding, M. Escobar, R. Chang, M. Lubarda, S. Li, V. Lomakin, *University of California, San Diego, United States*

#### 203.4 A Waveguide-Microstrip Structure for Millimeter-Wave Spatial Power Combining\*\*\*\*\* , %

D. Sun, Z. Chen, Y. Yu, *Dalhousie University, Canada*; B. Zhang, *University of Electronic Sci. and Tech. of China, China*

#### 203.5 A Compact LTCC-Based Multi-Layer Ultra Wideband (UWB) Bandpass Filter Composed of E-Shaped Electrodes \*\*\*\*\*B#5

T. Kaneko, Y. Horii, *Kansai University, Japan*

### 204. Scattering and Diffraction

Session Chairs: Makoto Ando, Alberto Toccafondi

#### 204.1 Scattering by a Finite Cylinder \*\*\*\*B#5

F. Schettino, F. Di Murro, M. D. Migliore, *University of Cassino, Italy*

#### 204.2 High-Frequency Scattered Field Computations of Complex NURBS Surfaces \*\*\*\*B#5

M. Balasubramaian, *Fraunhofer Institute for High Frequency Physics and Radar Techniques, Germany*; A. Toccafondi, S. Maci, *University of Siena, Italy, Italy*

#### 204.3 Electromagnetic Scattering from an Array of Cylindrical Rods with Statistically Varying Lengths \*\*\*\*B#5

K. Chatterjee, *Space Dynamics Laboratory, United States*; R. Mittra, *Pennsylvania State University, United States*

#### 204.4 Miniaturized-Element Frequency Selective Surfaces for Radar Cross Section Reduction \*\*\*\*B#5

A. Edalati, K. Sarabandi, *University of Michigan, United States*

#### 204.5 Scattering of Electromagnetic Waves from a Homogeneous Dielectric Cylinder Using Volume Integral Equations \*\*\*\*B#5

B. K. Minhas, *King Saud University, Saudi Arabia*

## 205. Electromagnetic Environment and Interference

Session Chairs: Gregory Tait, Andreas Cangellaris

- 205.1 Noise Source for Electromagnetic Compatibility Testing of New Wireless Communications Networks** \*\*\*B#5  
G. Tait, M. Slocum, *Naval Surface Warfare Center Dahlgren, United States*
- 205.2 Application of Team-Based Learning in Electromagnetic Compatibility Education** \*\*\*B#5  
D. G. Michelson, *University of British Columbia, Canada*
- 205.3 Transient Analysis of Driven Planar Interconnects in the Presence of Uncertainty in Routing and External Electromagnetic Interference** \*\*\*B#5  
A. C. Cangellaris, A. Rong, *University of Illinois, Urbana-Champaign, United States*
- 205.4 Studies of Electromagnetic Susceptibility Inside a Large Platform Using the Domain Decomposition Methods** \*\*\*B#5  
Y. Shao, J. Wang, B. Zhao, J.-F. Lee, *The Ohio State University, United States*
- 205.5 Calculation of Electric Fields Radiated from an Electrostatic Discharge Suppressor for IC Protection** \*\*\*B#5  
H.-Y. Chen, C.-T. Kuo, *Yuan Ze University, Taiwan*

## 206. Radar and Imaging Systems

Session Chairs: Qing Liu, Michael Saville

- 206.1 Detection of Moving Target on a Moving Platform Using Doppler Radar** \*\*\*B#5  
Y. Kim, *California State University at Fresno, United States*
- 206.2 Advances in Polarimetric Synthetic Aperture Radar** \*\*\*\*B#5  
M. A. Saville, D. F. Fuller, *Air Force Research Lab, United States*; J. A. Jackson, *Air Force Institute of Technology, United States*
- 206.3 Simulation of High Resolution Image Reconstructed from Low Frequency Array** \*\*\*B#5  
J.-F. Kiang, M.-M. Chiou, *National Taiwan University, Taiwan*
- 206.4 Inverse Source Solver with Phaseless Field Data Compatibility for High Resolution Near Field Scanner** \*\*\*B#5  
Z. Yu<sup>1</sup>, M. Chai<sup>2</sup>, J. A. Mix<sup>2</sup>, K. P. Slattery<sup>2</sup>, Q. H. Liu<sup>1</sup>  
<sup>1</sup>*Duke University, United States*; <sup>2</sup>*Intel Corporation, United States*
- 206.5 Simultaneous Reconstruction of Dielectric and Magnetic Contrasts in Axisymmetric Inhomogeneous Media** \*\*\*B#5  
W. Zhang, Q. H. Liu, *Duke University, United States*



## 207. Electromagnetics Education

Session Chairs: Parveen Wahid, Mike Potter

- 207.1 Gender Disparity in Engineering; Results and Analysis from School Counselors Survey and National Vignette** , '   
E. T. Iskander<sup>1</sup>, C. Furse<sup>2</sup>, P. Gore<sup>1</sup>, A. Bergerson<sup>1</sup>   
<sup>1</sup>University of Utah, United States; <sup>2</sup>Univeristy of Utah, United States
- 207.2 Labatorials - a New Approach to Teaching Electricity and Magnetism to Students in Engineering** ( , )   
M. E. Potter, D. Ahrensmeier, R. I. Thompson, W. J. F. Wilson, *University of Calgary, Canada*
- 207.3 Why Square Antennas Produce Round Beams** , +   
M. C. Leifer, *Ball Aerospace and Technologies Corp., United States*
- 207.4 On the "Tunneling" of Full-Vector X-Waves Through a Slab under Frustrated Total Reflection Condition** , -   
M. A. Salem, H. Bagci, *King Abdullah University of Science and Technology, Saudi Arabia*
- 207.5 A Low Cost, High Performance Radar for Use by Undergraduate and Post-Graduate Students** B#5   
A. M. Petroff, B. Dewberry, *Time Domain, United States*

## 208. Time-Domain Numerical Methods

Session Chairs: Shanker Balasubramaniam, Yang Liu

- 208.1 Accurate Temporal Discretization of Time Domain Boundary Integral Equations** - %   
Y. Beghein<sup>1</sup>, K. Cools<sup>2</sup>, D. De Zutter<sup>1</sup>   
<sup>1</sup>Ghent University, Belgium; <sup>2</sup>University of Nottingham, UK
- 208.2 An O(N<sub>s</sub>N<sub>t</sub>Log<sup>2</sup>N<sub>t</sub>) TDIE Solver for Scattering from Periodic Quasiplanar Domains** - '   
D. Dault, B. Shanker, *Michigan State University, United States*
- 208.3 Coupling Electromagnetics with Micromagnetics** ( - )   
R. Chang, V. Lomakin, *University of California, San Diego, United States*; E. Michielssen, *Universit of Michigan Ann Arbor, United States*
- 208.4 An Acceleration Technique for Computing Fields from a Periodic Source above a Layered Medium** - +   
D. Dault<sup>1</sup>, J. Gao<sup>1,2</sup>, S. Balasubramaniam<sup>1</sup>   
<sup>1</sup>Michigan State University, United States; <sup>2</sup>Ansys, Inc., United States
- 208.5 A Rationale for Using Huygens Absorbing Boundary Conditions in Particle-in-Cell Codes** - -   
M. Bonilla, B. Goursaud, *EADS Nuclétudes, France*

## 209. Wireless On-Body and WLAN Antennas

Session Chairs: Peter Hall, Cynthia Furse

- 209.1 New Wideband Tunable Printed Antennas for Medical Applications**\*\*\*\*( \$%  
A. Sabban, *ORT BRAUDE, Israel*
- 209.2 A Novel Planar Antenna for Wireless Body Area Network**\*\*\*\*( \$'  
Y.-J. Chi, F.-C. Chen, *National Chiao Tung University, Taiwan*
- 209.3 Printed Dual-Band Loop Antenna for WLAN Applications** \*\*\*\*\*( \$)  
I.-F. Chen, C.-M. Peng, J.-W. Yeh, *Jinwen University of Science and Technology, Taiwan*
- 209.4 Low Profile Patch Antenna for On-Body Wireless Sensor Application in MBAN Band** \*\*\*\*( \$+  
T.-W. Koo<sup>1</sup>, Y.-J. Hong<sup>2</sup>, G. Park<sup>2</sup>, K. Shin<sup>2</sup>, J.-G. Yook<sup>1</sup>  
<sup>1</sup>*Yonsei university, South Korea*; <sup>2</sup>*Samsung advanced institut of technology, South Korea*
- 209.5 Dual-Band Inductively-Loaded Miniaturized Antenna** \*\*\*\*( \$-  
M. A. Othman, T. M. Abuefadel, *Cairo University, Egypt*; A. M. Safwat, *Ain Shams University, Egypt*

## 210. Reflector antennas

Session Chairs: Behrouz Khayatian, Daniel Hoppe

- 210.1 Strut Shaping of 34m BeamWaveguide Antenna for Reductions in near-Field RF and Noise Temperature**\*\*\*\*( %&  
B. Khayatian, D. J. Hoppe, M. J. Britcliffe, E. Gama, *JPL, United States*
- 210.2 Design of an 9m Dual-Offset Reflector Antenna for S-Band Weather Radar Applications**\*\*\*\*( %  
R. Hoferer, R. Schwerdtfeger, *General Dynamics SATCOM Tech, United States*; V. N. Bringi, *Colorado State University, United States*
- 210.3 Planar Dual-Antenna System for Blind Spots Elimination in Mobile Communication System**\*\*\*\*( %&  
J. Li, Q. Chen, K. Sawaya, *School of Engineering, Tohoku University, Japan*; Q. Yuan, *Sendai National College of Technology, Japan*
- 210.4 Multibeam Reflector Antenna Fed by Few Elements for Ka-Band Communication Satellite**\*\*\*\*( %&  
S. Yun, M. Uhm, J. Choi, I. Yom, *ETRI, South Korea*
- 210.5 Broadside L-Shaped Wire Array**\*\*\*\*( %&  
E. H. Lim, K. S. Tang, K. L. Choo, *Universiti Tunku Abdul Rahman, Malaysia*

## 211. Antenna Testing

Session Chairs: Ozlem Kilic, Saeed Khan

- 211.1 Antenna Cross-Polarization Isolation Impact on the Measurement of Weakly Cross-Polarized Sea Clutter** \*\*\*B#  
T. Miller, *Naval Surface Warfare Center, Carderock Division, United States*; O. Kilic, *Catholic University of America, United States*; M. Mirotznik, *University of Delaware, United States*
- 211.2 A Comparative Analysis of the Impact of Different Structures on Multipath Mitigation in the GPS Context** \*\*\*B#  
S. M. Khan, *Kansas State University, United States*
- 211.3 Design of a PC Interface for Advanced Antenna Array Test**\*\*\*B#  
Y. Huang, R. J. Weber, *Montana State University, United States*; C. G. Melendez, *University of Puerto Rico, United States*
- 211.4 Precision Measurement of a High Performance Circularly Polarized Antenna in a Medium Performance Anechoic Chamber**\*\*\*B#  
R. H. Johnston, *Dept E&CE, University of Calgary, Canada*
- 211.5 Research on the Small Size Beam Tilt Antenna Using CNT Switch** \*\*\*B#  
M. H. Jeong, B. Y. Park, S. O. Park, *Korea Advanced Institute of Science and Technology, South Korea*

## 212. Discontinuous Galerkin Finite Element Methods

Session Chairs: Stephen Gedney, Jian-Ming Jin

- 212.1 A Discontinuous Galerkin Method with Lagrange Multipliers to Solve Vector Electromagnetic Problems in Two Dimensions** \*\*\*\*( &#%  
M. Xue, J. Jin, *Center for Computational Electromagnetics, University of Illinois at Urbana-Champaign, United States*
- 212.2 A Discontinuous Galerkin Framework for Hybridizing VGFEM and FEM** \*\*\*\*( &  
O. Tuncer, B. Shanker, L. C. Kempel, *Michigan State University, United States*
- 212.3 Discontinuous Galerkin Finite Element Simulations with Polyhedral Elements** \*\*\*\*( &  
C. R. Waltz, J.-F. Lee, *Ohio State University, United States*
- 212.4 Analysis of Antennas Using DG-FETD Method** \*\*\*\*( &+  
F.-G. Hu, C.-F. Wang, *Temasek Labs @NUS, Singapore*
- 212.5 DG-FETD Modeling of EM Structures with Waveguide Excitations** \*\*\*\*( &-  
F.-G. Hu, C.-F. Wang, *Temasek Labs @NUS, Singapore*

### 213. Dielectric and Dielectric-Loaded Antennas

Session Chairs: Aly Fathy, Slawomir Koziel

- 213.1 A Design of Waveguide Integrated RF Lens Antenna** ( ' %  
Y.-T. Lin, C.-Y. Chen, H.-T. Chou, L.-R. Kuo, *Yuan Ze University, Taiwan*
- 213.2 Design of Hybrid Ultra-Wideband Monocone-Dielectric Resonator Antennas with Different Load Materials** ( ' '  
S. Koziel, S. Ogurtsov, *Reykjavik University, Iceland*
- 213.3 Dielectric Rod Antenna with Substrate Integrated Waveguide Planar Feed for Wide Band Applications** ( ' )  
R. Kazemj, *K. N. Toosi University of Technology, Iran*; A. Fathy, *University of Tennessee, USA*
- 213.4 Dielectric Resonator Antenna Embedded in a Denim Jeans Button for Ultra-Wideband Applications** ( ' )  
M. Alsharkawy, D. AbdelAziz, S. Farghaly, *Arab Academy for Science, Technology, and Maritime Transport, Egypt*

## IF21 Metamaterial Surfaces and Cloaks

Session Chairs: Alexander Yakovlev, Yang Hao

- IF21.1 Design and Simulation of a Novel Compact Unitcell for DNG Metamaterials Based on Stepped-Impedance Resonator Technique** \*\*\*\*\*(' +  
B. Zarghooni, T. A. Denidni, *INRS, Canada*
- IF21.2 Dispersion Analysis of Printed-Circuit Tensor Impedance Surfaces**\*\*\*\*\*(' -  
A. M. Patel, A. Grbic, *University of Michigan - Radiation Laboratory, United States*
- IF21.3 Investigation on the Beam-Scanning Capability of a Gradient Index Fishnet Structure** \*\*\*\*\*(' %  
M. Maasch, O. Hamza Karabey, C. Damm, M. Roig, R. Jakoby, *Technische Universität Darmstadt, Germany*
- IF21.4 Phase Contrivance Modulated Artificial Metasurface Embedded with Rotated Slot** \*\*\*\*\*(' '  
Y. Ranga<sup>1</sup>, L. Matekovits<sup>2</sup>, S. G. Hay<sup>1</sup>, T. S. Bird<sup>1</sup>  
<sup>1</sup>*CSIRO, ICT Centre, Australia;* <sup>2</sup>*Politecnico di Torino, Italy*
- IF21.5 Design of a Planar Near-Field Plate**\*\*\*\*\*(' (  
M. F. Imani, A. Grbic, *University of Michigan, United States*
- IF21.6 Generalized Additional Boundary Conditions and Analytical Model for Multilayered Mushroom-Type Wideband Absorbers** \*\*\*\*\*(' (+  
Y. R. Padooru<sup>1</sup>, A. B. Yakovlev<sup>1</sup>, C. S. R. Kaipa<sup>1</sup>, G. W. Hanson<sup>2</sup>, F. Medina<sup>3</sup>, F. Mesa<sup>3</sup>, A. W. Glisson<sup>1</sup>  
<sup>1</sup>*University of Mississippi, United States;* <sup>2</sup>*University of Wisconsin-Milwaukee, United States;* <sup>3</sup>*University of Seville, Spain*
- IF21.7 EM Performance Analysis of Novel Double-Layer MNG-ENG Metamaterial FSS for Radome Applications**\*\*\*\*\*(' (-  
S. Narayan, S. J. B., R. U. Nair, R. M. Jha, *CSIR-National Aerospace Laboratories, India*
- IF21.8 Improving Phase Continuity in Electromagnetic Gradient Surface for Large Reflecting Structures** \*\*\*\*\*(' ) %  
H. P. Seo, Y. S. Kim, Y. Lim, Y. J. Yoon, *Yonsei University, South Korea*
- IF21.9 Mantle Cloaking Using Sub-Wavelength Conformal Metallic Meshes and Patches** \*\*\*\*\*(' ) '  
Y. R. Padooru, A. B. Yakovlev, *University of Mississippi, United States;* P.-Y. Chen, A. Alu, *University of Texas at Austin, United States*
- IF21.10 Experimental Demonstration of a Conformal Mantle Cloak for Radio-Waves** \*\*\*\*\*(' ) )  
J. C. Soric, A. Alù, A. Kerkhoff, D. Rainwater, *The University of Texas at Austin, United States*

## IF22 Nanoscale Electromagnetics

Session Chairs: Richard Ziolkowski, Stefano Maci

- IF22.1 An Update of Research on Scaled RF Replicas that Emulate Plasmonic and Graphene-based Devices** ""B#  
S. Hrabar<sup>1</sup>, Z. Eres<sup>2</sup>, D. Muha<sup>1</sup>, D. Zaluski<sup>1</sup>, M. Mlakar<sup>1</sup>, A. Vovk<sup>1</sup>  
<sup>1</sup>University of Zagreb, Croatia; <sup>2</sup>Research Institute Rujger Boskovic, Croatia
- IF22.2 Design of Optical Antennas with Broad Bandwidth** ""B#  
H. Zhang, Y. Lin, University of North Texas, United States
- IF22.3 Nano-Corrugated Plasmonic Surface for Light Trapping** ""B#  
A. Polemi, K. L. Shuford, Drexel University, United States
- IF22.4 Leaky-Wave Slot Antennas at Optical Frequencies** ""B#  
A. Polemi, Drexel University, United States; S. Maci, University of Siena, Italy
- IF22.5 Low-Terahertz Transmissivity and Broadband Planar Filters Using Graphene-Dielectric Stack**""B#  
C. S. R. Kaipa<sup>1</sup>, A. B. Yakovlev<sup>1</sup>, G. W. Hanon<sup>2</sup>, Y. R. Padooru<sup>1</sup>, F. Medina<sup>3</sup>, F. Mesa<sup>3</sup>  
<sup>1</sup>University of Mississippi, United States; <sup>2</sup>University of Wisconsin-Milwaukee, United States; <sup>3</sup>University of Seville, Spain
- IF22.6 Analysis of Nanoscale Electromagnetic Problems by Using an Integral Equation Method with Fast Inverse Laplace Transform** ""B#  
S. Kishimoto, S. Ohnuki, Y. Ashizawa, K. Nakagawa, Nihon University, Japan; W. C. Chew, University of Illinois, USA
- IF22.7 Analysis of Electromagnetic Fields of a Plasmonic Cross Antenna with Bit-Patterned Media** ""B#  
H. Iwamatsu, T. Kato, S. Ohnuki, Y. Ashizawa, K. Nakagawa, Nihon University, Japan; W. C. Chew, University of Illinois, USA
- IF22.8 Hybrid Simulation of an Electron Constrained by a Harmonic Oscillator Potential Using the FDTD Method for the Maxwell - Schrodinger Equations** ""B#  
T. Takeuchi, S. Ohnuki, T. Sako, Y. Ashizawa, K. Nakagawa, Nihon University, Japan; M. Tanaka, Gifu University, Japan; W. C. Chew, University of Illinois, USA
- IF22.9 A Maxwell-Bloch Solver for the Analysis of Nanocavity Optics Problems** ""B#  
N. Miller, A. Baczewski, D. Dault, C. Piermarocchi, B. Shanker, Michigan State University, United States
- IF22.10 Design Optimization of Nanobowtie Antenna for High-Efficiency Low Bandgap Photovoltaic Cells** ""B#  
S. Choi, K. Sarabandi, University of Michigan, United States
- IF22.11 Wavefront Engineering and Sub-Diffraction Light Control with High Contrast Dielectrics** ""B#  
J. Li, University of Illinois at Chicago, United States
- IF22.12 Properties of CNT Array Scatterers as a Function of Frequency** ""( ) +  
A. I. Sofiropoulos, S. Koulouridis, University of Patras, Greece; H. T. Anastassiou, Technological and Educational Institute of Serres, Greece
- IF22.13 Boosting PV Cell Performances by Using Horn Nano-Concentrators** ""( ) -  
D. Ramaccia, F. Bilotti, A. Toscano, "Roma Tre" University, Italy
- IF22.14 Broadband Absorbers for the Mid-IR Based on Multi-Screen Frequency Selective Surfaces** ""( \* %  
J. A. Bossard, Z. Bayraktar, D. H. Werner, The Pennsylvania State University, United States
- IF22.15 Metamaterials with Custom Emissivity Polarization in the Near-IR** ""( \* +  
J. A. Bossard, D. H. Werner, The Pennsylvania State University, United States
- IF22.16 Modeling of Optical Dielectric Nanoantennas at Microwaves** ""B#  
D. S. Filonov<sup>1</sup>, A. E. Krasnok<sup>1</sup>, A. E. Miroshnichenko<sup>2</sup>, A. P. Slobozhanyuk<sup>1</sup>, P. V. Kapitanova<sup>1</sup>, Y. S. Kivshar<sup>1,2</sup>, P. A. Belov<sup>1,3</sup>  
<sup>1</sup>National Research University of Information Technologies, Mechanics and Optics (ITMO), Russian Federation; <sup>2</sup>Australian National University, Australia; <sup>3</sup>Queen Mary University of London, United Kingdom

## IF23 Antenna Applications of Metasurfaces

Session Chairs: Filippo Capolino, Franco De Flaviis

- IF23.1 Octave Bandwidth Monopole Antenna Using Ultra-Thin Anisotropic Metamaterial Coating** \*\*\*B#  
Z. H. Jiang, M. D. Gregory, D. H. Werner, *The Pennsylvania State University, United States*
- IF23.2 Planar Spiral AMCs Integrated on 60 GHz Antennas** \*\*\*\*(\*)  
H. F. Contopanagos, *National Center for Scientific Research, Greece*; C. A. Kyriazidou, *Broadcom Corporation, Greece*; F. De Flaviis, *University of California, Irvine, USA*; N. G. Alexopoulos, *Broadcom Corporation, USA*
- IF23.3 A Compact Directive Antenna Combining Metamaterial Collimating Lens and Artificial Magnetic Ground Plane** \*\*\*\*(\*+)  
J. P. Turpin, Q. Wu, D. H. Werner, *Pennsylvania State University, United States*; E. Lier, B. Martin, M. Bray, *Lockheed Martin, United States*
- IF23.4 Tunable and Active Metasurface-Based On-Chip Antennas** \*\*\*\*(\*-)  
S. Saadat, H. Mosallaei, *Northeastern University, United States*
- IF23.5 Effect of Ground Plane on Circularly Polarized Microstrip Antenna Using Artificial Ground Structure** \*\*\*\*(+%)  
T. Fukusako, R. Nobe, S. Maruyama, *Kumamoto University, Japan*
- IF23.6 Possible Feeds of the HIS Antenna Without Dipole on Top** \*\*\*\*(+)  
C. Guclu, S. Pan, J. Sloan, F. Capolino, *University of California, Irvine, USA*
- IF23.7 Artificial Impedance Surface for Widening the Bandwidth of an Antenna** \*\*\*\*(+)  
X. Begaud, A. C. Lepage, J. Sarrazin, *Telecom ParisTech, France*
- IF23.8 Circularly Polarized Metasurface Antennas** \*\*\*\*(++)  
G. Minatti, S. Maci, *University of Siena, Italy*; A. Freni, *University of Florence, Italy*; P. De Vita, *Ingegneria dei Sistemi, Italy*; M. Sabbadini, *European Space Agency, The Netherlands*
- IF23.9 CP Metasurfaced Antennas Excited by LP Sources** \*\*\*\*(+)  
H. L. Zhu, K. L. Chung, X. L. Sun, S. W. Cheung, T. I. Yuk, *The University of Hong Kong, China*
- IF23.10 Metasurface Transformation** \*\*\*B#  
E. Martini, S. Maci, *University of Siena, Italy*

## IF24 Wireless Systems and RFID in Complex Environments

Session Chairs: Perry Wilson, YU-JIUN REN

- IF24.1 Receptive Properties of the Human Body of Emitted Electromagnetic Waves for Energy Harvesting** \*\*\*\*( , %  
J. Hwang, T. Kang, C. Hyoung, S. Kang, *Electronics and Telecommunications Research Institute, South Korea*
- IF24.2 Radar Characterization of Automobiles and Surrogate Test-Targets for Evaluating Automotive Pre-Collision Systems** \*\*\*\*( , '  
W. Buller, *Michigan Technological University, United States*; D. Leblanc, *University of Michigan, United States*
- IF24.3 Experimental Study on the Effects of Groups of People on Magnetoquasistatic Positioning Accuracy** \*\*\*\*( , )  
D. D. Arumugam<sup>1</sup>, J. D. Griffin<sup>2</sup>, D. D. Stancil<sup>3</sup>, D. S. Ricketts<sup>1</sup>  
<sup>1</sup>*Carnegie Mellon University, United States*; <sup>2</sup>*Disney Research Pittsburgh, United States*; <sup>3</sup>*North Carolina State University, United States*
- IF24.4 Efficient Ambient WiFi Energy Harvesting Technology and Its Applications** \*\*\*\*( , +  
U. Olgun, C.-C. Chen, J. L. Volakis, *ElectroScience Lab. The Ohio State University, United States*
- IF24.5 Measurement of the Distribution of the Electromagnetic Field from Multisource Inside a Car Using a Hook Dipole** \*\*\*\*( , -  
R. A. A. Rodrigues, G. Fontgalland, *Universidade Federal de Campina Grande- UFCG, Brazil*; S. E. Barbin, *Universidade de São Paulo, Brazil*
- IF24.6 Measurements and Simulations of Multi-Frequency Human Radar Signatures** \*\*\*\*( - %  
J. Park, J. T. Johnson, *The Ohio State University, United States*
- IF24.7 Practical Read Range Evaluation of Wearable Embroidered UHF RFID Tag** \*\*\*\*( - '  
K. Koski, E. Koski, T. Bjorninen, A. A. Babar, L. Ukkonen, L. Sydanheimo, *Tampere University of Technology, Finland*; Y. Rahmat-Samii, *University of California Los Angeles, USA*
- IF24.8 Fabrication of Embroidered UHF RFID Tags** \*\*\*\*( - )  
E. Koski, K. Koski, T. Bjorninen, A. A. Babar, L. Sydanheimo, L. Ukkonen, *Tampere University of Technology, Finland*; Y. Rahmat-Samii, *University of California Los Angeles, USA*
- IF24.9 Determining Efficiency of HF Aircraft-Coupled Antennas in Composite Aircraft Using FDTD** \*\*\*\*( - +  
C. Amburgey, R. Perala, G. Rigden, T. McDonald, *Electro Magnetic Applications, Inc., United States*



## IF25 Small Antennas: Low Frequency Applications

Session Chairs: Ashwin Iyer, Peder Hansen

- IF25.1 LF Antenna Optimization over High Impedance Ground Plane** (--)  
A. R. Rodriguez, P. Hansen, L. Koyama, SPAWAR Systems Center Pacific, United States; Q. Ding, V. Lomakin, ECE UCSD, United States
- IF25.2 Optimized Helical Monopole Antennas for Portable VHF Communication Devices** (%)\$%  
S. Zhao, C. Fumeaux, C. Coleman, Adelaide University, Australia
- IF25.3 Design and Performance of an Integrated Antenna for a 433MHz Car Park Monitoring System** (%)\$'  
R. Caso, A. Michel, P. Nepa, G. Manara, University of Pisa, Italy; R. Massini, Consortium Ubiquitous Technologies (CUBIT), Italy
- IF25.4 Chassis Engineering to Enlarge the Bandwidth for GSM-450 Application** (%)\$)  
F. Ferrero, R. Staraj, J.-M. Ribero, CNRS-University of Nice, France
- IF25.5 Driven, Metamaterial-Inspired, 3D Magnetic EZ Antenna for Mesoband HPM Applications** (%)\$+  
J. Ng, R. W. Ziolkowski, University of Arizona, United States; S. Tyo, University of Arizona, USA; M. C. Skipper, M. D. Abdalla, ASR Corporation, USA
- IF25.6 Reducing the Size of Monopole Antennas Using Magneto-Dielectric Material Loading** (%)\$-  
N. V. Venkatarayalu, M. Iddagoda, EADS Innovation Works, Singapore; L. B. Kong, S.-K. Ting, National University of Singapore, Singapore
- IF25.7 Electrically Small Magneto-Dielectric Coated VHF Monopole Antenna** (%)%  
C.-F. Wang, L. B. Kong, F.-G. Hu, Z. Yang, Z.-W. Li, National University of Singapore, Singapore
- IF25.8 Design and Performance of a Lumped Resistively Loaded Spiral Antenna** (%)%  
M. Zou, J. Pan, P. Li, UESTC, China
- IF25.9 A Compact Circularly Polarized Multilayer Printed Antenna for Use on Micro-Satellites** (%)%)  
A. P. Murdoch, S. K. Podilchak, Y. M. Antar, Royal Military College of Canada, Canada
- IF25.10 Fundamental Study on Curved Folded Dipole Antenna** (%)%+  
T. Nakao, N. T. Hung, M. Nagatoshi, H. Morishita, National Defence Academy, Japan

## IF26 Remote Sensing

Session Chairs: Andreas Danklmayer, sermsak jaruwatanadilok

- IF26.1 Trends and Variation in Ku-Band Backscatter of Natural Targets on Land Observed in QuikSCAT Data** \*\*\*B#5  
S. Jaruwatanadilok, B. W. Stiles, *Jet Propulsion Laboratory, California Institute of Technology, United States*
- IF26.2 FDTD Simulation of Radio Wave Propagation at Intersection Surrounded by Compound Walls in Residential Area for Inter-Vehicle Communications Using 720 MHz Band** %  
K. Taguchi, R. Aoyama, S. Imai, T. Kashiwa, *Kitami Institute of Technology, Japan*
- IF26.3 On the Propagation of mmWave-Signals in the Maritime Boundary Layer** \*\*\*B#5  
A. J. Danklmayer, H. Essen, *Fraunhofer FHR, Germany*; J. Foerster, M. Behn, *Technical Center for Ships and Naval Weapons, Germany*; Y. Hurtaud, *DGA, France*; V. Fabbro, L. Castanet, *ONERA, France*
- IF26.4 Calibration of Ground Penetrating Radar Responses for Identification of Shallowly Buried Objects** \*\*\*B#5  
M. Nishimoto, D. Yoshida, M. Himeno, M. Tanabe, *Kumamoto University, Japan*
- IF26.5 Imaging of Dielectric Targets Using RF Tomography** \*\*\*B#5  
S. Nishikata, *Mitsubishi Heavy Industries, Ltd., Japan*; V. Picco, T. Negishi, D. Erricolo, *University of Illinois at Chicago, United States*
- IF26.6 High Frequency Ground Wave Propagation** \*\*\*B#5  
S. F. Mahmoud, *Kuwait University, Kuwait*; Y. M. M. Antar, *Royal Military College of Canada, Canada*
- IF26.7 Investigation of suitable Mapping Function for GAGAN system** \*\*\*B#5  
R. C. Kudala, *DEFENCE UNIVERSITY COLLEGE, Ethiopia*

## IF27 RFID - Systems

Session Chairs: Xianming Qing, Luca Catarinucci

- IF27.1 Power Conversion Gain as a Design Metric for RFID Systems** (\*\*\*\*) &  
J. T. Block, L. Blanca-Pimentel, J. L. Gonzalez, M. J. Almada, C. R. Valenta, G. D. Durgin, *Georgia Institute of Technology, United States*
- IF27.2 Location and Tracking of Items Moving on a Conveyor Belt and Equipped with UHF-RFID Tags** (\*\*\*\*) &  
P. Nepa, F. Lombardini, A. Buffi, *University of Pisa, Italy*
- IF27.3 Exploiting the Characteristics of Paraffin as a Substrate for UHF RFID and Antenna Applications** (\*\*\*\*) &+  
A. A. Babar<sup>1</sup>, S. Manzari<sup>2</sup>, A. Z. Elsherbeni<sup>3</sup>, L. Sydänheimo<sup>1</sup>, G. Marrocco<sup>2</sup>, L. Ukkonen<sup>1</sup>  
<sup>1</sup>Tampere University of Technology, Finland; <sup>2</sup>University of Rome, Tor Vergata, Italy; <sup>3</sup>University of Mississippi, USA
- IF27.4 A UHF Near-Field/Far-Field RFID Metamaterial-Inspired Loop Antenna** (\*\*\*\*) &-  
X. Qing, Z. N. Chen, C. K. Goh, *Institute for Infocomm Research, Singapore, Singapore*
- IF27.5 Analysis of the RFID Antenna with the Nonlinear Component** (\*\*\*\*) ' %  
W. Kang, J. Kim, K. Lee, Y. Chung, *Kwangwoon University, South Korea*
- IF27.6 A Flexible, Wideband RFID Tag Antenna for Metallic Surfaces** (\*\*\*\*) ' '  
J.-H. Cho, H.-W. Son, *Chonbuk National University, South Korea*; S.-H. Jeong, W.-K. Choi, C.-W. Park, *Electronics and Telecommunications Research Institute (ETRI), South Korea*
- IF27.7 On the Use of UHF RFID Antenna Systems Customized for Robotic Applications** (\*\*\*\*) ' )  
L. Catarinucci, S. Tedesco, L. Tarricone, *University of Salento, Italy*
- IF27.8 Passive UHF Tag-to-Tag Communications Properties** (\*\*\*\*) ' +  
G. Marrocco<sup>1</sup>, S. Caizzone<sup>1,2</sup>  
<sup>1</sup>University of Roma Tor Vergata, Italy; <sup>2</sup>German Aerospace Center (DLR), Germany
- IF27.9 Application of Rectennas for Contactless Energy Transfer** (\*\*\*\*) ' -  
M. M. Maglio, R. E. Zich, *Politecnico di Milano, Italy*
- IF27.10 Range Improvement of Backscatter Radio Systems at 5.8GHz Using Tags with Multiple Antennas** (\*\*\*\*) ( %  
M. B. Akbar, M. M. Morys, C. R. Valenta, G. D. Durgin, *Georgia Institute of Technology, United States*

## 251. Antenna Feed Systems for Space and Terrestrial Applications

Session Chairs: Sudhakar Rao, Nuria Llombart Juan, Isamu Chiba  
Session Organizers: Sudhakar Rao, Nuria Llombart Juan, Isamu Chiba

- 251.1 **Omnidirectional Antenna Bypassed Feeding Using a Turnstile Junction** ( ) ( '  
F. Mayol Soler, M. Padilla Pardo, *Ryma, Spain*
- 251.2 **An S/X-Band Feed Design for a 9m Dual-Offset Reflector Antenna for Weather Radar Application** ( ) ( )  
R. Hoferer, R. Schwerdtfeger, *General Dynamics SATCOM Tech, United States*; V. N. Bringi, *Colorado State University, United States*
- 251.3 **Leaky Wave Enhanced Phased Array for the Reduction of the Grating Lobe Level** ( ) ( ) ( +  
N. Llombart, *Universidad Complutense de Madrid, Spain*; D. Blanco, E. Rajo-Iglesias, *Universidad Carlos III, Spain*; J. Campuzano, A. Montesano-Benito, *EADS CASA Espacio, Spain*
- 251.4 **A Dual-Polarized, Dual-Frequency, Corrugated Feed Horn for SMAP** ( ) ( ) (-  
P. Focardi, P. R. Brown, *NASA Jet Propulsion Laboratory, California Institute of Technology, United States*
- 251.5 **The Proposed DESDynI Array-Fed Reflector Feed** ( ) ( ) ( ) %  
N. F. Chamberlain, R. E. Hodges, J. D. Vacchione, M. S. Zawadzki, *Jet Propulsion Laboratory, California Institute of Technology, United States*
- 251.6 **Terahertz Antenna for Arrays of Hundreds of Pixels** ( ) ( ) ( ) '  
T. Reck<sup>1</sup>, C. Jung-Kubiak<sup>1</sup>, C. Lee<sup>1</sup>, N. Llombart-Juan<sup>2</sup>, G. Chattopadhyay<sup>1</sup>, I. Mehdi<sup>1</sup>  
<sup>1</sup>*Jet Propulsion Laboratory, United States*; <sup>2</sup>*Universidad Complutense de Madrid, Spain*
- 251.7 **A Ku-Band Dual-Polarization Connected Array of Dipoles with Wide-Scan Capability for in-Flight Entertainment** ( ) ( ) ( ) )  
D. Cavallo<sup>1,2</sup>, A. Neto<sup>2</sup>, G. Gerini<sup>1</sup>, R. Bolt<sup>1</sup>, R. Grooters<sup>1</sup>, D. Deurloo<sup>1</sup>, B. van Zalk<sup>3</sup>, G. Toso<sup>4</sup>, R. Midthassel<sup>4</sup>  
<sup>1</sup>*TNO, Netherlands*; <sup>2</sup>*Delft University of Technology, Netherlands*; <sup>3</sup>*Thales Netherlands B.V., Netherlands*; <sup>4</sup>*European Space Agency, Netherlands*
- 251.8 **Design of Profiled Circular Horn Feed with High Efficiency** ( ) ( ) ( ) +  
T. S. Bird, *CSIRO ICT Centre, Australia*; C. Granet, *BAE Systems Australia Ltd, Australia*
- 251.9 **A Slotted Waveguide Array Antenna Covered by a Dielectric Slab with a Post-Wall Cavity** ( ) ( ) ( ) -  
S. Yamaguchi, *Mitsubishi Electric Corporation, Japan*
- 251.10 **A Reverse-Diplexing RF Chain Architecture for Space Telecom Antennas** ( ) ( ) ( ) \* %  
G. Addamo<sup>1</sup>, O. A. Peverini<sup>1</sup>, P. Cecchini<sup>2</sup>, R. Mizzoni<sup>2</sup>, R. Tascone<sup>1</sup>, G. Virone<sup>1</sup>  
<sup>1</sup>*IEIT-CNR, Italy*; <sup>2</sup>*Thales Alenia Space Italy, Italy*
- 251.11 **S-Band Feeder for Balloon Ground Station System** ( ) ( ) ( ) \* &  
L. J. Foged, A. Giacomini, A. Potenza, R. Morbidini, *SATIMO, Italy*; J. P. Abadie, *ELTA, France*; J. Mongis, *CNES, France*

## 252. Prof. Robert Kouyoumjian Memorial Session: Asymptotic HF and Hybrid Methods

Session Chairs: Giuliano Manara, Prabhakar Pathak  
Session Organizers: Giuliano Manara, Prabhakar Pathak

- 252.1 **The Contribution of Prof. Robert Kouyoumjian to Edge Diffraction and Field Transition at and near Shadow Boundaries Using UTD** ( ) ( ) ( ) B#  
C. A. Balanis, *Arizona State University, United States*
- 252.2 **Uniform Geometrical Theory of Diffraction for a Curved Wedge Excited by an Electromagnetic Beam** ( ) ( ) ( ) B#  
P. H. Pathak, *Ohio State University, United States*; Y. Kim, *Loral, SSD, United States*
- 252.3 **A UTD Analysis of Inhomogeneous Plane Wave Diffraction** ( ) ( ) ( ) ( ) B#  
G. Manara, P. Nepa, *University of Pisa, Italy*
- 252.4 **Large Complex Modeling Using UTD: in Memory of Prof. Robert Kouyoumjian** ( ) ( ) ( ) ( ) B#  
R. J. Marhefka, *The Ohio State University, United States*
- 252.5 **Input Impedance and Mutual Coupling of Dipoles Close to the Edge of a Half-Plane** ( ) ( ) ( ) ( ) B#  
L. Aberbour<sup>1</sup>, H. Rmil<sup>2</sup>, C. Craeye<sup>1</sup>, S. Maci<sup>3</sup>  
<sup>1</sup>*Université Catholique de Louvain, Belgium*; <sup>2</sup>*University of Moastir, Tunisia*; <sup>3</sup>*University of Siena, Italy, Italy*
- 252.6 **UTD for Wedge Double Diffraction: from Prof. Kouyoumjian's Early Contributions to the Most Recent Results** ( ) ( ) ( ) ( ) B#  
M. Albani, G. Carluccio, F. Puggelli, *University of Siena, Italy*
- 252.7 **Learning Electromagnetics and Diffraction Theory from Prof. Robert Kouyoumjian** ( ) ( ) ( ) ( ) B#  
J. L. Volakis, *Ohio State University, United States*
- 252.8 **From Keller's 50-Year Old GTD to Its Modern Applications in Reflector Antenna Designs: a Historical Perspective** ( ) ( ) ( ) ( ) B#  
Y. Rahmat-Samii, *UCLA, United States*
- 252.9 **Rapid Antenna Coupling Analysis Tool for Arbitrary Antennas Using UTD** ( ) ( ) ( ) ( ) \* ( )  
H. Z. Zhang, J. A. Catton, J. H. Morrill, *Boeing, United States*; P. H. Pathak, *The Ohio State University, United States*
- 252.10 **Further Studies of Scattering by a Lossless DNG Metamaterial Wedge** ( ) ( ) ( ) ( ) B#  
P. L. E. Uslenghi, *University of Illinois at Chicago, United States*; V. G. Daniele, *Politecnico di Torino, Italy*
- 252.11 **A Review of the Incremental Theory of Diffraction for Complex Source Points** ( ) ( ) ( ) ( ) B#  
D. Erricolo, *University of Illinois at Chicago, United States*; S. M. Canta, *Space Systems/Loral, United States*; A. Toccafondi, *Università di Siena, Italy*

### 253. Antenna Arrays: Theory and Design

Session Chairs: Robert MacPhie, Benjamin Braaten

- 253.1 **A Phase Only Excitation Law for Omnidirectional Linear Arrays of Dipoles Including Coupling Effects** \*\*\*B#  
G. Toso, P. Angeletti, D. Petrolati, *European Space Agency, Netherlands*
- 253.2 **Reconfigurable Wave Velocity Transmission Lines for Phased Arrays** \*\*\*B#  
N. Host, C.-C. Chen, J. L. Volakis, *Ohio State University, United States*
- 253.3 **Phase-Amplifying Architecture for Coupled-Oscillator Arrays** \*\*\*B#  
R. Moussounda, R. G. Rojas, *The Ohio State University, United States*
- 253.4 **Beam Steering Body-Worn Smart Antenna Array** \*\*\*B#  
R. Islam, M. Ali, *University of South Carolina, United States*
- 253.5 **Design of Multiple-Element, Closely-Spaced Parasitic Array** \*\*\*B#  
Y. Li, *Baylor University, United States*
- 253.6 **A Linear Receiving Array Which Combines Two Square-Law Detector Outputs to Increase the Array Directivity** \*\*\*B#  
R. H. MacPhie, L. Yuan, *University of Waterloo, Canada*
- 253.7 **Minimum Q for Arrays above a Ground Plane** \*\*\*B#  
J. P. Doane, K. Sertel, J. L. Volakis, *Ohio State University, United States*
- 253.8 **Antenna Array Thinning and Selective Excitation Techniques for Side Lobe Level Reduction and Power Management** \*\*\*B#  
S. D. Keller, *US Army Research Laboratory, United States*
- 253.9 **Measurement and Analysis of a Wireless Phased Array Antenna Prototype** \*\*\*B#  
M. A. Stoneback, M. I. Stoneback, Y. Kuga, *University of Washington Dept. of Electrical Engineering, United States*
- 253.10 **Low Sidelobe Substrate Integrated Waveguide (SIW) Series Slot Array Antenna for 45°-Inclined Linear Polarization** \*\*\*B#  
D.-Y. Kim, S. Nam, *Seoul National Univ., South Korea*
- 253.11 **The 12-Beam Switching System with Adjustable Phase Shift Array** \*\*\*B#  
C.-J. Chang, H.-P. Lin, *National Taipei University of Technology, Taiwan*; M.-C. Tseng, *Industrial Technology Research Institute, Taiwan*; S.-S. Jeng, *National Dong Hwa University, Taiwan*

## 254. Electromagnetic Imaging and Sensing Applications in Biology and Medicine

Session Chairs: Elise Fear, Mahta Moghaddam

### 254.1 Microwave Tomography via Domain Decomposition for Finite Element Methods\*\*\*\*)\*\*

E. A. Attardo, *Istituto Superiore Mario Boella, Italy*; G. Vecchi, *Politecnico di Torino, Italy*

### 254.2 High-Permittivity Dielectric Materials for Optimum Transmittance in MRI Systems \*\*B#5

G. Carluccio<sup>1,2</sup>, Q. X. Yang<sup>2</sup>, D. Erricolo<sup>1</sup>, C. M. Collins<sup>2</sup>

<sup>1</sup>*University of Illinois at Chicago, United States*; <sup>2</sup>*Pennsylvania State University, United States*

### 254.3 Shielded UWB Sensor for Biomedical Applications \*\*B#5

J. Bourqui, E. C. Fear, *University of Calgary, Canada*

### 254.4 Feasibility Study of Microwave Tomography for In Vivo Characterization of Tissue as a Diagnostic Technique for Human Disease\*\*\*B#5

C. Kaye, J. LoVetri, A. Zakaria, M. Ostadrahimi, *University of Manitoba, Canada*

### 254.5 Thermoacoustic Imaging and Spectroscopy for Enhanced Materials Differentiation \*\*\*\*B#5

X. Wang, D. Bauer, R. Witte, H. Xin, *University of Arizona, United States*

## 255. Microstrip antennas and printed devices

Session Chairs: Vasudevan Kesavath, Jennifer Bernhard

### 255.1 Conformal Biomimetic Antenna Array for Direction Finding ""B#

G. Fontgalland, UFCG, Brazil; J. L. Volakis, OSU, United States

### 255.2 Light-Responsive, Heat-Activated, Reconfigurable Microstrip Structures ""B#

G. J. Hayes, North Carolina State University, United States; Y. Liu, M. D. Dickey, Chemical and Biomolecular Engineering, United States; G. Lazzi, University of Utah, United States

### 255.3 A Reconfigurable Circularly-Polarized Microstrip Antenna Using Micro-Pneumatic Control ""B#

B. Wu, M. Okoniewski, C. Hayden, University of Calgary, Canada

### 255.4 A Center-Fed Half-Width Microstrip Leaky-Wave Antenna with an Adjustable Principal Beam ""B#

K. Akinlabi-Oladimeji, J. Tang, A. Temme, E. J. Rothwell, P. Chahal, L. C. Kempel, R. O. Ouedraogo, Michigan State Univ, United States

### 255.5 Investigation of Resonance Properties of Modified Microstrip Patch Antennas ""B#

K. R. Schab, J. T. Bernhard, University of Illinois at Urbana-Champaign, United States

### 255.6 Dual-Band Planar Microstrip Butler Matrix ""B#

J. Shao, H. Ren, B. Arigong, H. Zhang, University of North Texas, United States

### 255.7 Miniaturized Handset and Tablet Internal Antennas for 3G and Long Term Evolution Applications ""B#

Y.-J. Ren, Research In Motion Corp., United States

### 255.8 Analytical and Simulated Resonances of a Helmet-Mounted Conformal Patch Antenna ""B#

B. Amang, G. Wilkins, Morgan State University, United States; S. Weiss, Army Reseach Laboratory, United States

### 255.9 Microwave Antennas Based on Small Ferrite Particles ""B#

M. L. Sigalov<sup>1,2</sup>, Z. Ibragimov<sup>2,3</sup>, M. Berezin<sup>2,3</sup>, R. Shavit<sup>3</sup>, E. Kamenetskii<sup>3</sup>  
<sup>1</sup>Applied Electromagnetics Ltd, Israel; <sup>2</sup>Goji Israel Ltd, Israel; <sup>3</sup>Ben-Gurion University of the Negev, Israel

### 255.10 Millimeter-Wave Printed Yagi-Uda Antennas ""B#

H. Y. D. Yang, S. S. Zhao, University of Illinois at Chicago, United States

### 255.11 Enhanced Axial-Ratio Bandwidth of a Probe-Fed Microstrip Antenna ""B#

T.-N. Chang, E.E. department, Tatung University, Taiwan

## 256. Random and Complex Media Effects

Session Chairs: Saba Mudaliar, Akira Ishimaru

- 256.1 Effect on Solid Objects of Non-Linear High Energy Pulse Propagation Through Turbulent Environments** ""B#5  
M. A. Stoneback, A. Ishimaru, Y. Kuga, *University of Washington Dept. of Electrical Engineering, United States*
- 256.2 Precursor Fields Reflected from Low Observables** ""B#5  
C. L. Palombini, K. E. Oughstun, *University of Vermont, United States*
- 256.3 Application of the Mutual Coherence Functions and Interference Gating in Increasing Signal Intensity in Imaging Through Discrete Random Media** ""B#5  
E. H. Bleszynski, M. K. Bleszynski, T. Jaroszewicz, *Monopole Research, United States*
- 256.4 Analysis of Depolarized Electromagnetic Waves Propagated Through Random Medium** ""B#5  
Y. Nanbu, *Sasebo National College of Technology, Japan*; M. Tateiba, *Ariake National College of Technology, Japan*; H. El-Ocla, *Lakehead University, Canada*
- 256.5 Coherent Wavefront Synthesis in a Wave-Diffusive Medium** ""B#5  
A. Cozza, *SUPELEC, France*
- 256.6 On the Nature of Multiple Scattering Processes in Radiative Transfer Model for Layered Random Media** ""B#5  
S. Mudaliar, *Air Force research Laboratory, United States*
- 256.7 Sensitivity Analysis on Simulated Backscattering Cross Section from Vegetated Area Due to Changes in Environments** ""B#5  
S. Jaruwatanadilok, S. Saatchi, *Jet Propulsion Laboratory, California Institute of Technology, United States*
- 256.8 Calculation of VLF Wave Propagation Using a Multi-Physics FDTD/SAMI3 Simulator of the Earth-Ionosphere System** ""B#5  
J. Niu, J. J. Simpson, *University of New Mexico, United States*
- 256.9 Effective Medium Theory of Forest** ""B#5  
Y. Li, *Baylor University, United States*
- 256.10 Millimeter-Wave Imaging Systems at 200 and 300 GHz** ""B#5  
J. M. Mower, Y. Kuga, *University of Washington, United States*



## 257. Dual-Polarized and Circularly Polarized Antennas

Session Chairs: Chi-Chih Chen, Yongxin Guo

257.1 **A Compact Dual-Band (L1/L2) GPS Antenna Design** \* ,  
M. Chen, C.-C. Chen, *The Ohio State University, USA*

257.2 **A Single Layer Dual-Polarization Printed Bow-Tie Broadband Antenna** +\$  
C.-M. Peng, I.-F. Chen, C.-J. Wu, *Jinwen University of Science and Technology, Taiwan*

257.3 **Miniaturized Cavity-Backed Dual-Polarized Slot Antenna** +&  
Y. Dong, T. Itoh, *University of California at Los Angeles, United States*

257.4 **Gain Improvement Topology Using Conical Structure for Jamming Resilient GPS Antennas** +(   
Y.-K. Cho, H.-D. Kang, S.-Y. Hyun, J.-G. Yook, *Yonsei University, South Korea*

257.6 **Design of Cavity-Backed Circularly-Polarized Cylindrical Microstrip Antennas** +\*  
A. F. Tinoco-S., D. C. Nascimento, J. C. D. S. L. S. Lacava, *Instituto Tecnológico de Aeronáutica, Brazil*; O. M. C. Pereira-Filho, *Federal University of Pernambuco, Brazil*

257.7 **GPS+GLONASS Active Antenna for Extremely High Temperature Aerospace Applications** ) +,  
D. R. Jahagirdar, *Research Center Imarat, India*

257.8 **Generation of Circular Polarization Using Electric and Magnetic Current Elements** \*), \$  
A. R. Harish, T. Kumar, *Indian Institute of Technology Kanpur, India*

257.9 **2.45GHz Dual Polarized Aperture-Coupled Antennas with High Isolation Performance** \*), &  
M. M. Morsy, *Sensor Networks and Cellular System (SNCS) Research Center, Saudi Arabia*

**Compact Circular Polarization Microstrip Antenna Design** \*), (  
Y. Li, F. Yang, C. Wu, P. Yang, J. Ouyang, *University of Electronic Science and Technology of China, China*

## 258. UWB Antennas

Session Chairs: John Papapolymerou, Christos Christodoulou

- 258.1 **60GHz Wire-Bond Helical Antennas in 130nm CMOS Technology** , \*  
K.-K. Huang, D. D. Wentzloff, *University of Michigan Ann Arbor, United States*
- 258.2 **An Ultra-Wideband Planar Slot Antenna with WLAN Band Rejection** , , '  
M.-C. Chang, M.-Y. Ding, W.-C. Weng, *National Chi Nan University, Taiwan*
- 258.3 **Millimeter-Wave Ultra-Wide-Band Antenna Array Integrated on Silicon with BCB Membranes** ) - \$  
L. Dussopt, H. Salti, *CEA-LETI, France*; J. Kim, S. Seok, N. Rolland, *CNRS-EMN, France*
- 258.4 **Quasi-Millimeter Wave Leaf-Shaped Bowtie Array Antenna Backed by an EBG Substrate** ) - &  
M. Yamamoto, T. Koyanagi, S. Fujita, T. Nojima, *Hokkaido University, Japan*
- 258.5 **A Novel Miniaturized UWB Antenna with 5.7 GHz Band Rejection Function** ) - (  
J. Xu, D. Shen, *Yunnan University, China*; X. Zhang, *Concordia University, Canada*; K. Wu, *Montreal University, Canada*
- 258.6 **An UltraWide Band W-Band End-Fire Antenna on Flexible Organic Substrate** ) - \*  
W. T. Khan, C. E. Patterson, J. Papapolymerou, *Georgia Institute of Technology, United States*
- 258.7 **Ultra-Wideband, Miniaturized, Low Profile, Omnidirectional Antenna Using a Novel Reactive Loading Approach** ) - ,  
J. Oh, K. Sarabandi, *University of Michigan, United States*
- 258.8 **Ultrawideband Coplanar Waveguide- Fed- Fractal Antenna** ) ) \$ \$  
A. A. Omar, *King Faisal University, Saudi Arabia*
- 258.9 **Ultra-Wideband Antenna with Band-Notches for Lower and Upper WLAN** ) ) B \$  
R. Azim, M. T. Islam, *UNiversiti Kebangsaan Malaysia, Malaysia*; A. T. Mobashsher, *King Abdulaziz University, Kingdom of Saudi Arabia*
- 258.10 **An Inkjet-Printed UWB Antenna on Paper Substrate Utilizing a Novel Fractal Matching Network** ) ) \$ &  
B. Cook, A. Shamim, *King Abdullah University of Science and Technology (KAUST), Saudi Arabia*

## 259. Optimization Methods in Electromagnetics

Session Chairs: Douglas Werner, Daniel Weile

- 259.1 **DGA-Designed Bended Film Antenna for Dual-Band WLAN Operation** \*\*\*\*\*(  
R. Hosono, N. Guan, *Fujikura Ltd., Japan*
- 259.2 **Phase-Only Monopulse Pattern Notching via Semidefinite Programming** \*\*\*\*\*(  
P. J. Kajenski, *Raytheon, United States*
- 259.3 **A Circularly Polarized Mixed Loop-Dipole Yagi Antenna** \*\*\*\*\*(  
P. J. Kajenski, *Raytheon, United States*
- 259.4 **Accurate and Efficient Design of Double Post Substrate Integrated Waveguide Filters Using Simulators Based on Open Space Modal Expansions** \*\*\*\*\*(  
E. Diaz Caballero<sup>1</sup>, J. Morro<sup>1</sup>, H. Esteban<sup>1</sup>, A. Belenguer<sup>2</sup>, B. Vicente<sup>1</sup>  
<sup>1</sup>*Universitat Politecnica de Valencia, Spain*; <sup>2</sup>*Universidad de Castilla-La Mancha, Spain*
- 259.5 **Comparison of Differential Evolution and Cuckoo Optimization for Antenna Array Problems** \*\*\*\*\*(  
M. M. Stevanetic, D. I. Olcan, *University of Belgrade, Serbia*; B. M. Kolundzija, *WIPL-D, Serbia*
- 259.6 **Reducing the Size of MIMO Arrays Using Adjoint-Based Geometry Evolution** \*\*\*\*\*(  
M. Ghassemi, M. H. Bakr, *McMaster University, Canada*; N. Sangary, *Research In Motion (RIM), Canada*
- 259.7 **CEM Optimization of the HF Antennas Installations Onboard the Aircraft** \*\*\*\*\*(  
A. Saakian, *NAVAIR, United States*
- 259.8 **Efficient GA-Based Electromagnetic Optimization Using HDMR-Generated Surrogate Models** \*\*\*\*\*(  
A. C. Yucel, E. Michielssen, *University of Michigan, United States*
- 259.9 **On the Optimal Design of Non-Uniform Concentric Circular Antenna Arrays** \*\*\*\*\*(  
A. H. Sharaq, N. I. Dib, *Jordan University of Science and Technology, Jordan*
- 259.10 **A Design Procedure for Defected Ground Structure in Antenna Arrays Based on Genetic Algorithm** \*\*\*\*\*(  
H. Moghadas<sup>1,2</sup>, A. Tavakoli<sup>3</sup>  
<sup>1</sup>*University of Alberta, Canada*; <sup>2</sup>*TRLabs, Canada*; <sup>3</sup>*Amirkabir University of Tech., Iran*

## 260. Finite Difference Time Domain Techniques

Session Chairs: Fumie Costen, Mike Potter

- 260.1 Accuracy and Robustness of FDTD Simulation of Devices Characterized by Measured S-Parameters** ""B#5  
Y. Wang, S. Langdon, *Remcom, Inc., United States*
- 260.2 Using the FDTD Method to Accurately Model Staircased Thin Wires** ""B#5  
T. P. Montoya, *South Dakota School of Mines & Technology, United States*; G. S. Smith, *Georgia Institute of Technology, United States*
- 260.3 Huygens Absorbing Boundary Condition for the 3D FDTD Method** ""B#5  
H. Almeer, F. Costen, *University of Manchester, United Kingdom*; J.-P. Berenger, *Centre d'Analyse de Defense, France*
- 260.4 Parallel Implementation of 3D Locally One-Dimensional FDTD Method on Distributed Memory Architectures** ""B#5  
M. Mustafa, F. Costen, T. Hemmi, *The University of Manchester, United Kingdom*; S. G. Garcia, *University of Granada, Spain*
- 260.5 Development of Accurate and Efficient FDTD Dispersive Algorithm for Human Body in 400 MHz ~ 3 GHz** ""B#5  
S.-G. Ha<sup>1</sup>, J. Cho<sup>1</sup>, J. Choi<sup>1</sup>, Y. B. Park<sup>2</sup>, K.-Y. Jung<sup>1</sup>  
<sup>1</sup>*Hanyang University, South Korea*; <sup>2</sup>*Ajou University, South Korea*
- 260.6 FDTD Modeling of Graphene-Based RF Devices: Fundamental Aspects and Applications** ""B#5  
X. Yu, C. D. Sarris, *University of Toronto, Canada*
- 260.7 FDTD Method on a Lebedev Grid for Anisotropic Materials** ""B#5  
M. D. Nauta, M. E. Potter, M. Okoniewski, *University of Calgary, Canada*
- 260.8 FDTD Analysis of Stochastic Variations in Periodic Structures Using Periodic Boundary Conditions** ""B#5  
C. D. Sarris, J. Gu, *University of Toronto, Canada*
- 260.9 A Frequency Dependent 3D Locally One-Dimensional FDTD Method** ""B#5  
T. Hemmi, F. Costen, *The University of Manchester, United Kingdom*; S. G. Garcia, *University of Granada, Spain*
- 260.10 Investigation of anti-Aliasing Methods in FDTD Simulation of Electromagnetic Problems** ""B#5  
A. Eroglu, B. Westrick, *Purdue University Fort Wayne, United States*

## 261. Near-Field Techniques and Applications

Session Chairs: Kamal Sarabandi, Yuanxun Wang

- 261.1 **Antenna near-Field Coupling for Accurate RF Power Measurement of Radio Transmitters** \*\*\*\*B#  
J. Shen, *Aeroflex, Inc., United States*
- 261.2 **SAF Analysis of Antennas Operating in Complex near-Field (NF) Scattering Environments** \*\*\*\*\* &  
B. J. Cown, *GEMTECH Microwaves +, United States*; J. P. Estrada, *Satimo-USA, United States*
- 261.3 **Capacity Performance of an Inductively Coupled near-Field Communication Link** \*\*\*\*\* &  
U. Azad, Y. Wang, *University of California, Los Angeles, United States*
- 261.4 **Impact of Receiver Coil Misalignment on near-Field Communication System Performance** \*\*\*\*\* &  
U. Azad, Y. Wang, *University of California, Los Angeles, United States*
- 261.5 **Design of Radio Repeater System Using a Near-field Cancellation Technique** \*\*\*\*\* \$  
Y. J. Song, K. Sarabandi, *University of Michigan, United States*
- 261.6 **In-Phase Resonant Inductive Coupling for Multi-Layer Vertical Communication in 3D-ICs** \*\*\*\*\* &  
S. Han, D. D. Wentzloff, *University of Michigan, United States*
- 261.7 **Optimization Framework on Antenna Arrays for Near Field Multifocusing** \*\*\*\*\* (   
J. Alvarez, R. G. Ayestarán, G. León, J. A. López-Fernández, L. F. Herrán, F. Las-Heras, *University of Oviedo, Spain*
- 261.8 **A Preliminary Investigation of Miniature Loudspeaker High Frequency Resonance and Its Impact to Antenna Radiation Performance** \*\*\*\*\* \*  
X. L. Chen, N. Chavannes, N. Kuster, *ETH/ IT'IS Foundation for Research on Information Technologies in Society, Switzerland*; G. H. Ng, Y. S. Tay, *AAC Technologies Pte Ptd, Singapore*
- 261.9 **SAR of Interleaved Excitation of an MRI Array**\*\*\*\*\* ,  
M. Kozlov, R. Turner, *Max Planck Institute for Human Cognitive and Brain Sciences, Germany*
- 261.10 **Broadband, Efficient Small Antennas and MIMO for Near Field Communication Systems** \*\*B#  
R. B. Gottula, K. F. Warnick, *Brigham Young University, United States*

## 262. Reflectarrays

Session Chairs: Fan Yang, Jianfeng Li

### 262.1 Beam-Scanning Reflectarray Antennas: an Overview''B#

P. Nayeri, F. Yang, A. Z. Elsherbeni, *The University of Mississippi, United States*

### 262.2 An Investigation of Beam Squint in Offset-Fed Reflectarrays ''B#

E. Almajali, D. McNamara, *University of Ottawa, Canada*; J. Shaker, M. R. Chaharmir, *Communications Research Centre Canada, Canada*

### 262.3 Feed-Image Lobes in Offset-Fed Reflectarrays''B#

E. Almajali, D. McNamara, *University of Ottawa, Canada*; J. Shaker, M. R. Chaharmir, *Communications Research Centre Canada, Canada*

### 262.4 A Varactor-Loaded Cross Dipole Unit Cell for Circularly Polarized Beam-Steering Reflectarray ''B#

W.-T. Hung, S.-Y. Chen, *National Taiwan University, Taiwan*

### 262.5 Experimental Investigation of Elimination Blindness Propagation Channel Using Reflectarray ''\* ( \$

Q. Chen, J. Li, Y. Kurihara, K.-H. Chen, K. Sawaya, *School of Engineering, Tohoku University, Japan*; Q. Yuan, *Sendai National College of Technology, Japan*; N. Tran, Y. Oda, *NTT DOCOMO, INC., Japan*

### 263. Advances in Integral Equation Methods

Session Chairs: Levent Gurel, Branislav Notaros

- 263.1 IE Analysis of Scattering from Multilayered Doubly Periodic Array of 3-D General Objects Using Equivalence Principle and Connection Scheme** \*\* ( & F.-G. Hu, *Temasek Labs @NUS, Singapore*; J. Song, *Iowa State University, USA*; T. Kamgaing, *Intel Corporation, USA*)
- 263.2 Efficient Higher Order Volume-Integral-Equation Modeling of Dielectric Scatterers** \*\*\*\* ( ( E. Chobanyan<sup>1</sup>, M. Ilic<sup>2</sup>, M. Djordjevic<sup>3</sup>, B. Notaros<sup>1</sup> <sup>1</sup>Colorado State University, United States; <sup>2</sup>University of Belgrade, Serbia; <sup>3</sup>ICT College, Serbia)
- 263.3 Analysis of Linear Antenna near Dielectric Object by CBFM** \*\*\*\*\* ( \* K. Konno, Q. Chen, K. Sawaya, *Graduate School of Engineering, Tohoku University, Japan*; T. Sezai, *Japan Aerospace Exploration Agency, Japan*)
- 263.4 A Nyström Solution of the Quasi-Magnetostatic Volume Integral Equation for Eddy Current Analysis** \*\*\*\* ( , J. C. Young, S. D. Gedney, R. J. Adams, *University of Kentucky, United States*)
- 263.5 Analysis and Augmentation of the Duffy Transformation for Near-Singular Integrals** \*\*\*\*) \$ M. M. Botha, *University of Stellenbosch, South Africa*)
- 263.6 Parallel-MLFMA Solutions of Large-Scale Problems Involving Composite Objects** \*\*\*\*) & O. Ergul<sup>1</sup>, L. Gurel<sup>2,3</sup> <sup>1</sup>University of Strathclyde, United Kingdom; <sup>2</sup>Bilkent University, Turkey; <sup>3</sup>Bilkent University Computational Electromagnetics Research Center (BiLCER), Turkey)
- 263.7 Characterization of Wave Physics Using the Rigorous Helmholtz Decomposition Based on the Surface Integral Equation** \*\*\*\*) ( X. Y. Z. Xiong, W. E. I. Sha, L. J. Jiang, *The University of Hong Kong, China*)
- 263.8 Efficient Analysis of Finite Antenna Arrays Using the Domain Green's Function Method** \*\*\*\*) \* D. J. Ludick, U. Jakobus, *EM Software & Systems - S.A. (Pty) Ltd, South Africa*; D. B. Davidson, *University of Stellenbosch, South Africa*)
- 263.9 FDTD vs. AIM for Bioelectromagnetic Analysis** \*\*\*\*) , C. S. Geyik, F. Wei, J. W. Massey, A. E. Yilmaz, *University of Texas at Austin, United States*)

## 264. Finite-Element Methods: Theory and Applications

Session Chairs: Valentin de la Rubia, John Volakis

- 264.1 Convergence of a Fully Overlapping Domain Decomposition Method** ""B#5  
T. Peng, K. Sertel, J. L. Volakis, *ElectroScience Laboratory, The Ohio State University, United States*
- 264.2 Singular, Hierarchical Vector Bases of the Additive Kind for FEM Applications** ""B#5  
R. D. Graqlia, *Politecnico di Torino, Italy*; A. F. Peterson, *Georgia Institute of Technology, USA*
- 264.3 Direct Domain Decomposition Finite Element Method for Designing Patch Antennas** ""B#5  
B. El Jaafari, M. A. González, J. García-Jiménez, J. Zapata, *Universidad Politécnica de Madrid, Spain*
- 264.4 Reliable Fast Frequency Sweep of Microwave Circuits Getting Rid of Non-Physical Resonances via the Reduced-Basis Method** ""B#5  
V. de la Rubia, *Universidad Politécnica de Madrid, Spain*
- 264.5 Hybrid Finite Element Method and Boundary Integration Method for an Anisotropic Body of Revolution** ""B#5  
Z. Yu<sup>1</sup>, X. Rui<sup>2</sup>, J. Hu<sup>2</sup>, Q. H. Liu<sup>1</sup>  
<sup>1</sup>*Duke University, United States*; <sup>2</sup>*UESTC, China*
- 264.6 FOSLL\* Finite Element Method for Picard's Extended System of Time Harmonic Maxwell's Equations in 2D** ""B#5  
J. Kataja, *Aalto University, Finland*
- 264.7 On the Local Preconditioning of FETI-DOP** ""B#5  
G. N. Paraschos, M. N. Vouvakis, *University of Massachusetts, United States*
- 264.8 Combined Quadtree/Delaunay Method for Mesh Generation** ""B#5  
S. Tang, M. Vouvakis, *University of Massachusetts at Amherst, United States*
- 264.9 Multi Right Hand Side Optimization for FETI Domain Decomposition Method Applied to the Calculation of Large and Finite Phased Array Antennas** ""B#5  
A. Barka, F.-X. Roux, *ONERA The French Aerospace Lab, France*
- 264.10 Application of the LU Recombination Method to the Dual-Primal Finite Element Tearing and Interconnecting Method for Solving Low-Frequency Breakdown Problems** ""B#5  
W. Yao, J.-M. Jin, *University of Illinois at Urbana-Champaign, United States*



## 265. Wideband and Multiband Dielectric Resonator Antennas

Session Chairs: Yahia Antar, Aldo Petosa

- 265.1 Mutual Coupling Reduction in a Multi-Mode Multi-Function Dielectric Resonator Antenna** \*\*\*\* \* \$  
L. Zou, C. Fumeaux, *The University of Adelaide, Australia*
- 265.2 Compact Wideband Low Permittivity RDR Antenna Using Double Parasitic Metallic Strips for Ku-Band Applications** \*\*\*\* \* &  
E. K. I. Hamad, H. A. Atallah, *South Valley University, Egypt*; A. Z. Elsherbeni, *University of Mississippi, USA*
- 265.3 F YH ]b ]b[ -bH^ ] [ YbWZGi fj Y]`UbVWZUbX`FYWtbbUjggUbVW]b`UK ]fY`Ygg7 cbbYVWYX`K cf X`\*\*\*\* \* (   
ÓÉS^ \) cAU]E@^c**
- 265.4 An Appraisal of the Characteristic Modes of Dielectric Objects** \*\*\* B#5  
H. Alroughani<sup>1</sup>, J. L. Ethier<sup>1,2</sup>, D. A. McNamara<sup>1</sup>  
<sup>1</sup>*University of Ottawa, Canada*; <sup>2</sup>*Communications Research Centre Canada, Canada*
- 265.5 A Novel Triple-Band Cylindrical Dielectric Resonator Antenna Using Varying Permittivity in  $\phi$ -Direction** \*\*\*\* \*  
R. K. Chaudhary, K. V. Srivastava, A. Biswas, *Indian Institute of Technology Kanpur, INDIA, India*
- 265.6 A New Low-Loss and Efficient Excitation Method for Low-Permittivity Dielectric Resonator Antennas** \*\*\*\* \* ,  
A. Rashidian<sup>1</sup>, D. M. Klymyshyn<sup>2</sup>, L. Shafai<sup>1</sup>  
<sup>1</sup>*University of Manitoba, Canada*; <sup>2</sup>*University of Saskatchewan, Canada*
- 265.7 Rectangular Hybrid DRA for Ultra-Wideband Applications** \*\*\*\* \* +\$  
H. R. Gorla<sup>1</sup>, M. R. Khan<sup>2</sup>, M. Morsy<sup>3</sup>, F. J. Harackiewicz<sup>1</sup>, D. W. Addison<sup>1</sup>  
<sup>1</sup>*Southern Illinois University Carbondale/IEEE student member, United States*; <sup>2</sup>*University of Saskatchewan, Canada*; <sup>3</sup>*University of Tabuk, Saudi Arabia*
- 265.8 Investigation of a Cylindrical Dielectric Resonator Antenna Excited with a Higher Order Mode** \*\*\*\* \* +&  
D. Guha, A. Banerjee, *University of Calcutta, India*; C. Kumar, *ISRO Satellite Centre, India*; Y. M. M. Antar, *Royal Military College, Canada*
- 265.9 Design of Compact UWB Dielectric Resonator Antennas** \*\*\*\* \* +(   
Y. Ge, W. Tang, H. Zhang, *Huaqiao University, China*
- 265.10 Aesthetic Transparent Dielectric Resonator Antenna with Omnidirectional Radiation Pattern** \*\*\*\* \* +\*  
X. S. Fang, K. W. Leung, *City University of Hongkong, China*
- 265.11 Dual Polarized Rectangular DRA for 3GPP** \*\*\*\* \* +,  
P. Li, M. E. Ermutlu, J. Pan, *UESTC, China*

## 266. RF/Microwave Technology for Cancer Detection and Treatment

Session Chairs: Susan Hagness, Magda El-Shenawee

- 266.1 Breast Cancer Detection Utilizing Brillouin Precursors at Microwave Frequencies** \*\*\*\*, \$  
M. Dawood, *New Mexico State University, United States*; H. U. R. Mohammed, *Texas Instruments Inc., United States*; A. V. Alejos, *University of Vigo, Spain*
- 266.2 Minimally-Invasive Antennas for Microwave Cancer Ablation of Osteosarcoma** \*\*\*\* B#5  
E. S. Gamez, C. J. Cela, K. Loizos, D. Y. Furgeson, G. Lazzi, *University of Utah, United States*
- 266.3 Beamspace Based Time Reversal Processing for Breast Cancer Detection** \*\*\*\*, &  
A. Sanagavarapu Mohan, M. D. Hossain, M. J. Abedin, *University of Technology Sydney, Australia*
- 266.4 A Diagnosis for Microwave Imaging of the Breast** \*\*B#5  
J. M. Lee, H. J. Kim, S. H. Son, S. I. Jeon, H. D. Choi, *ETRI, South Korea*
- 266.5 Development of a Hyperthermia Applicator with Compact Microstrip Antennas** \*\*\*\*, (   
O. Isik, E. Korkmaz, S. Kara, M. A. Nassor, *Fatih University, Turkey*; B. Turetken, *TUBITAK, Turkey*

## 267. Reflectarray systems and applications

Session Chairs: Giovanni Toso, Sembiam Rengarajan

- 267.1 High-Gain Beam-Scanning Reflectarray Antennas Using an Active-Feed Scheme** \*\*\*\*, \*  
P. Naveri, F. Yang, A. Z. Elsherbeni, *The University of Mississippi / Student, United States*
- 267.2 Scanning Properties of Faceted Reflectarrays** \*\*\*\*, ,  
S. R. Rengarajan, *California State University, United States*
- 267.3 Design of Dual-Polarized Contoured Beam Reflectarrays with Cross-Polar and Sidelobe Suppression** \*\*\*\*\* - \$  
M. Zhou<sup>1,2</sup>, S. B. Sørensen<sup>1</sup>, P. Meincke<sup>1</sup>, E. Jørgensen<sup>1</sup>, O. S. Kim<sup>2</sup>, O. Breinbjerg<sup>2</sup>, G. Toso<sup>3</sup>  
<sup>1</sup>TICRA, Denmark; <sup>2</sup>Technical University of Denmark, Denmark; <sup>3</sup>ESA-ESTEC, The Netherlands
- 267.4 Ka-Band Reflectarray for Interferometric SAR Altimeter** \*\*\*\*\* - &  
R. E. Hodges, M. S. Zawadzki, *Jet Propulsion Laboratory, United States*
- 267.5 Printed Reflector for Ka-Band Applications** \*\*\*\*\* - (   
P. Ratajczak, P. Brachat, *Orange Labs, France*; J.-M. Baracco, *Mardel, France*; G. Toso, *ESA/ESTEC, The Netherlands*
- 267.6 On the Scanning Properties of a Confocal Dual Reflector Antenna System** \*\*B#5  
F. Pelorossi<sup>1,2</sup>, B. Tsonevska<sup>1</sup>, G. Toso<sup>1</sup>, P. Angeletti<sup>1</sup>, F. Frezza<sup>2</sup>  
<sup>1</sup>European Space Agency, Netherlands; <sup>2</sup>Università di Roma La Sapienza, Italy

### 301. Electromagnetic Bandgap Materials 1

Session Chairs: Amir Zaghoul, Keith Whites

- 301.1 A Method for Determining Optimal EBG Reflection Phase for Low Profile Antennas \*\*\*\*\* - \***  
I. T. McMichael, *US Army RDECOM CERDEC NVESD, United States*; M. Mirotznik, *The University of Delaware, United States*; A. I. Zaghoul, *US Army Research Laboratory, United States*
- 301.2 Experimental 2D Characterization of the Electromagnetic Field Distribution Scattered by an EBG Cylinder \*\*\*\*\* - ,**  
L. Matekovits, G. Dassano, M. Orefice, *Politecnico di Torino, Italy*
- 301.3 Versatile Design Technique for Customizable Electromagnetic Band Gap Structures \*\*\*+\$\$**  
S. H. Martin, D. H. Werner, *The Pennsylvania State University, United States*; M. Bray, E. Lier, B. Cleaveland, *Lockheed Martin Corporation, United States*
- 301.4 EBG Dielectric-Resonator Antenna with Reduced Back Radiation for Millimeter-Wave Applications \*\*\*+\$\$&**  
M. J. Al-Hasan, T. A. Denidni, *INRS, University of Quebec, Canada*; A.-R. Sebak, *Concordia University, Canada*
- 301.6 A Low Profile Efficient Leaky-Wave Antenna Composed of High Aspect Ratio EBG Unit Cells \*\*\*B#**  
M. Hosseini, D. M. Klymyshyn, *University of Saskatchewan, Canada*
- 301.7 A Simple EBG Structure for Dual-Band Circularly Polarized Antennas with High Directivity \*\*\*\*+\$(**  
B. A. Zeb, K. P. Esselle, *Macquarie University, Australia*
- 301.8 Isolation Enhancement Between Microstrip Patch Antennas Using Dual-Band EBG Structure Without Common Ground Plane \*\*\*\*+\$\$\***  
H. M. Lee, W. S. Choi, *Kyonggi University, South Korea*
- 301.9 Multiple Fork-like EBG Structure and Its Analysis as Artificial Magnetic Conductor \*\*\*B#**  
M. M. Fakharian, P. Rezaei, *Department of Electrical and computer Engineering, Semnan University, Iran*

## 302. Design and Analysis of Dielectric Resonator Antennas

Session Chairs: Satish Sharma, Stuart Long

- 302.1 New Excitation for Cubic Dielectric Resonator Antenna to Produce Omnidirectional Pattern** \*\*\*\*B#  
M. Yazdani, [M. A. EL Sabbagh](#), *Syracuse University, United States*
- 302.2 Comparative Study of Gain Enhancement of a Dielectric Resonator Antenna Using Three Superstrates for Millimeter-Wave Applications** \*\*\*+&,  
[Y. Coulibaly](#)<sup>1</sup>, M. Nedil<sup>1</sup>, A. Hagra<sup>2</sup>, D. Hammou<sup>1</sup>, L. Talbi<sup>3</sup>, T. A. Denidni<sup>2</sup>  
<sup>1</sup>UQAT-LRTCS, Canada; <sup>2</sup>Institut National de la Recherche Scientifique (INRS), Canada; <sup>3</sup>Université du Québec en Outaouais, Canada
- 302.3 Cylindrical Dielectric Resonator Antenna Designs That Have Reduced Lateral Radiation** \*\*\*\*+&#  
[A. P. Huynh](#), D. R. Jackson, S. A. Long, D. R. Wilton, *University of Houston, United States*
- 302.4 Beam Focussing Properties of Circular Array Antenna by Employing Dielectric Resonator Antennas** \*\*\*\*+&#  
M. Garg, [S. K. Sharma](#), *San Diego State University, United States*
- 302.5 Model Management for Efficient EM-Simulation-Driven Design of Dielectric Resonator Antennas** \*\*\*\*+&#  
[S. Koziel](#), S. Ogurtsov, *Reykjavik University, Iceland*
- 302.6 Radiation Pattern Redirection Based on Mode Degeneracy in Cubic Dielectric Resonator Antenna** \*\*\*\*B#  
M. Yazdani, [M. A. EL Sabbagh](#), *Syracuse University, United States*
- 302.7 Improvement of Aperture Coupling in SIW-Fed DRA Using Embedded Metallic Posts** \*\*\*\*+&#  
[W. M. Abdel-Wahab](#), S. Safavi-Naeini, *University of Waterloo, Canada*
- 302.8 Characterization of Defected Ground Structure to Be Used Between Two DRA Array Elements for Suppressing the Mutual Coupling** \*\*\*\*+&#  
[D. Guha](#), *University of Calcutta, India*; S. Biswas, *Institute of Technology and Marine Engineering, India*
- 302.9 High-Gain Hybrid Monopole Dielectric Resonator Antenna** \*\*\*+&#  
[Y. Gao](#), Z. Feng, *Tsinghua University, China*

### 303. Flexible 2D and 3D Printed Antennas

Session Chairs: Cynthia Furse, Manos Tentzeris

Session Organizers: Reyhan Baktur, Cynthia Furse

#### 303.1 A Look at the Future of 3D Printed Antennas ""B#5

B. Willis, *L3 Communications, United States*; C. M. Furse, *University of Utah, United States*

#### 303.2 Inkjet-Printed Planar Antenna for a Wireless Sensor on Paper Operating at Wi-Fi Frequency ""+&&

S. R. Palacios<sup>1</sup>, S. Kim<sup>1</sup>, S. Elia<sup>1</sup>, A. Rida<sup>1</sup>, S. Nikolaou<sup>2</sup>, M. Tentzeris<sup>1</sup>  
<sup>1</sup>*Georgia Institute of Technology, United States*; <sup>2</sup>*Frederick University, Cyprus*

#### 303.3 Embroidered Textile Circuits for Microwave Devices ""+&{

L. Zhang, Z. Wang, J. L. Volakis, *The Ohio State University, United States*

#### 303.4 Inkjet Printed 95% Transparent Meshed Antennas Integrated on a Two-Cell Solar Panel

J. A. Arellano, R. Baktur, T. Yasin, *Utah State University, United States*

#### 303.5 GSM and Wi-Fi Textile Antenna for High Data Rate Communications ""+&\*

Z. Wang, L. Zhang, D. Psychoudakis, J. L. Volakis, *The Ohio State University, United States*

#### 303.6 Comparison of Two Planar Elliptical Ultra-Wideband PPy Conductive Polymer Antennas ""+&

T. Kaufmann<sup>1</sup>, A. Verma<sup>1</sup>, S. F. Al-Sarawi<sup>1</sup>, V.-T. Truong<sup>2</sup>, C. Fumeaux<sup>1</sup>  
<sup>1</sup>*The University of Adelaide, Australia*; <sup>2</sup>*Defence Science and Technology Organisation (DSTO) Melbourne, Australia*

#### 303.7 Inkjet Printed S-Band and L-Band Antenna Arrays Wrapped on a Cylinder ""B#5

M. Maimaiti, R. Baktur, *Utah State University, United States*

#### 303.8 Wearable Textile Antennas for Low UHF Applications""B#5

M. Orefice, P. Pirinoli, G. Vietti, *Politecnico di Torino, Italy*

#### 303.9 Major Factors Restricting Bandwidth Performance in Antenna Array Feed Network Printed on Flexible Membranes and Made with Foam Substrate""B#5

P. Kabacik, M. Hofman, *Wroclaw University of Technology, Poland*

### 304. Future Trends in Radar

Session Chairs: Lorenzo Lo Monte, Gary Scalzi, Jon Sjogren

Session Organizers: Lorenzo Lo Monte, Gary Scalzi

#### 304.1 Implications of Current Radar Research on Antennas and Propagation \*\*\*+ \$

G. J. Scalzi, *Air Force Research Laboratory, United States*

#### 304.2 Human Thermal Emissions and Their Exploitation in Passive Microwave Radar\*\*\*\*+ &

R. Vela, *University of Dayton Research Institute, United States*; R. M. Narayanan, *The Pennsylvania State University, United States*; R. L. Ewing, *Air Force Research Laboratory, USA*

#### 304.3 Polyomino Subarraying Through Genetic Algorithms \*\*\*+ (

P. Rocca, R. Chirikov, *ELEDIA Research Center - University of Trento, Italy*; R. J. Mailloux, *Arcon Corporation, USA*

#### 304.4 Target-Adaptive Radar Pulse-Train Optimization \*\*\*\*+ \*

A. C. O'Connor, *Sensors Directorate, United States*; R. Vela, L. Lo Monte, *University of Dayton Research Institute, United States*

#### 304.5 On the Detection of Weak Targets that Exhibit Partial-Coherence \*\*\*\*+',

J. P. Browning, *Air Force Research Laboratory, USA*; H. D. Griffiths, *University College London, UK*; C. J. Baker, *The Ohio State University, USA*; M. C. Wicks, *University of Dayton Research Institute, OH*

#### 304.6 Rediscovering Monopulse Radar with Digital Sum-Difference Beamforming \*\*\*+(\$

L. Lo Monte, R. Vela, *University of Dayton Research Institute, United States*; L. Westbrook, *Air Force Research Laboratory, United States*

#### 304.7 Range-Doppler-Angle Ambiguity Function Analysis in Modern Radar \*\*\*\*+(&

M. C. Wicks, L. Lo Monte, R. Vela, *University of Dayton, United States*

#### 304.8 Virtual Beamforming with Multiple Input Multiple Output (MIMO) Radar\*\*B#

H. Deng, *Florida International University, USA*; B. Himed, *Air Force Research Laboratory, Wright-Patterson AFB, USA*

#### 304.9 Software Defined, Plug-and-Play (PNP) Radar Transceiver for Phased-Array Applications \*\*\*\*+('

J. P. Browning, *Air Force Research Laboratory, United States*; A. Bhat, A. Feinberg, C. Lin, *Intelligent Automation, Inc., United States*; R. C. Mone, E. L. Turner, M. D. Tracy, *Lockheed Martin, United States*

#### 304.10 Cramér-Rao Bound Analysis for Target Range and Angle of Arrival Estimation Using Multipath Exploitation with a Single Antenna Radar \*\*B#

H. T. Hayvaci, P. Setlur, N. Devroye, D. Erricolo, *University of Illinois at Chicago, United States*

### 305. Phased Array Antennas I

Session Chairs: Andrea Massa, Kubilay Sertel

- 305.1 A Structurally Integrated Wide Band UHF Array on a Flying Wing\*\*\*\*+()**  
S. Livingston, G. Shows, J. Lee, *Raytheon Co., United States*; B. Chiou, *Bell Helicopter Textron, US*; K. A. Hunten, *Lockheed Martin Aeronautics, US*
- 305.2 Holography-Based Phased-Array Antenna Imaging Systems \*\*\*\*+ (+**  
E. C. Ngai, *Hann-Jann, United States*
- 305.3 Circuit Model Based Optimization of Ultra-Wideband Arrays\*\*\*\*+(-**  
E. A. Alwan, K. Sertel, J. L. Volakis, *The Ohio State University, Electroscience Laboratory, United States*
- 305.4 A 6.3:1 Bandwidth Scanning Tightly Coupled Dipole Array with Co-Designed Compact Balun\*\*\*\*+) %**  
J. P. Doane, K. Sertel, J. L. Volakis, *The Ohio State University, United States*
- 305.5 Circular Sparse Arrays with Quantized Weights \*\*\*\*+)'**  
P. Angeletti, G. Toso, *European Space Agency, Netherlands*
- 305.6 Ka-Band Active Sparse Arrays for SATCOM Applications\*\*\*\*+)**  
A. Catalani, L. Russo, *Space Engineering SpA, Italy*; O. M. Bucci, *Università "Federico II", Italy*; T. Isernia, *Università Mediterranea, Italy*; G. Toso, P. Angeletti, *European Space Agency, Netherlands*
- 305.7 Synthesis of Planar Arrays Through Bayesian Compressive Sensing \*\*\*\*+) +**  
G. Oliveri, M. Carlin, A. Massa, *ELEDIA Research Center - University of Trento, Italy*
- 305.8 Analysis of Infinite Phased Array Antennas with Gaussian Excitation Weightings \*\*\*\*+) -**  
H.-T. Chou, *Yuan Ze University, Taiwan*; S.-C. Tuan, *Oriental Institute of Technology, Taiwan*
- 305.9 General Analysis of Floquet Modes for an One-Dimensional, Infinite Phased Array Antennas \*\*\*\*+\* %**  
H.-T. Chou<sup>1</sup>, S.-C. Tuan<sup>2</sup>, L.-R. Kuo<sup>1</sup>  
<sup>1</sup>*Yuan Ze University, Taiwan*; <sup>2</sup>*Oriental Institute of Technology, Taiwan*
- 305.10 Synthesis of Thinned Uniformly-Excited Time-Modulated Linear Arrays Using an Improved Invasive Weed Optimization Algorithm \*\*\*\*+\*'**  
R. Bhattacharya, S. Saha, T. K. Bhattacharyya, *Indian Institute of Technology Kharagpur, India*

### 306. Electromagnetic Imaging for Breast Cancer Detection

Session Chairs: Susan Hagness, Ovidio Bucchi

**306.1 UWB Magnitude Combined Realistic Breast Model Imaging Capabilities \*\*\*\*+\*)**

M. Guardiola, L. Jofre, J. Romeu, *UPC, Spain*

**306.2 Microwave Breast Imaging Using an Enclosed Array of Multi-Band Miniaturized Patch Antennas \*\*\*\*B#**

M. J. Burfeindt, J. D. Shea, A. M. Weiss, N. Behdad, B. D. Van Veen, S. C. Hagness, *University of Wisconsin-Madison, United States*

**306.3 3D Nonlinear Inversion of Realistic Phantoms with Time-Domain Data \*\*\*\*B#**

G. Chen, M. Ali, M. Moghaddam, *University of Southern California, United States*

**306.4 Average Property Estimation of Breast Tissue: the Use of Time-Gating and Antenna Compensation Techniques \*\*\*\*B#**

J. D. Garrett, J. Bourqui, E. Fear, *University of Calgary, Canada*

**306.5 Estimation of regional geometric and spatially averaged dielectric properties of an object \*\*\*\*+\* +**

D. J. Kurrant, E. C. Fear, *University of Calgary, Canada*

**306.6 Terahertz Tomography Technique for the Assessment of Breast Cancer Tumor Margins \*\*\*\*B#**

A. M. Hassan<sup>1</sup>, D. C. Hufnagle<sup>2</sup>, G. E. Pacey<sup>3,4</sup>, M. El-Shenawee<sup>1</sup>

<sup>1</sup>*University of Arkansas, United States;* <sup>2</sup>*Miami University, Unites States;* <sup>3</sup>*Ohio Wright Center for Innovation (IDCAST), Unites States;* <sup>4</sup>*University of Dayton Research Institute, Unites States*

**306.7 Contrast-Enhanced Microwave Imaging of Breast Tumors Using Sparsity Regularization \*\*\*\*+\* -**

F. Gao, B. D. Van Veen, S. C. Hagness, *University of Wisconsin-Madison, United States*

**306.8 Feasibility Study of a Novel Microwave Breast Cancer Imaging Approach Exploiting Magnetic Nanoparticle as Contrast Agents \*\*\*\*+\*%**

O. M. Bucchi, G. Bellizzi, *University of Naples, Italy;* L. Crocco, C. Ilaria, S. Rosa, *CNR, Italy*

**306.9 Contrast-Enhanced Breast Cancer Detection Using Dynamic Microwave Imaging \*\*\*\*+\*'**

M. Klemm, *University of Bristol, United Kingdom*

**306.10 Complex Natural Resonances of Dielectric Objects Embedded in Inhomogeneous Breast Models \*\*\*\*+\*+)**

F. Yang, A. M. Sanagavarapu, *University of Technology Sydney, Australia*



### 307. Microstrip Circuits I

Session Chairs: Dimitris Anagnostou, George Eleftheriades

- 307.1 Design of a Miniaturized Branch Line Coupler Using Common Defected Ground Structure** \*\*\*++  
J. Lim, J. Lee, Y. Jeon, K. Kwon, S.-M. Han, D. Ahn, *Soonchunhyang University, South Korea*; Y. Jeong, *Chonbuk National University, South Korea*
- 307.2 A Novel Heptagonal Microstrip Rat-Race Hybrid Coupler with Harmonic Suppression and Size Reduction** \*\*\*\*+-  
W. Song, H. Deguchi, M. Tsuji, *Doshisha University, Japan*
- 307.3 Low Loss H-Shape SIW Hybrid Coupler for Millimeter-Wave Phased Arrays Antenna Systems** \*\*\*\*+, %  
W. M. Abdel-Wahab, S. Safavi-Naeini, *University of Waterloo, Canada*
- 307.4 Exponentially-Decaying Traveling-Wave Resonators by Coupled Positive-Index/Negative-Index Guides** \*\*\*+, '  
H. Mirzaei, G. V. Eleftheriades, *University of Toronto, Canada*
- 307.5 Tunable Bandpass and Bandstop Filter Cascade for Dynamic Pole Allocation** \*\*\*+, )  
H. H. Sigmarsson, *University of Oklahoma, United States*; E. J. Naglich, J. Lee, D. Peroulis, W. J. Chappell, *Purdue University, United States*
- 307.6 Sectoral Horn Printed Power-Combiner** \*\*\*\*B#  
L. Boccia, A. Emanuele, E. Arneri, A. Shamsafar, G. Amendola, *University of Calabria, Italy*
- 307.7 CCITL Implementation Using Two-Section Microstrip Transmission Lines** \*\*\*\*+, +  
S. Limsaengruchi, R. Silapunt, D. Torrungrueng, *King Mongkut's University of Technology Thonburi, Thailand*
- 307.8 Design and Analysis of Dual-Band Unequal-Split Bagley Power Dividers** \*\*\*\*+, -  
O. A. Abu-Alnadi, N. I. Dib, *Jordan University of Science and Technology, Jordan*
- 307.9 Tri-Band Branch-Line Coupler with T-Type and Additional Port Impedance Transformers** \*\*\*\*+-%  
F. Lin, Q.-X. Chu, *School of Electronic and Information Engineering, South China University of Technology, China*
- 307.10 Design and Analysis of a 3-Way Unequal Split Ultra-Wideband Wilkinson Power Divider** \*\*\*\*+, '  
D. F. Hawatmeh<sup>1</sup>, K. A. Al Shamaileh<sup>2</sup>, N. I. Dib<sup>1</sup>  
<sup>1</sup>*Jordan University of Science and Technology, Jordan*; <sup>2</sup>*Waseela for Integrated Telecommunications Solutions, Jordan*

### 308. Scattering by Random or Complex Media

Session Chairs: Silvio Barbin, ismail jouny

#### 308.1 Scattering Features for Target Recognition Using Finite Rate of Innovation Model \*\*\*\*+ )

I. I. Jouny, Lafayette college, United States

#### 308.2 Scattering from an Object above a Rough Surface Using the Extended PILE Method Hybridized with PO Approximation \*\*\*\*+ +

M. Kouali, C. Bourlier, IETR, France; G. Kubické, DGA Information Superiority, France

#### 308.3 Scattering from Spherical Particles with Negative Permeability \*\*\*\*+ -

Z. Ren, O. M. Ramahi, University of Waterloo, Canada

#### 308.4 Estimation of Side-Hole Location Using Circular Wavefront of Scattering Waves Visualized by Pulsed Laser Scanning\*\*\*\*, \$%

T. Yamamoto<sup>1</sup>, H. Tsuda<sup>1</sup>, J. Takatsubo<sup>1,2</sup>

<sup>1</sup>National Institute of Advanced Industrial Science and Technology (AIST), Japan; <sup>2</sup>Tsukuba Technology Co., Ltd., Japan

#### 308.5 Nystrom Solutions of Electromagnetic Scattering by Inhomogeneous Anisotropic Objects \*\*, \$'

Y. W. Gu, M. S. Tong, Tongji University, China

#### 308.6 Combined Double Frequency Profiling of Microstructure Rain Parameters \*\*, \$)

A. Linkova, G. Khlopov, O. Voitovych, A. Kogut, G. Rudnev, Y. Belov, S. Khomenko, Usikov Institute of Radiophysics and Electronics of National Academy of Sciences of Ukraine, Ukraine

#### 308.7 A Study of Wave Coefficients as Target Signature for Identification \*\*, \$+

X. Jiang, Peking University, China; M. Xia, University of Electronic Science and Technology of China, China

#### 308.8 Scattering of an Object above a Rough Surface with Impedance Boundaries Using IPO and FMM \*\*\*\*, \$-

M. Dehmollaian, H. Biglary, University of Tehran, Iran

#### 308.9 On the Implementation of the Method of Moments for Solving Volume Integral Equations with Inhomogeneous Dielectric Media \*\*\*\*, %%

Z. Y. Zhu, W. T. Sheng, M. S. Tong, Tongji University, China

#### 308.10 RCS of a Target above a Random Rough Surface with Impedance Boundaries Using GO and PO Methods \*\*, %

H. Biglary, M. Dehmollaian, University of Tehran, Iran

### 309. Measurements of Antennas and Wireless Systems

Session Chairs: Tapan Sarkar, Michael Francis

- 309.1 **Validation of the Slepian Approach to Truncation-Error Reduction in Spherical Near-Field Scanning** <sup>\*\*\*\*</sup>, %  
K. T. Kim, *Air Force Research Laboratory, United States*
- 309.2 **Probe Pattern Inaccuracy in Fully Probe Corrected Multilevel Plane Wave Based near-Field Far-Field Transformed Planar near-Field Measurements** <sup>\*\*\*</sup>, %  
M. A. Qureshi, C. H. Schmidt, T. F. Eibert, *Technische Universität München, Germany*
- 309.3 **Sub Spectra Representation of Antennas for Plane Wave Based Near-Field Far-Field Transformation at Short Measurement Distances** <sup>\*\*\*\*</sup>, %  
C. H. Schmidt, T. F. Eibert, *Technische Universität München, Germany*
- 309.4 **Estimating Far-Field Errors Due to Mechanical Errors in Spherical near-Field Scanning** <sup>\*\*\*\*</sup>, &%  
M. H. Francis, *National Institute of Standards and Technology, United States*
- 309.5 **Retrieval of Free Space Radiation Pattern Through Non-Anechoic Data** <sup>\*\*\*\*</sup>, &  
W. Zhao, M. HongSik, T. K. Sarkar, *Syracuse University, United States*
- 309.6 **Accuracy Improvement of a Positioning System by Using Software Algorithms** <sup>\*\*\*B#</sup>  
J. R. Almagro Clemente<sup>1</sup>, L. Hernandez García<sup>1</sup>, J. Carrillo Melo<sup>2</sup>, F. Cátedra Pérez<sup>1</sup>  
<sup>1</sup>*University of Alcalá, Spain;* <sup>2</sup>*Omron Europe, Spain*
- 309.7 **An Effective Algorithm for the Synthesis of a Plane Wave Generator for Linear Array Testing** <sup>\*\*\*\*</sup>, &  
O. M. Bucci, *Naples University "Federico II", Italy;* M. D. Migliore, G. Panariello, D. Pinchera, *University of Cassino, Italy*
- 309.8 **Evaluation of Laboratory Equipments as Channel Sounding System for Mobile Radio Propagation** <sup>\*\*\*\*</sup>, &  
Y. H. Lee, *Nanyang Technological University, Singapore;* Y. S. Meng, *National Metrology Centre, A\*STAR, Singapore*
- 309.9 **Small-Scale Fading Determination with a Ray-Tracing Model, and Statistics of the Field** <sup>\*\*\*</sup>, &-  
T. F. C. Leao, C. W. Trueman, *Concordia University, Canada*
- 309.10 **Implementation and Measurement of Millimeter-Wave on-Chip Multi-Antenna Systems with High Isolation** <sup>\*\*\*</sup>, ' %  
K. Payandehjoo, R. Abhari, *McGill University, Canada*

### 310. UWB Antennas in Communications

Session Chairs: Wajih Elsallal, Yazid Yusuf

- 310.1 Experimental Characterization of the Underground UWB Channel** \*\*\*\*, \*\*  
M. M. Moutairou, G. Y. Delisle, N. Kandil, *LRTCS-UQAT, Canada*
- 310.2 An Integrated Antenna for Cognitive Radios** \*\*\*\*, \*)  
G. Augustin, T. A. Denidni, *National Institute of Scientific Research, Canada*
- 310.3 Novel Monopole Antenna for Bluetooth and UWB Applications** \*\*\*\*, \* +  
G. N. Malheiros-Silveira<sup>1</sup>, R. T. Yoshioka<sup>2</sup>, H. E. Hernández-Figueroa<sup>1</sup>  
<sup>1</sup>*State University of Campinas (UNICAMP), Brazil;* <sup>2</sup>*Eldorado Research Institute, Brazil*
- 310.4 Design and Analysis of a Compact Antenna for UWB RFID Applications** \*\*\*\*, \* -  
A. Toccafondi, C. Della Giovampaola, *University of Siena, Italy*
- 310.5 IR-UWB Wide-Beam Antenna for Indoor Home Security Service** \*\*\*\*, (%  
J. Moon, J. Ha, Y. Lee, J. Choi, *Hanyang University, South Korea*
- 310.6 Effect of Spiral Antennas Pulse Distortion on the Performance of Ultra-Wideband Impulse Radio Systems** \*\*\*, (\*  
M. A. Elmansourj, D. S. Filipovic, *University of Colorado at Boulder, United States*
- 310.7 Time Reversal Compared to Inverse Filtering** \*\*\*\*, ()  
W. M. Dyab, T. K. Sarkar, *Syracuse University, United States*; M. Salazar-Palma, *Universidad Carlos III de Madrid, Spain*
- 310.8 Time-Reversal Techniques Applied to Ultrawideband Indoor Wireless Communication Systems: a Comparative Study** \*\*\*\*, (+  
A. E. Fouda, F. L. Teixeira, *The Ohio State University, United States*
- 310.9 Transient Radiation Properties of Tapered Slot Antenna** \*\*\*\*, (-  
K. Ebnabbasi, *NORTHEASTERN UNIVERSITY, United States*; S. Sczyslo, *Ruhr-Universität, GERMANY*
- 310.10 Integrated Dual-Purpose Narrow/Ultra-Wide Band Antenna for Cognitive Radio Applications** \*\*\*\*, )%  
Y. Li, W. Li, *Harbin Engineering University, China*; R. Mitra, *The Pennsylvania State University, USA*

### 311. Optimization Techniques

Session Chairs: Sembiam Rengarajan, Ahmad Hoorfar

- 311.1 A Novel Methodology for the Shape Optimization of Electromagnetic Scattering Targets** ""B#  
N. V. Nair, B. Shanker, *Michigan State University, United States*
- 311.2 Modified BBO Algorithm for Electromagnetic Optimization** ""B#  
Y. Wang<sup>1</sup>, M. Mussetta<sup>2</sup>, P. Pirinoli<sup>1</sup>  
<sup>1</sup>*Politecnico di Torino, Italy;* <sup>2</sup>*Politecnico di Milano, Italy*
- 311.3 Application of CMA Evolution Strategies for Multilayer Wall Parameter Estimation in Through-the-Wall Radar Imaging** ""B#  
A. Hoorfar, C. Thajudeen, *Villanova University, United States*
- 311.4 Meta-Particle Swarm Optimization for Frequency Selective Surface** ""B#  
H. M. Linh, M. Mussetta, F. Grimaccia, R. E. Zich, *POLITECNICO DI MILANO, Italy*
- 311.5 Design of Dual-Band GPS Antennas for Small Controlled Reception Pattern Antenna Applications** ""B#  
G. Byun<sup>1</sup>, H. Kim<sup>1</sup>, S. M. Seo<sup>2</sup>, I. Park<sup>3</sup>, H. Choo<sup>1</sup>  
<sup>1</sup>*Hongik University, South Korea;* <sup>2</sup>*Agency for Defense Development, South Korea;* <sup>3</sup>*Ajou University, South Korea*
- 311.6 Genetic Algorithm Optimization of a Slot Array with Full Wave Method-of-Moments Analysis** ""B#  
S. R. Rengarajan<sup>1,2</sup>  
<sup>1</sup>*California State University, Northridge, United States;* <sup>2</sup>*Jet Propulsion Laboratory, Caltech, 91109*
- 311.7 Novel Antenna Designs Using Level-Set Based Topology Optimization** ""B#  
G. Kiziltas, *Sabanci University, Turkey*
- 311.8 Antennas for Power Transfer Optimization** ""B#  
H. Shadmehr, M. Mussetta, F. Grimaccia, R. E. Zich, *POLITECNICO DI MILANO, Italy*
- 311.9 Analysis and Design of Frequency Selective Surface Using FEBI and Adaptive, Black-Box Model Order Reduction** ""B#  
M. B. Stephanson, Y. Zhao, J.-F. Lee, *The Ohio State University, United States*
- 311.10 Optimum Placement of Array Antenna Elements on Aircraft for Accurate DOA Estimation in a Wide Frequency Range** ""B#  
G. Byun<sup>1</sup>, S. Park<sup>2</sup>, I. Park<sup>3</sup>, H. Choo<sup>1</sup>  
<sup>1</sup>*Hongik University, South Korea;* <sup>2</sup>*LIG Nex1 Co., Ltd., South Korea;* <sup>3</sup>*Ajou University, South Korea*

### 312. Advances in FDTD Methods and Analysis

Session Chairs: Tengmeng Tan, Jamesina Simpson

- 312.1 An Analytical Expression for FDTD Solution to the Problem of TM Oblique Incidence on a Dielectric Thin Film** <sup>\*\*\*\*, )'</sup>  
S.-K. Jeng, *Department of Electrical Engineering, National Taiwan University, Taiwan*
- 312.2 Accuracy of Point Source Models with Coincident Phase Centers in a Cubic FDTD Grid for Arbitrary Source Orientation** <sup>\*\*\*\*, ))</sup>  
G. M. Noetscher, Y. Xu, S. N. Makarov, *Worcester Polytechnic Institute, United States*
- 312.3 Local Crank-Nicolson Procedure for Short Thin Wire in the FDTD Method** <sup>\*\*\*\*, )+</sup>  
C. C. Guiffaut, A. A. Reineix, *XLIM Institute - UMR CNRS - University of Limoges, France*; B. B. Pecqueux, *CEA DAM GRAMAT, France*
- 312.4 FDTD Analysis of Dispersive Periodic Structures with Skewed Grids** <sup>\*\*\*\*, )-</sup>  
K. ElMahgoub<sup>1</sup>, A. Z. Elsherbeni<sup>1</sup>, F. Yang<sup>1,2</sup>  
<sup>1</sup>*The University of Mississippi, United States*; <sup>2</sup>*Tsinghua University, China*
- 312.5 Implementation of a PEMC Boundary Condition in the 2-D FDTD Technique** <sup>\*\*\*\*, \*%&</sup>  
V. Nayyeri, M. Soleimani, *Iran University of Science and Technology, Iran*; M. Dehmollaian, *University of Tehran, Iran*
- 312.6 An Efficient Implementation of a 3D Spatially-Filtered FDTD Subgridding Scheme** <sup>\*\*\*\*, \*'</sup>  
C. Chang, C. D. Sarris, *University of Toronto, Canada*
- 312.7 Improvement of FDTD Simulation Accuracy Using the Oversampling Method of Rasterization** <sup>\*\*\*\*, \*)</sup>  
A. Eroglu, B. Westrick, *Purdue University Fort Wayne, United States*
- 312.8 Moving Sources, FDTD and Reciprocity** <sup>\*\*\*\*, \*+</sup>  
J. L. Young, C. L. Wagner, *University of Idaho, United States*
- 312.9 High-Fidelity FDTD Modeling of Far-Field TE Scattering from a PEC Cylinder** <sup>\*\*\*\*, \*-</sup>  
D. B. Davidson, *University of Stellenbosch, South Africa*

### 313. Antenna Feeds and Matching

Session Chairs: Dimitrios Peroulis, Wonbin Hong

- 313.1 **Dual-Mode Waveguide Feeds for Polarization Control in Offset Reflector Antennas** \*\*\*\*B#  
Z. Allahgholi Pour, L. Shafai, *University of Manitoba, Canada*
- 313.2 **Frequency Selective Microstrip-to-Slotline Transition for Tapered Slot Antenna Feeding** \*\*\*B#  
D. Lo Hine Tong, P. Minard, A. Louzir, *TECHNICOLOR R&D, FRANCE*
- 313.3 **A Dual-Band Microstrip Crossover and Its Miniaturization** \*\*\*\*, +%  
J. Shao, H. Ren, B. Arigong, H. Zhang, *University of North Texas, United States*
- 313.4 **Wideband Diode-Based Reconfigurable Matching Network Operating at 36 dBm Input Power** \*\*\*\*, +  
W. N. Allen, D. Peroulis, *Purdue University, United States*
- 313.5 **Development of 2.4GHz One-Sided Directional Slot Antenna with 2-Stage Bandpass Filter** \*\*\*\*, +)  
H. Kanaya, M. Kato, D. Kanemoto, K. Yoshida, R. K. Pokharel, K. Yoshitomi, *Kyushu University, Japan*
- 313.6 **60 GHz Dipole Antenna for Short Range Indoor Communication Systems** \*\*\*, ++  
D.-J. Jung, J. N. Hansen, K. Chang, *Texas A&M University, United States*
- 313.7 **Reflectarray Antenna as a Feed System for Parallel Plate Waveguide Slot Array** \*\*\*\*, +  
A. Kordzadeh, P. Mousavi, *University of Alberta, Canada*
- 313.8 **Advances in Impedance Matching Tools for Antenna Applications** \*\*\*\*, , %  
J. Rahola, *Optenni Ltd, Finland*
- 313.9 **Scan Capability of Fabry Perot Cavity (FPC) Antennas with Array Feeds** \*\*\*\*, , '  
J. Kim, M. Kim, R. Mitra, *Kyungsu University, South Korea*
- 313.10 **Yagi Antenna with Frequency Domain Filtering Performance** \*\*\*\*, , )  
Z. Wang, P. S. Hall, P. Gardner, *University of Birmingham, U.K.*

### 314. Experimental Performance Analysis of Urban and Terrestrial Wireless Systems

Session Chairs: Anatoliy Ioffe, Magdy Iskander

- 314.1 Rain Attenuation Fade-Slope Characteristics of 120-GHz-Band Wireless Links** <sup>\*\*\*\*</sup>, , +  
A. Hirata, J. Takeuchi, H. Takahashi, N. Kukutsu, *NTT Corporation, Japan*
- 314.2 Radio Channel Sounding Using a Circular Horn Antenna Array in the 2.3 GHz Band** <sup>\*\*\*\*</sup>, , -  
A. Yamamoto, T. Sakata, *Panasonic Corporation, Japan*; K. Ogawa, *Toyama University, Japan*; K. Olesen, J. Ø. Nielsen, G. F. Pedersen, *Aalborg University, Denmark*
- 314.3 Study of Path Loss for Ground Based Communication in Military UHF Band** <sup>\*\*\*\*</sup>, - %  
X. H. Mao, Y. H. Lee, S. H. Ting, *Nanyang Technological University, Singapore*
- 314.4 Impact of Antenna Pattern and Handset Rotation on Macro-Cell and Pico-Cell Propagation in Heterogeneous LTE Networks** <sup>\*\*\*\*</sup>, - '  
E. Mellios, Z. Mansor, G. S. Hilton, A. R. Nix, J. P. McGeehan, *University of Bristol, United Kingdom*
- 314.5 Experimental Study of Fading Characteristics for Wireless Communications in High-Speed Railway Environments** <sup>\*\*\*\*</sup>, - )  
M.-C. Tseng, M.-H. Cheng, *Industrial Technology Research Institute, Taiwan*
- 314.6 Bivariate Analysis of Indoor Radio Measurements** <sup>\*\*\*\*</sup>, - +  
A. S. Ioffe, G. Monghal, A. Papatthanassiou, C. Rom, H. Yaghoobi, *Intel Corporation, United States*
- 314.7 Determination of the Delay Spread of an Indoor Channel Measurement Campaign in the UHF Band** <sup>\*\*\*\*</sup>, --  
S. Sczyslo, S. Dortmund, I. Rolfes, *Ruhr-Universität Bochum, Germany*
- 314.8 Investigation of Inter-User Interference of Wireless Body Area Networks at 60 GHz** <sup>\*\*\*\*</sup>- \$%  
X. Y. Wu, Y. I. Nechayev, C. C. Constantinou, P. S. Hall, *University of Birmingham, United Kingdom*
- 314.9 Measurement-Based Ray-Tracing Models Calibration in Urban Environments** <sup>\*\*\*\*</sup>- \$'  
A. Navarro Cadavid<sup>1</sup>, N. Cardona<sup>2</sup>, D. Guevara<sup>3</sup>, J. Lopez<sup>2</sup>  
<sup>1</sup>Universidad Icesi, Colombia; <sup>2</sup>Universitat Politècnica de Valencia, Spain; <sup>3</sup>Universidad Francisco de Paula Santander, Colombia
- 314.10 Statistical Adjustment of Empirical Propagation Path Loss Models to the COST 2100 Cali Reference Scenario** <sup>\*\*\*\*</sup>- \$)  
A. Navarro Cadavid, C. A. Ardila\_Marin, *Universidad Icesi, Colombia*



### 315. Integral Equation Methods I

Session Chairs: Andrew Peterson, Francesco Andriulli

- 315.1 MFIE Impedance Matrix Integral Calculation to Prescribed Precision** ""B#  
J. S. Asvestas, D. W. Richardson, O. E. Allen, *NAVAIR, United States*
- 315.2 Impact of Solenoidal Bases and Galerkin Testing on the Accuracy of Volume Integral Equation Numerical Solutions for Dielectric Bodies** ""B#  
A. F. Peterson, *Georgia Institute of Technology, United States*
- 315.3 Volume Integral Equation Method for Highly Anisotropic Media** ""B#  
J. Markkanen, P. Ylä-Oijala, S. Järvenpää, A. Sihvola, *Aalto University, Finland*
- 315.4 Combined Source Integral Equation for Electromagnetic Scattering by Homogeneous Lossy Objects** ""B#  
P. Ylä-Oijala<sup>1</sup>, S. P. Kiminki<sup>1</sup>, K. Cools<sup>2</sup>, F. P. Andriulli<sup>3</sup>, S. Järvenpää<sup>1</sup>  
<sup>1</sup>*Aalto University, Finland*; <sup>2</sup>*University of Nottingham, UK*; <sup>3</sup>*TELECOM Bretagne, France*
- 315.5 A Sparse Direct Solution of an Augmented Formulation for Dielectric Scattering** ""B#  
J. Cheng, R. J. Adams, *University of Kentucky, United States*; X. Xu, *Sigrity, Inc., United States*
- 315.6 A Non-Conformal Integral Equation Domain Decomposition Method for Electromagnetic Scattering Analysis of Large Multi-Scale Objects** ""B#  
Z. Peng, K.-H. Lim, J.-F. Lee, *ElectroScience Lab., United States*
- 315.7 A Hybrid Basis Function Technique for the Solution of Scattering from Complex Structures Using the Generalized Method of Moments** ""B#  
D. Dault, N. V. Nair, B. Shanker, *Michigan State University, United States*
- 315.8 Novel Mode-Matching Technique for the Efficient Analysis of Complex Multi-Layer SIW and SISW-Based Structures** ""B#  
J. Seljan, M. Casaletti, G. Valerio, M. Ettore, R. Sauleau, *University of Rennes 1, France*; S. Maci, *University of Siena, Italy*
- 315.9 A Macro Basis-Function-Based Technique for the Analysis of Thin Penetrable Scatterers over a Wide Frequency Band** ""B#  
C. Pelletti, R. Mittra, G. Bianconi, *The Pennsylvania State University, United States*
- 315.10 Alternate Integral Equations for Simple Obstacles in Guides** ""B#  
C. M. Butler, *Clemson University, United States*

## IF31 MIMO Channel Characterization and Performance Evaluation

Session Chairs: Naoki Honma, Costas Sarris

- IF31.1 Real-Time Millimeter-Wave MIMO Channel Measurements**\*\*\*\*- \$-  
J. Ahmadi-Shokouh, G. Z. Rafi, A. Taeb, S. Safavi-Naeini, *University of Waterloo, Canada*
- IF31.2 Realistic Ray-Tracing Based Assessment of MIMO Performance in Indoor Environments**\*\*\*\*- \$-  
N. Sood, C. D. Sarris, *University of Toronto, Canada*
- IF31.3 Series Expansion of the MIMO Spatial Covariance**\*\*\*\*- %&  
F. K. Sharifabad, M. A. Jensen, *Brigham Young University, United States*
- IF31.4 Mutual Coupling Effects in Multi-User Massive MIMO Base Stations**\*\*\*- %  
X. Artiga, B. Devillers, *Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain*; J. Perruisseau-Carrier, *École Polytechnique Fédérale de Lausanne (EPFL), Switzerland*
- IF31.5 On the Estimation Accuracy in MIMO Channel Between Parasitic Antenna Arrays**\*\*\*\*- %&  
N. Honma, *Iwate University, Japan*
- IF31.6 Performance Evaluation of MIMO Pattern Reconfigurable Antennas**\*\*\*\*- %&  
Y. Zhou, R. S. Adve, S. V. Hum, *University of Toronto, Canada*
- IF31.7 LTE Throughput Evaluation of MIMO Antenna Handset in the Presence of User's Body**\*\*\*\*- %  
T. Yoshida<sup>1</sup>, A. Miyata<sup>1</sup>, M. Sakurai<sup>2</sup>, E. Hankui<sup>1</sup>  
<sup>1</sup>NEC Corporation, Japan; <sup>2</sup>NEC CASIO Mobile Communications, Ltd., Japan
- IF31.8 A Parameter Estimation Algorithm for Propagation Channels Based on Two-Layer Evidence Framework**\*\*\*- &%  
X. Yin, Y. Hu, Z. Zeng, J. Zhou, M. Tong, *Tongji University, China*; Z. Zhong, S. X. Lu, *Huawei Technology Company, China*
- IF31.9 Channel Capacity Improvement Dependency of Antenna Separation Lengths for Aeronautical 2x2 MIMO System**\*\*\*B#&  
N. Kanada, Y. Sumiya, N. Yonemoto, S. Futatsumori, E. Isozaki, *Electronic Navigation Research Institute, Japan*
- IF31.10 Investigations on Wideband MIMO Indoor Channel Characteristics at 2.35GHz with Multiple Polarized Antennas**\*\*\*- &  
N. Zhang, H. Wang, W. Hong, J. Zhou, G. Yang, H. Zhang, C. Yu, *Southeast University, China*
- IF31.11 Effect of Antenna Configuration on Performance of MIMO-Based Access Points in a Service Tunnel**\*\*\*B#&  
A. Emami Forooshani, D. G. Michelson, *University of British Columbia, Canada*
- IF31.12 Cooperative MIMO Beamforming with a Per-Antenna Power Constraint**\*\*\*\*- &  
A. L. Anderson, *Tennessee Technological University, United States*; M. A. Jensen, *Brigham Young University, United States*

## IF32 Metamaterial Antennas and Applications

Session Chairs: Stefano Maci, Chi-Chih Chen

- IF32.1 Investigation of UHF Performance Characteristics of Antennas over Various PEC, Dielectric, Ferrite, and Hybrid PEC-Metamaterial Groundplanes**\*\*\*B#&  
M. Khaliq<sup>1</sup>, J. K. Breakall<sup>2</sup>, J. Daniel<sup>1</sup>, G. Minko<sup>1</sup>, T. Pursche<sup>1</sup>  
<sup>1</sup>US Army, United States; <sup>2</sup>Penn State University, United States
- IF32.2 Wideband UHF Metamaterial Antenna**\*\*\*B#&  
M. Ali, N. A. Bishop, *University of South Carolina, United States*
- IF32.3 Low-Profile Antennas with Anisotropic Dispersive Metamaterial Substrate**\*\*\*B#&  
H. Odabasi, F. L. Teixeira, *Ohio State University, United States*
- IF32.4 Demonstration of High Gain Low Profile Antenna Based on Low-Index Metaleins and Artificial Magnetic Ground Plane**\*\*\*B#&  
E. Lier, M. G. Bray, B. G. Martin, *Lockheed Martin, United States*; J. P. Turpin, Q. Wu, D. H. Werner, *Pennsylvania State University, United States*
- IF32.5 On the Validity of Non Space-Dispersive Impedance Boundary Condition for Representing High-Impedance Metasurfaces**\*\*\*B#&  
M. Faenzi, G. Minatti, G. M. Sardi, E. Martini, S. Maci, *University of Siena, Italy*
- IF32.6 Improving the Directivity of Electrically Small Antennas Using Slotted Parasitic Ground Planes**\*\*\*B#&  
M. M. -C. Tang<sup>1,2</sup>, R. W. Ziolkowski<sup>2</sup>, S. Xiao<sup>1</sup>, B. -Z. Wang<sup>1</sup>  
<sup>1</sup>University of Electronic Science and Technology of China, China; <sup>2</sup>University of Arizona, USA
- IF32.7 Sensitivity and Error Analysis of a Surface Plasmonic Mode Metallic Grating Sensor**\*\*\*- &+  
H. Amarloo, A. Rohani, S. Safavi-Naeini, *University of Waterloo, Canada*
- IF32.8 A Novel CRLH ZOR Microstrip Patch Antenna**\*\*\*B#&  
Z. Zhang, E. Li, *University of Electronic Science and Technology of China, China*
- IF32.9 A Miniaturized Antenna Based on CRLH Structure**\*\*\*- &  
Z. Guo, Z. Zhang, *University of Electronic Science and Technology of China, China*
- IF32.10 A New Method for Band-Notching Application in UWB Circular Disk Monopole Antenna Using Defected Ground Structure**\*\*\*B#&  
Z. Mousavi Razi, P. Rezaei, M. Skandari Cherati, *Semnan university, Iran*
- IF32.11 Design and Anlysis of Multiband High Refractive Index Metamaterials**\*\*\*- ' %  
N. E. Islam, Z. Lu, *University of Missouri-Columbia, United States*; B. Camps, *MR: comp GmBH, Germany*

### IF33 RFID- Novel structures

Session Chairs: Christopher Valenta, K. V. S. Rao

- IF33.1 Low Profile Rigid UHF RFID Tags** \*\*\*\*- '\*  
K. Rao, S. F. Lam, P. V. Nikitin, *Intermec Technologies Corporation, United States*
- IF33.2 Low Profile UHF RFID Antenna Design with EBG Structures** \*\*\*\*- '\* )  
A. Eroglu, N. Reynolds, C. Pomalaza-Ráez, *Purdue University Fort Wayne, United States*
- IF33.3 Microstrip-Line-Fed Circularly-Polarized Circular Slot Antenna with a Spur Slot** \*\*\*\*- '\* +  
J.-Y. Jan, K.-Y. Chiu, C.-Y. Pan, H.-M. Chen, C.-H. Chen, *National Kaohsiung University of Applied Sciences, Taiwan*
- IF33.4 Planar Inverted F Antenna Circularly Polarized for RFID Applications** \*\*\*\*- '\* -  
S. Pflaum, R. Staraj, G. Kossivas, *LEAT, Universty of Nice Sophia-Antipolis, France*
- IF33.5 Chipless RFID System Based on Magnetoinductive-Wave (MIW) Delay Lines** \*\*\*\*- '\* (%  
F. J. Herraiz-Martínez, E. Ugarte-Muñoz, D. Segovia-Vargas, *Universidad Carlos III de Madrid, Spain*; F. Paredes, G. Zamora, F. Martín, J. Bonache, *Universitat Autònoma de Barcelona, Spain*
- IF33.6 Compact Quasi-Yagi Antenna Loaded with Artificial Transmission Lines for RFID Applications** \*\*\*\*- '\* ('  
P. Hajzadeh, H. R. Hassani, *Shahed University, Iran*; S. H. Sedighy, *Iran Univ. of Science & Tech, UC Irvine, Iran*
- IF33.7 Miniaturized on-Chip Slot Antenna in 90nm CMOS** \*\*\*\*- '\* ()  
M. R. Khan, *University of Saskatchewan, Canada*; H. Gorla, *Southern Illinois University, USA*
- IF33.8 UHF Bowtie RFID Antenna with Resistive and Inductive Stubs** \*\*\*\*- '\* (+  
M. M. Masud, *North Dakota State University, United States*; S. Capdevila, *Universitat Politècnica de Catalunya, Spain*
- IF33.9 Omnidirectional Loop Antenna for a 5.8 GHz Microwave Backscatter RFID Tag** \*\*\*\*- '\* (-  
C. R. Valenta, R. Hasse, M. B. Akbar, W. Hunsicker, K. Naishadham, G. D. Durgin, *Georgia Institute of Technology, United States*
- IF33.10 Passive UHF RFID Printed Monopole Tag Antenna for Identification of Metallic Objects** \*\*\*\*- '\* )%  
A. E. Abdulhadi, R. Abhari, *McGill University, Canada*

### IF34 Small Antennas: Design Concepts

Session Chairs: Istvan Szini, Zhongxiang Shen

- IF34.1 Realizing Huygens Sources Through Spherical Sheet Impedances \*\*\*\*- )'**  
C. Pfeiffer, A. Grbic, *University of Michigan, Ann Arbor, United States*
- IF34.2 Innovative Procedure for Analytical Synthesis of Small Radiators \*\*\*\*- ))**  
R. Stefanelli, D. Trinchero, *iXem Labs - Politecnico di Torino, Italy*
- IF34.3 Electrically Small Omni-Directional Antenna of Circular Polarization \*\*\*\*- ) +**  
Y. Yu, S. He, *Zhejiang University, China*; Z. Shen, *Nanyang Technological University, Singapore*
- IF34.4 A Compact Wide Beam Circularly Polarized Antenna \*\*\*\*- ) -**  
Q. Guo, Y. Li, X. Liang, R. Jin, J. Geng, S. Ye, W. Wang, W. Li, *Shanghai Jiao Tong University, China*
- IF34.5 Comparisons of the Planar and 3D Egyptian Axe Dipole NFRP Antennas' Performance Characteristics \*\*\*\*- \* %**  
R. T. Cutshall, R. W. Ziolkowski, *University of Arizona, United States*
- IF34.6 Effects of Dielectric or Magnetic Materials to Electrical Characteristics of Very Small Normal-Mode Helical Antennas \*\*\*\*- \*\***  
K. Ochiyama, N. Michishita, Y. Yamada, *National Defense Academy, Japan*
- IF34.7 Miniaturisation Technique for Quadrifilar Helix Antenna \*\*\*\*- \* )**  
A. Takacs<sup>1</sup>, T. Idda<sup>1</sup>, H. Diez<sup>2</sup>, H. Aubert<sup>1</sup>  
<sup>1</sup>CNRS; LAAS; and *University of Toulouse*; <sup>2</sup>UPS, INSA, INP, ISAE; LAAS, France; <sup>2</sup>CNES (French Spatial Agency), France
- IF34.8 A Novel Dual-Band Circularly-Polarized Wide-Beam Quadrifilar Helix Antenna \*\*\*\*- \* +**  
X. Bai, D. Yang, J. Tang, J. Geng, R. Jin, X. Liang, *Shanghai Jiao Tong University, China*
- IF34.9 Miniaturized CP Patch Antenna with Low Spurious Radiation for GNSS Applications \*\*\*\*- \* -**  
S. Caizzone, N. Basta, A. Dreher, *German Aerospace Center (DLR), Germany*
- IF34.10 Design of Antenna on Package Exploiting Self-Resonance of Carrier Board \*\*\*\*- + %**  
M.-H. Cheng, C.-P. Lai, *Graduate Institute of Communication Engineering, National Taiwan University, Taiwan*; H.-C. Yen, K.-H. Liao, *Advanced Semiconductor Engineering Inc., Taiwan*; S.-Y. Chen, *Department of Electrical Engineering, National Taiwan University, Taiwan*
- IF34.11 Radiation Pattern Estimation of Bond Wire Antennas \*\*\*\*- +'**  
L.-C. Lin, C.-H. Tu, D.-C. Chang, Y.-Z. Juang, *National Applied Research Laboratories, Taiwan*

## IF135 Leaky-Wave and Traveling-Wave Antennas

Session Chairs: David Jackson, Filippo Capolino

- IF35.1 Novel High Efficiency Side-Grating Millimeter-Wave Antenna** \*\*\*\*- +)  
A. Zandieh, A. S. Abdellatif, S. Safavi-Naeini, *University of Waterloo, Canada*
- IF35.2 Radiation Properties of an Integrated Optical Leaky Wave Antenna with Periodic Silicon Perturbations** \*\*\*\*- ++  
S. Campione, C. Guclu, Q. Song, O. Boyraz, F. Capolino, *University of California Irvine, United States*
- IF35.3 CRLH LWA with Polarization Diversity Using Equalized Common and Differential Modes** \*\*\*\*- +-  
S. S. Abielmona, H. V. Nguyen, C. Caloz, *Poly-GRAMES Research Center, Ecole Polytechnique de Montreal, Canada*
- IF35.4 Nonreciprocal and Magnetically Scanned Leaky-Wave Antenna Using Coupled Microstrip Lines** \*\*\*\*-, %  
N. Apaydin, L. Zhang, K. Sertel, J. L. Volakis, *The Ohio State University, ElectroScience Laboratory, United States*
- IF35.5 Analysis of a Finite-Size Bi-Directional Leaky Wave Antenna with Edge Reflection** \*\*\*\*-, '  
Y.-W. Hsu, Y.-C. Lin, *National Taiwan University, Taiwan*
- IF35.6 A Pi-Matching Network to Eliminate the Open-Stopband in 1-D Periodic Leaky-Wave Antennas** \*\*\*\*-, )  
P. Baccarelli, 'SAPIENZA' *University of Rome, Italy*; S. Paulotto, *Maxtena Inc., USA*; D. R. Jackson, *University of Houston, USA*
- IF35.7 Dual-Band Resonant Cavity Antenna with a Single Dielectric Superstrate** \*\*\*\*-, +  
M. A. Al-Tarifi, D. E. Anagnostou, A. K. Amert, K. W. Whites, *South Dakota School of Mines and Technology, United States*
- IF35.8 High-Gain Characteristics of a Slightly Flared Dielectric Tube Antenna** \*\*\*-, -  
J. Yamauchi, H. Sato, H. Nakano, *Hosei University, Japan*
- IF35.9 Near and Far-Field Focusing with Holographic Two-Dimensional Tapered Leaky-Wave Spiral Antennas** \*\*\*\*-- %  
D. Blanco, E. Rajo-Iglesias, *Universidad Carlos III de Madrid, Spain*; N. Lombart, *University Complutense of Madrid, Spain*; J. L. Gómez-Tornero, *Technical University of Cartagena, Spain*
- IF35.10 A Radial Slot Based Leaky-Wave Antenna Design for Continuous One-Sided Beam Scanning and Broadside Radiation** \*\*\*\*-- '  
S. K. Podilchak, A. P. Freundorfer, *Queen's University at Kingston, Canada*; Y. M. M. Antar, *The Royal Military College of Canada, Canada*
- IF35.11 A Simple Feed for 4-Arm Planar Traveling-Wave (TW) Antennas—for GNSS (Global Navigation Satellite System) and Other Applications** \*\*\*\*-- )  
J. J. H. Wang, D. J. Triplett, *Wang Electro-Opto Corporation, United States*

**IF35.12 Radiation by an Inductively-Loaded Half-Width Leaky-Wave Antenna** \*\*\*\*\*B#  
M. T. Corwin<sup>1</sup>, R. D. Penno<sup>2</sup>, S. W. Schneider<sup>1</sup>, E. J. Rothwell<sup>3</sup>, S. Balasubramaniam<sup>3</sup>, L. C. Kempel<sup>3</sup>  
<sup>1</sup>Air Force Research Labs, United States; <sup>2</sup>University of Dayton, United States; <sup>3</sup>Michigan State University, United States

### IF36 Transformation Electromagnetics

Session Chairs: Andrea Alu, Nader Engheta

- IF36.1 Controlling Nonlocal Light-Matter Interactions via Spectral-Domain Transformation Optics** \*\*\*\*\*- - +  
G. Castaldi, V. Galdi, University of Sannio, Italy; A. Alu, The University of Texas at Austin, USA; N. Engheta, University of Pennsylvania, USA
- IF36.2 Quasi-Conformal Transformation Electromagnetics Enabled Flat Collimating Lenses** \*\*\*- - -  
Q. Wu, J. P. Turpin, D. H. Werner, Penn State University, United States
- IF36.3 Cylindrical Metamaterial Lens for Single-Feed Adaptive Beamforming** \*\*\*\*\*%\$%  
J. P. Turpin, D. H. Werner, Pennsylvania State University, United States
- IF36.4 Gradient Index Transmission Cloak Composed of Arrays of Dielectric Elements** \*\*\*\*\*%\$%  
R. Duan, E. Semouchkina, R. Pandey, Michigan Technological University, United States
- IF36.5 Low Scattering Microwave Cloaking by All-Dielectric Metamaterials** \*\*\*\*\*%\$%)  
X. Wang, F. Chen, E. Semouchkina, Michigan Technological University, United States
- IF36.6 Design and Analysis of Electromagnetic Expanders and Concentrators** \*\*\*\*\*%\$%+  
S. Zhu, Y. Luo, East China Normal University, China
- IF36.7 Arbitrary N-Sided Irregular Polygonal Electromagnetic Concentrator** \*\*\*\*\*%\$%-  
S. H. Sedighy<sup>1,2</sup>, M. Khalaj-AmirHosseini<sup>1</sup>  
<sup>1</sup>Iran Univ. of Science & Tech, UC Irvine, Iran; <sup>2</sup>University of California, Irvine, USA
- IF36.8 Reconfigurable Transformation Optics Based Surface Plasmon Polariton Wave Adapter** \*\*\*\*\*%\$%  
B. Arigong, H. Zhang, H. Kim, Y. Lin, J. Shao, H. Ren, University of North Texas, United States
- IF36.9 Anisotropic Surface Impedance Cloak** \*\*\*\*\*%\$%  
R. G. Quarfoth, D. F. Sievenpiper, University of California, San Diego, United States
- IF36.10 Experimental Verification of Tensor Transmission-Line Metamaterials: a Printed Beam - Shifting Slab** \*\*\*\*\*B#  
G. Gok, A. Grbic, University of Michigan, United States

## IF37 Transmission and Absorption in Metamaterials

Session Chairs: Nader Behdad, Elena Semouchkina

- IF37.1 Analysis of Electromagnetic Wave Tunneling Through Stacked Single-Negative Metamaterial Slabs: a Microwave Filter Theory Approach** <sup>1</sup>  
C.-H. Liu, N. Behdad, *University of Wisconsin, Madison, United States*
- IF37.2 High-Power Microwave Filters and Frequency Selective Surfaces Utilizing EM Wave Tunneling Through  $\epsilon$ -Negative Layers** <sup>1</sup>  
C.-H. Liu, N. Behdad, *University of Wisconsin- Madison, United States*
- IF37.3 Forward and Backward-Wave Propagation in "Below Cut-off" Waveguides Loaded with Dielectric Resonators** <sup>1</sup>  
F. Chen, X. Wang, A. Hosseinzadeh, E. Semouchkina, *Michigan Technological University, United States*
- IF37.4 Investigation of a Microstrip-to-Ridge Gap Waveguide Transition by Electromagnetic Coupling** <sup>1</sup>  
A. Algaba Brazález, A. U. Zaman, P.-S. Kildal, *Chalmers University of Technology, Sweden*
- IF37.5 A Compact Crossover Using NRI-TL Metamaterial Lines** <sup>1</sup>  
M. A. Antoniadou, B. Henin, A. Abbosh, *University of Queensland, Australia*
- IF37.6 Equal Phase Slope Metamaterial Transmission Lines** <sup>1</sup>  
J. Church, J. Meloling, J. D. Rockway, *SPAWAR SSC-Pacific (Dept. of Navy), United States*
- IF37.7 A Miniature, Broadband, Non-Dispersive Phase Shifter Based on CRLH TL Unit Cells** <sup>1</sup>  
I. T. Nassar, A. A. Gheethan, T. M. Weller, G. Mumcu, *University of South Florida, United States*
- IF37.8 On the Design of Perfect Metamaterial Absorbers** <sup>1</sup>  
F. Costa, S. Genovesi, A. Monorchio, G. Manara, *University of Pisa, Italy*
- IF37.9 An Ultra Thin Metamaterial Absorber Using Electric Field Driven LC Resonator with Meander Lines** <sup>1</sup>  
S. Bhattacharyya, H. Baradiya, K. V. Srivastava, *Indian Institute of Technology, Kanpur, India, India*
- IF37.10 Extending the Absorbance Bandwidth of Metamaterial Absorber** <sup>1</sup>  
H. M. Lee, H. S. Lee, *Kyonggi University, South Korea*
- IF37.11 Diffraction Inspired, Polarization Dependent, Unidirectional Transmission in Thin Fishnets** <sup>1</sup>  
M. Beruete<sup>1</sup>, A. E. Serebryannikov<sup>2</sup>, V. Torres<sup>1</sup>, M. Navarro-Cía<sup>3</sup>, M. Sorolla<sup>1</sup>  
<sup>1</sup>Universidad Pública de Navarra, Spain; <sup>2</sup>Hamburg University of Technology, Germany; <sup>3</sup>Imperial College London, United Kingdom

## 351. Electromagnetic Bandgap Materials 2

Session Chairs: Prem Chahal, Ladislau Matekovits

- 351.1 **Plane Wave Scattering from a Curved HIS: Normal Incidence** .....%\$ )  
A. C. Durgun, C. A. Balanis, C. R. Birtcher, *Arizona State University, United States*
- 351.2 **A Terahertz Photonic Crystal Structure for Sensing Applications** .....%\$' +  
L. C. Acosta Silveira, J. A. Hejase, P. Chahal, *Michigan State University, United States*
- 351.3 **A Novel HIS with a Perforated Ground Plane for Miniaturization and Bandwidth Enhancement** .....%\$' -  
A. C. Durgun, C. A. Balanis, C. R. Birtcher, *Arizona State University, United States*
- 351.4 **Miniaturization of Microstrip Band Stop Filter Using a Novel Periodic Structure** .....%\$ ( %  
K. Y. Park, N. Wiwatcharagoses, P. Chahal, *Michigan State University, United States*
- 351.5 **Phenomenology of Resonance Reflectance by Intertwined Spiral Arrays** .....%\$ ('  
A. Vallecchi, *University of Siena, Italy*; A. G. Schuchinsky, *Queen's University of Belfast, United Kingdom*
- 351.6 **Three-Wave Nonlinear Scattering by Quasiperiodic Dielectric Structure** .....%\$ ( )  
O. V. Shramkova, A. G. Schuchinsky, *Queen's University Belfast, United Kingdom*
- 351.7 **Parametric Assessment of Properties of a Periodically Patterned Surface with Non-Uniform Rectangular Spiral Metallization in the Unit Cell** .....%\$ ( +  
L. Matekovits, *Politecnico di Torino, Italy*; A. De Sabata, *"Politehnica" University of Timisoara, Romania*
- 351.8 **A Technique to Extract Dispersion Characteristics of One-Dimensional Periodic Structures** .....%\$ ( -  
D. N. P. Thalakituna<sup>1</sup>, L. Matekovits<sup>2</sup>, K. Esselle<sup>1</sup>, S. Hay<sup>3</sup>, M. Heimlich<sup>1</sup>  
<sup>1</sup>*Macquarie University, Australia*; <sup>2</sup>*Politecnico di Torino, Italy*; <sup>3</sup>*CSIRO ICT Centre, Australia*
- 351.9 **A Thin and Broadband Tunable Radar Absorber Using Active Frequency Selective Surface** .....%\$ ( ) %  
Q. Chen, J.-J. Jiang, X.-X. Xu, L. Zhang, L. Miao, S.-W. Bie, *Huazhong University of Science and Technology, China*
- 351.10 **Analysis of Mushroom-like EBG Structure Utilizing Spin Sprayed Ni (-Zn)-Co Ferrite Films** .....%\$ ( B#  
M. M. Fakharian, P. Rezaei, *Department of Electrical and computer Engineering, Semnan University, Iran*



### 352. Non Foster Matching

Session Chairs: Dan Sievenpiper, Filiberto Bilotti

- 352.1 A Non-Foster Monopole Array**  $\dots\%$ )'  
C. R. White, *HRL Laboratories, LLC, United States*
- 352.2 Broadband Matching of Small Antennas Using Negative Impedance Converters.**  $\dots\%$ ) )  
O. O. Tade, P. Gardner, P. S. Hall, *University of Birmingham, United Kingdom*
- 352.3 Incorrect Stability Criteria for Non-Foster Circuits**  $\dots\%$ ) +  
S. D. Stearns, *Northrop Grumman Corporation, United States*
- 352.4 Stability and Implementation of Non-Foster Circuits for Antennas**  $\dots\%$ ) -  
S. Koulouridis, S. Stefanopoulos, *University of Patras, Greece, Greece*
- 352.5 Non-Foster Matching of Electrically Small Antennas. Stability Considerations**  $\dots\%$ \* %  
E. Ugarte-Muñoz, D. Segovia-Vargas, *University Carlos III of Madrid, Spain*; V. González-Posadas, J. L. Jiménez-Martín, *Universidad Politécnica de Madrid, Spain*
- 352.6 Non-Foster Augmented, Broadband, Efficient, Electrically Small, NFRP Dipole Antenna**  $\dots\%$ \*  
N. Zhu, R. W. Ziolkowski, *University of Arizona, United States*; J. Geng, *Shanghai Jiao Tong University, China*
- 352.7 Design of a Non-Foster Actively Loaded Metamaterial-Inspired Antenna**  $\dots\%$ \* )  
M. Barbuto, A. Monti, F. Bilotti, A. Toscano, *"Roma Tre" University, Italy*
- 352.8 Broadband Non-Foster Matching of an Electrically Small Loop Antenna**  $\dots\%$ \* +  
M. M. Jacob, J. Long, D. F. Sievenpiper, *University of California, San Diego, United States*
- 352.9 Two Novel Negative Impedance Converters for a UHF RFID Antenna**  $\dots\%$ \* -  
N. P. Mohamed Hassan Salem, *King Abdullah University of Science and Technology (KAUST), Saudi Arabia*; E. Niver, *New Jersey Institute of Technology (NJIT), United States of America*
- 352.10 Wideband Matching of an Electrically Small Antenna Using a Negative Impedance Converter Technique**  $\dots\%$ \*+ %  
W. Li, R. Chen, N. Zhai, S. Li, *Harbin Engineering University, China*; R. Mittra, *Pennsylvania State University, USA*

### 353. Theoretical, Algorithmic, and Technological Advances in Electromagnetic Inverse Scattering

Session Chairs: Aria Abubakar, Magda El-Shenawee, Andrea Massa

Session Organizers: Aria Abubakar, Magda El-Shenawee, Andrea Massa

- 353.1 Continued Evaluation of a Numerical System Characterization Method for a Cavity-like Microwave Inverse Scattering Imager** **B#**  
M. Haynes, *University of Michigan, United States*; J. Stang, M. Moghaddam, *University of Southern California, United States*
- 353.2 Optimal Location of Multiple Objects or Multi-Antenna Systems** **%+**  
M. Zoppi, C. Y. Pichot, *University of Nice-Sophia Antipolis, CNRS, France*; D. Claude, *Orange Labs, France*; S. Stefano, P. Giuseppe, *University of Florence, Italy*
- 353.3 Mixing Qualitative and Quantitative Procedures for Inverse Scattering: the Far Field Equation as an Effective Pre-Processing of Measured Data** **B#**  
L. Di Donato, A. F. Morabito, T. Isernia, *University Mediteranea, Italy*; I. Catapano, L. Crocco, *IREA CNR, Italy*
- 353.4 Microwave Imaging Using a Level Set Method for Breast Density Evaluation** **B#**  
T. J. Colgan, S. C. Hagness, B. D. Van Veen, *University of Wisconsin-Madison, United States*
- 353.5 The Linear Sampling Method for the Acceleration of the Level Set Algorithm** **%+**  
A. M. Hassan, T. Bowman, M. El-Shenawee, *University of Arkansas, United States*
- 353.6 Gauss-Newton Inversion Using Truncated Model Representations** **B#**  
Y. Lin, M. Li, A. Abubakar, T. M. Habashy, *Schlumberger-Doll Research, United States*
- 353.7 On the Implementation of a Three-Dimensional Finite-Element Contrast Source Inversion Method** **%++**  
A. Zakaria, J. LoVetri, *University of Manitoba, Canada*
- 353.8 An Inverse Scattering Method for a Stratified Slab Using Time-Reversed Fields** **%+-**  
T. Moriyama, T. Takenaka, *Nagasaki University, Japan*
- 353.9 Multi-Incidence Analysis of the Back-Propagated Induced Current Maps** **B#**  
A. Litman, H. Tortel, M. Guillaume, J.-M. Geffrin, *Institut Fresnel, France*
- 353.10 Noninvasive Bulk Dielectric Testing** **%%, %**  
N. R. Epstein, P. M. Meaney, A. Golnabi, S. D. Geimer, K. D. Paulsen, *Dartmouth College, United States*
- 353.11 Electromagnetic and Acoustic Inverse Scattering and Imaging in Complex Environments: Some Recent Progress** **B#**  
Q. H. Liu, M. Yuan, G. Ye, G. Chen, *Duke University, United States*; X. Zhu, Z. Zhao, *University of Electronic Science and Technology, China*

### 354. Terahertz Technology

Session Chairs: Hao Xin, Goutam Chattopadhyay

Session Organizers: Hao Xin, Goutam Chattopadhyay

- 354.1 Next Generation Solid-State Broadband Frequency-Multiplied Terahertz Sources** \*\*\*\*%, ' J. V. Siles<sup>1</sup>, G. Chattopadhyay<sup>1</sup>, A. Maestrini<sup>2</sup>, E. T. Schlecht<sup>1</sup>, C. Lee<sup>1</sup>, R. H. Lin<sup>1</sup>, J. J. Gill<sup>1</sup>, J. S. Ward<sup>3</sup>, C. Jung<sup>1</sup>, I. Mehdi<sup>1</sup>, P. H. Siegel<sup>1</sup>  
*<sup>1</sup>NASA Jet Propulsion Laboratory, United States; <sup>2</sup>Observatory of Paris, France; <sup>3</sup>currently at Raytheon Co., United States*
- 354.2 Coherent Terahertz Radiation Source and User Area at FACET** \*\*\*\*%, ) Z. Wu, A. Fisher, H. Loos, M. Hogan, *SLAC National Accelerator Laboratory, United States*
- 354.3 Non Dispersive Antenna Array Architectures for THz Sensing Systems: Connected Leaky Wave Slots** \*\*\*\*%, + A. Neto, D. Cavallo, *Delft University of Technology, Netherlands*
- 354.4 High Efficiency Elliptical-Slot Silicon RFIC Antenna with Quartz Superstrate** \*\*\*\*%, - J. M. Edwards<sup>1</sup>, D. Titz<sup>2</sup>, F. Ferrero<sup>2</sup>, C. Luxey<sup>2</sup>, G. M. Rebeiz<sup>1</sup>  
*<sup>1</sup>University of California, San Diego, United States; <sup>2</sup>University Nice - Sophia-Antipolis, France*
- 354.5 A Further Study of THz Photoconductive Antennas** \*\*\*\*%, % Y. Huang, N. Khiabani, *The University of Liverpool, United Kingdom*
- 354.6 Printed 3-D Electromagnetic Crystal (EMXT) Based THz Micro-Systems** \*\*\*\*B#5 M. Liang, W.-R. Ng, M. Gehm, H. Xin, *University of Arizona, United States*
- 15:40 354.7 THz Transparent Metamaterials for Spectroscopic Measurements** \*\*\*\*B#5 W.-G. Yeo, V. Sanphuang, N. K. Nahar, J. L. Volakis, *The Ohio State University, United States*
- 354.8 Optically Controlled Frequency Selective Surface for Millimeter-Wave Applications** \*\*\*\*%, -' H. Su, B. Yang, X. Liu, D. Li, X. Chen, R. S. Donnan, C. G. Parini, T. Kreuzis, *Queen Mary, University of London, United Kingdom*
- 354.9 Validation of CW THz Spectral Measurements** \*\*\*\*%, - ) W.-G. Yeo, N. K. Nahar, J. L. Volakis, *The Ohio State University, United States*
- 354.10 Dual-Band Optical Bench for Terahertz Radiometer for Outer Planet Atmospheres (TROPAs)** \*\*\*\*%, - + E. Schlecht, *Jet Propulsion Laboratory, California Institute of Technology, United States*
- 354.11 BU U 7 ca a i b]Ujcbg UbXBYfk cf\_gFYgYUfW 'H fi gfg'UbX'8 jfYUjcb \*\*\*\*%, -**  
UzOæ

## 355. Phased Array Antennas II

Session Chairs: Randy Haupt, Amir Mortazawi

- 355.1 60 GHz Beam-Steering Slotted Patch Antenna Array Using Liquid Crystal Phase-Shifters** \*\*\*%\$%  
P. Deo, D. Mirshekar-Syahkal, *University of Essex, United Kingdom*
- 355.2 94 GHz Power Amplifier Device Architecture in SiGe for Active Phased Arrays** \*\*\*\*%\$  
T. J. Farmer, A. Darwish, E. Viveiros, H. A. Hung, *US Army Research Laboratory, United States*; M. E. Zaghoul, *The George Washington University, United States*
- 355.3 Compact Design of a Planar Filtering Antenna Array Including a Frequency Selective Common-Mode Rejection Module** \*\*\*\*%\$  
L. Cifola, D. Cavallo, G. Gerini, *TNO, Defense Security and Safety, Netherlands*; A. Morini, *Università Politecnica delle Marche, Italy*
- 355.4 A Cavity-Backed Dual Polarized Array of Connected Spiral Antennas** \*\*\*\*%\$+  
R. Guinvarc'h, M. Serhir, *Supelec, France*; N. Ribière-Tharaud, *CEA, France*
- 355.5 A Dual Polarized Planar Phased Spiral Antenna Array** \*\*\*\*%\$-  
I. Hinojosa, R. Guinvarc'h, *SUPELEC, France*; R. L. Haupt, *Haupt Associates, USA*
- 355.6 A Corporate Fed Coplanar Folded Slot Antenna Array and Its Application for Beam Steering** \*\*\*\*%\$%  
M. A. Iskander<sup>1</sup>, R. Li<sup>1</sup>, D. E. Anagnostou<sup>1,2</sup>, M. T. Chryssomallis<sup>2</sup>, B. D. Braaten<sup>3</sup>  
<sup>1</sup>*South Dakota School of Mines and Technology, United States*; <sup>2</sup>*Democritus University of Thrace, Greece*; <sup>3</sup>*North Dakota State University, United States*
- 355.7 Ka-Band Phased Patch Antenna Array** \*\*\*\*%\$%  
Y. Zhang, J. Bai, S. Shi, D. W. Prather, *University of Delaware, United States*
- 355.8 Study of a New 4x3 Beam Forming Network for Triangular Arrays of Three Radiating Elements** \*\*\*\*%\$%  
J. García-Gasco Trujillo, Á. Noval Sánchez de Toca, I. Montesinos-Ortego, A. García Aguilar, M. Sierra Perez, *Technical University of Madrid, Spain*
- 355.9 Elimination of Beam Squint in Uniformly Excited Serially Fed Antenna Arrays Using Negative Group Delay Circuits** \*\*\*\*%\$%+  
W. A. Alomar, A. Mortazawi, *University of Michigan/Electrical Engineering and Computer Science, United States*
- 355.10 A Semi-Numerical Design Algorithm for Defected Ground Structure in Microstrip Antenna Arrays** \*\*\*\*%\$%  
H. Moghadas<sup>1,2</sup>, A. Tavakoli<sup>3</sup>  
<sup>1</sup>*University of Alberta, Canada*; <sup>2</sup>*TRLabs, Canada*; <sup>3</sup>*Amirkabir University of Tech., Iran*



## 357. Microstrip Circuits II

Session Chairs: Hongyu Zhou, Djuradj Budimir

- 357.1 Surface Roughness Modeling for CB-CPWs** \*\*\*%+  
A. Sain, K. L. Melde, *University of Arizona, United States*
- 357.2 Compact Ultra-Wideband Single-Ring Bandpass Filter with Sideband and Harmonic Suppression** \*\*\*%-  
Y. Liu, K. Chang, *Texas A&M University, United States*
- 357.3 Harmonic Suppression for Planar Ultrawideband Bandpass Filters Employing Broadside-Coupled Microstrip Patches** \*\*%/% %  
B. Henin, A. Abbosh, M. Antoniadis, *University of Queensland, Australia*
- 357.4 Dual-Band Filters Using Complementary Split-Ring Resonator and Capacitive Loaded Half-Mode Substrate-Integrated-Waveguide** \*\*\*\*%/% '  
D. E. Senior, X. Cheng, Y. K. Yoon, *University of Florida, United States*
- 357.5 Design of a Miniaturized Butler Matrix in IPD Process for 60 GHz Switched-Beam Antenna Arrays** \*\*\*\*%/% )  
D. Titz<sup>1</sup>, F. Ferrero<sup>1</sup>, C. Laporte<sup>2</sup>, C. Luxey<sup>1</sup>, H. Ezzeddine<sup>2</sup>, G. Jacquemod<sup>1</sup>  
<sup>1</sup>*Université de Nice-Sophia Antipolis, France*; <sup>2</sup>*ST Microelectronics, France*
- 357.6 Compact Dielectric-Filled Waveguide Filters and Diplexers** \*\*\*%/%+  
N. Mohottige, D. Budimir, *Westminster University, United Kingdom*
- 357.7 A Low-Loss CPW to Dielectric Waveguide Transition for Millimeter-Wave Hybrid Integration** \*\*\*%/%-  
A. Zandieh<sup>1</sup>, N. Ranjkesh<sup>1</sup>, M. Basha<sup>2</sup>, S. Safavi-Naeini<sup>1</sup>  
<sup>1</sup>*University of Waterloo, Canada*; <sup>2</sup>*University of Tabuk, Saudi Arabia*
- 357.8 Microstrip to Waveguide Transition Dedicated to Wireless Millimeter-Wave Applications** \*\*\*\*%/%%  
D. Hammou, M. Nedil, N. Kandil, Y. Coulibaly, *UQAT-LRTCS, Canada*; E. Moldovan, S. O. Tatu, *INRS-EMT, Canada*
- 357.9 Wideband Planar Microstrip to Waveguide Transition for Ku-Band Applications** \*\*\*B#  
S. Ordek<sup>1</sup>, M. M. Bilgic<sup>2</sup>, K. Yegin<sup>2</sup>, T. Turkkani<sup>1</sup>, M. Sengiz<sup>1</sup>  
<sup>1</sup>*Neta Electronic Equipment Ind. Corp., Turkey*; <sup>2</sup>*Yeditepe University, Turkey*
- 357.10 Efficient Electromagnetic Analysis for Interconnect and Packaging Structures Based on Volume-Surface Integral Equations** \*\*\*%/%) '  
M. S. Tong, J. C. Zhou, J. H. Zhou, X. F. Yin, *Tongji University, China*
- 357.11 Spurious Passband Suppression in Microstrip Hairpin-Line Bandpass Filter by Means of Quasi Fractal** \*\*\*B#  
A. Labakhsh, *IAU, Kermanshah Branch, IRAN*; A. A. Lotfi-Neyestanak, *IAU, Shahre Rey Branch, IRAN*

### 358. Scattering, Diffraction, and RCS

Session Chairs: Constantine Balanis, Makoto Ando

- 358.1 RCS Analysis of Tree Trunk above Rough Surface Using Reaction Theorem** ( )  
H. Nejadi, K. Sarabandi, *University of Michigan, United States*
- 358.2 Efficient RCS Analysis of Complex Bodies on Infinite Ground Plane** ( ) +  
L. Lozano, I. Gonzalez, M. J. Algar, F. Cátedra, *Universidad de Alcalá, Spain*
- 358.3 Physical Optics Formula for the Radar Cross Section of Finite Cylindrical Metallic Shells with Cubic Spline Profile** ( ) -  
A. Vallecchi, *University of Siena, Italy*
- 358.4 Full Pattern Comparison of PO and MER Line Integrations with SGO Correction** ( ) %  
P. Lu, M. Ando, *Tokyo Institute of Technology, Japan*
- 358.5 Bessel Beam Scattering by a Conducting Sphere** ( ) '  
H. Shoorian, D. Sounas, C. Caloz, *Ecole Polytechnique, Canada*
- 358.6 Extended UTD Solution for Scattered Fields by a Coated Conducting Cylinder** ( ) )  
K. Goto, L. H. Loc, T. Kawano, T. Ishihara, *National Defense Academy, Japan*
- 358.7 RCS of a Microstrip Leaky Wave Antenna** ( ) B#  
S.-T. Yang, H. Ling, *The University of Texas at Austin, United States*
- 358.8 UTD for CAD Models: the Uniform Geometrical Theory of Diffraction in the 21st Century** ( ) B#  
R. J. Burkholder<sup>1</sup>, C. J. Reddy<sup>2</sup>, A. Wilhite<sup>2</sup>, P. H. Pathak<sup>1</sup>  
<sup>1</sup>*The Ohio State University, United States*; <sup>2</sup>*Applied EM, Inc., United States*
- 358.9 Shadow Radiation for Scalar Problems: Relations Between Babinet Principle and Physical Optics** ( ) +  
G. Kubické, *DGA Information Superiority, France*; C. Bourlier, N. Pinel, *IETR Laboratory, France*; P. Pouliguen, *DGA Strategy Direction, France*
- 358.10 Scattering and Diffraction of a Complex-Source Beam by a Wedge** ( ) -  
M. Katsav, E. Heyman, *Tel Aviv University, Israel*; L. Klinkenbusch, *Christian-Albrechts-Universitaet zu Kiel, Germany*

### 359. Pattern Reconfigurable Antennas

Session Chairs: Hisamatsu Nakano, Tayeb A. Denidni

- 359.1 Low-Profile Capacitively Fed Steerable Square Loop Antenna** \*\*\*\*\*%+-%  
A. Pal, A. Mehta, *Swansea University, United Kingdom*; D. Mirshekar-Syahkal, *University of Essex, United Kingdom*; H. Nakano, *Hosei University, Japan*
- 359.2 A Compact Reconfigurable Antenna with Pattern Diversity** \*\*\*\*\*%+-%  
H. Li, S. He, *Royal Institute of Technology (KTH), Sweden*
- 359.3 Dual-Mode L-Band Switched Parasitic Element Antenna for Avionics Applications** \*\*\*\*\*%+-%  
L. Akhondzadeh-asl, J.-J. Laurin, *ecole polytechnique de montreal, Canada*
- 359.4 Design of a New Ultra-Wideband 4\*4 Butler Matrix for Beamforming Antenna Applications** \*\*\*\*\*%+-%  
M. L. Abdelghani, T. A. Denidni, *INRS 800, rue De La Gauchetiere O, bur 6900 H5A 1K6, Canada*; M. Nedil, *Université du Québec en Abitibi Témiscamingue , J9P 1Y3, Canada*
- 359.5 Pattern Reconfigurable Antenna for Adaptive Multi-Input Multi-Output Switching Applications** \*\*\*\*\*%+-%  
I. Lim, S. Lim, *Chungang univ., South Korea*
- 359.6 Theoretical and Experimental Demonstration of Beam Steering of Patch Antenna with Superstrate** \*\*\*\*\*%+-%  
H. Attia, O. Siddiqui, O. Ramahi, *University of Waterloo, Canada*
- 359.7 CPWG-Fed Reconfigurable Beam Steering Antenna Using Dipole and Loop Combined Structure** \*\*\*\*\*%+-%  
S. Ha<sup>1</sup>, J. Kim<sup>1</sup>, Y. Kim<sup>2</sup>, B. Lee<sup>3</sup>, C. W. Jung<sup>1</sup>  
<sup>1</sup>Seoul National University of Science and Technology, South Korea; <sup>2</sup>Inha Technical College, South Korea; <sup>3</sup>Kwangwoon University, South Korea
- 359.8 Reconfigurable Microstrip Yagi-Uda Antenna with a Scannable Circularly Polarized Beam** \*\*\*\*\*%+-%  
A. Khidre<sup>1</sup>, F. Yang<sup>1,2</sup>, A. Elsherbeni<sup>1</sup>  
<sup>1</sup>University of Mississippi, United States; <sup>2</sup>Tsinghua University, China
- 359.9 Controllable Pattern Reconfigurable Microstrip Disc Antenna** \*\*\*\*\*%+-%  
M. Abou Al-alaa, H. Elsadek, E. Abdullah, *Electronics Research Institute, Egypt*; E. Hashish, *Faculty of Engineering, Egypt*



### 360. UWB Antenna Arrays

Session Chairs: Dejan Filipovic, Max Ammann

- 360.1 Limits for Low Complexity Beam-Steering for UWB Antenna Arrays** -  
V. Sipal, D. Edwards, *University of Oxford, United Kingdom*; B. Allen, *University of Bedfordshire, United Kingdom*
- 360.2 Vivaldi Array for Generation of UWB Circular Polarization** -  
A. Narbudowicz, M. John, X. Bao, M. J. Ammann, *Dublin Institute of Technology, Ireland*
- 360.3 On the Mutual Coupling of UWB Antenna Arrays Using EBG Layers** -  
O. M. Haraz, *Concordia University, Canada*; A.-R. Sebak, *King Saud University - PSATRI, Saudi Arabia*
- 360.4 Rotationally Symmetric Planar Ultra-Wideband Array Design Techniques** -  
M. D. Gregory, D. H. Werner, *The Pennsylvania State University, United States*
- 360.5 An Eight-Element Dielectric Rod Antenna Array Integrated to a Substrate Integrated Waveguide Feed for Wide Band Applications** -  
R. Kazemj, *K. N. Toosi University of Technology, Iran*; A. Fathy, *University of Tennessee, USA*
- 360.6 Design of Wideband Stepped-Notch Arrays Using Multi-Section Impedance Transformer Design Rules** -  
R. Gunnarsson, P. Andersson, L. Pettersson, *Swedish Defence Research Agency, Sweden*
- 360.7 Monolithically Integrated K/Ka Array-Based Direction Finding Subsystem** -  
N. Jastram, D. Filipovic, *University of Colorado, United States*
- 360.8 Wideband Circularly-Polarized Aperture Antenna Arrays Utilizing UWB Directional Coupler** -  
K.-H. Lu, K.-C. Lin, S.-K. Lin, *Graduate Institute of Communication Engineering, National Taiwan University, Taiwan*; Y.-C. Lin, *Department of Electrical Engineering, National Taiwan University, Taiwan*
- 360.9 Uniplanar UWB Antenna for Diversity Applications** -  
B. P. Chacko, G. Augustin, T. A. Denidni, *National Institute of Scientific Research(INRS), Canada*

### 361. Electromagnetic Design Optimization

Session Chairs: Yahya Rahmat-Samii, Matthew Bray

- 361.1 SVM for Electromagnetics: State-of-Art, Potentialities, and Trends** \*\*\*%&\$+  
G. Oliveri, P. Rocca, A. Massa, *ELEDIA Research Center - University of Trento, Italy*
- 361.2 Evaluation of Stochastic Algorithm Performance on Antenna Optimization Benchmarks** \*\*\*%&\$-  
I. Brinster, P. De Wagter, J. Lohn, *Carnegie Mellon University, United States*
- 361.3 Comparison of Different Optimization Techniques in Antenna Design – Part I** \*\*\*%&?%  
R. E. Zich, M. Mussetta, F. Grimaccia, R. Albi, A. Carbonara, P. D'Antuono, T. Guffanti, E. Zucchelli, *POLITECNICO DI MILANO, Italy*
- 361.4 Comparison of Different Optimization Techniques in Antenna Design – Part II** \*\*\*%&?%  
R. E. Zich, M. Mussetta, F. Grimaccia, J. Banchetti, T. Guggiani, A. Oregio Catelan, F. Lo Presti, O. Testoni, T. Zanelli, *POLITECNICO DI MILANO, Italy*
- 361.5 Modified Bayesian Optimization Algorithm for Microstrip Filter Design** \*\*\*%&?%  
B. V. Ha<sup>1</sup>, M. Mussetta<sup>1</sup>, P. Pirinoli<sup>2</sup>, R. E. Zich<sup>1</sup>  
<sup>1</sup>*POLITECNICO DI MILANO, Italy*; <sup>2</sup>*Politecnico di Torino, Italy*
- 361.6 Efficient Simulation-Driven Design Optimization of Antennas Using Co-Kriging** \*\*\*%&?%  
S. Koziel, S. Ogurtsov, *Reykjavik University, Iceland*; I. Couckuyt, T. Dhaene, *Ghent University - IBBT, Belgium*
- 361.7 Selecting Model Fidelity for Antenna Design Using Surrogate-Based Optimization** \*\*\*%&?%  
S. Koziel, S. Ogurtsov, *Reykjavik University, Iceland*
- 361.8 Space Mapping Design Exploiting Library Antenna Models** \*\*\*%&?%  
S. Tu, Q. S. Cheng, J. W. Bandler, N. K. Nikolova, *McMaster University, Canada*
- 361.9 A Matlab Based Universal CEM CAD Optimizer** \*\*\*%&?%  
A. Borysenko, *A&E Partnership, United States*; N. Herscovici, *Air Force Research Laboratory, Wright Patterson Air Force Base, United States*
- 361.10 General Rules for Objective Functions in Wide- and Multi-Band Pixelized Antenna Design** \*\*\*%&?%  
Y.-S. Chen, Y.-C. Chan, H.-J. Li, S.-Y. Chen, *National Taiwan University, Taiwan*

### 362. Advances in Non-Standard FDTD Methods

Session Chairs: Raphael Kastner, David Davidson

- 362.1 Divergence of Electric Field for the two-dimensional (2-D) Leapfrog ADI-FDTD method. **T. H. Gan**, E. L. Tan, *NTU, Singapore*
- 362.2 A Time-Domain Discretisation of Maxwell's Equations in Nontrivial Media Using Collocated Fields **W. Tierens**, D. De Zutter, *Ghent University, Belgium*
- 362.3 3D and 4D Space-Time Grids for Electromagnetic Wave Computation Using Finite Integration Method **T. Matsuo**, S. Shimizu, T. Mifune, *Kyoto University, Japan*
- 362.4 Fast Analysis of Scattering from Inhomogeneous Dielectric Bodies of Revolution Embedded in Layered Media and Application to Lens Design **X. Wang**, Q. Wu, D. H. Werner, *The Pennsylvania State University, United States*
- 362.5 Nearly PML for an Unconditionally-Stable Six-Stages Split-Step FDTD Method **Y.-D. Kong**, **Q.-X. Chu**<sup>1,2</sup>  
<sup>1</sup>School of Electronic and Information Engineering, South China University of Technology, China; <sup>2</sup>The State Key Laboratory of Millimeter Waves, Southeast University, China
- 362.6 A Hybrid 2D/3D Cylindrical FDTD Method Based on Azimuthal Mode Decomposition **S. Kirsch**, R. Schuhmann, *Technische Universität Berlin, Germany*
- 362.7 Cylindrical FDTD Grid-Compatible Green's Functions **O. Markish**, **R. Kastner**, *Tel Aviv University, Israel*
- 362.8 Evaluation of the Numerical Accuracy of Overset Grid Generation Method for a Rotating Body **S. Sahranj**, M. Kuroda, *Tokyo University of Technology, Japan*
- 362.9 Unconditionally Stable High-Order Picard Iteration Algorithm for Computational Electromagnetics **A. Ghasemi**, K. Sreenivas, L. K. Taylor, *National Center for Computational Engineering, United States*

### 363. Printed Dipole, Slot, and Planar Inverted-F Antennas

Session Chairs: Dimitrios Peroulis, Hualiang Zhang

- 363.1 **Radiation Efficiency Enhancement for Dipoles Placed Adjacent to Lossy Silicon Substrates** ( )  
D. Kim, D. Peroulis, *Purdue University, United States*
- 363.2 **A Frequency Reconfigurable Monopole Antenna Based on Complementary Split-Ring Resonators** ( )  
S. C. Basaran, K. Sertel, *ELECTROSCIENCE LABORATORY, United States*
- 363.3 **Ground Plane Effects on Planar Inverted-F Antennas** ( ) +  
N. Bohannon, J. Bernhard, *University of Illinois at Urbana-Champaign, United States*
- 363.4 **Low-Cost 60 GHz Printed Yagi Antenna Array** ( ) -  
Z. Briqech, *Concordia University, Canada*; A.-R. Sebak, *King Saud University, Saudi Arabia*
- 363.5 **Multiband Printed-IFA on Electromagnetic Band-Gap** ( ) %  
D. M. N. Elsheakh, E. A. Abdallah, *Electronics Research Institute, Egypt*
- 363.6 **Two Types of Planar Inverted F Antenna Fed at the Edge** ( ) '  
A. Matsui, K. Fujimaki, B. He, *Saitama Institute of Technology, Japan*
- 363.7 **Size Reduction of a Rear Radiating Microstrip Fed Printed Dipole Antenna** ( ) )  
M. Q. Maula, L. Shafai, *University of Manitoba, Canada*
- 363.8 **A High-Sensitivity 2.45 GHz Rectenna for Low Input Power Energy Harvesting** ( ) +  
H.-C. Sun, Y.-X. Guo, Z. Zhong, *NUS, Singapore*
- 363.9 **High Isolation Antenna Based on Super Coupling of Electromagnetic Energy from a Waveguide to Free Space** ( ) B#  
S. Seran, J. P. Donohoe, *Mississippi State University, United States*
- 363.10 **Wideband Directive Dipole Antenna with Integrated Balun** ( ) -  
A. R. Harish, T. Kumar, *Indian Institute of Technology Kanpur, India*

### 364. Reflectarray elements and synthesis

Session Chairs: Fan Yang, Paola Pirinoli

#### 364.1 Reflection Coefficient Analysis of a TEM-Excited Reflectarray Unit Cell Using Quality Factors

K. K. Karnati<sup>1</sup>, Y. Yusuf<sup>2</sup>, S. Ebadi<sup>1</sup>, X. Gong<sup>1</sup>  
<sup>1</sup>University of Central Florida, United States; <sup>2</sup>University of Wisconsin-Madison, US

#### 364.2 A New CPSS Element

J. Roy, Communications Research Centre Canada, Canada

#### 364.3 Validation of a S-Band Reflectarray Prototype with Square Ring Resonators

G. C. Vietti, P. Pirinoli, M. Orefice, G. Dassano, Politecnico di Torino, Italy; M. Mussetta, POLITECNICO DI MILANO, Italy

#### 364.4 Design of Single Layer RA with Enhanced Bandwidth

B. V. Ha<sup>1</sup>, P. Pirinoli<sup>2</sup>, M. Mussetta<sup>1</sup>, R. Zich<sup>1</sup>  
<sup>1</sup>Politecnico di Milano, Italy; <sup>2</sup>Politecnico di Torino, Italy

#### 364.5 Ka-Band Tunable Reflectarray Unit Cell Using BST Technology

Y. Shen, S. Ebadi, X. Gong, University of Central Florida, United States

#### 364.6 Dual-Band MEMS-Tunable Slotted-Cross Reflective Unit Cell with Orthogonal Polarization

H. Moghadas<sup>1,2</sup>, M. Daneshmand<sup>1,2</sup>, P. Mousavi<sup>1,2</sup>, M. R. Chaharmir<sup>3</sup>, J. Shaker<sup>3</sup>  
<sup>1</sup>University of Alberta, Canada; <sup>2</sup>TRLabs, Canada; <sup>3</sup>Communication Research Center, Canada

#### 364.7 Dual-Band Orthogonally-Polarized Slotted-Lozenge Reflective Unit Cell Tuned by MEMS Varactor

D. Oloumi<sup>1,2,3</sup>, H. Moghadas<sup>1,2</sup>, P. Mousavi<sup>1,2</sup>  
<sup>1</sup>University of Alberta, Canada; <sup>2</sup>TRLabs, Canada; <sup>3</sup>Blekinge Institute of Technology, Sweden

#### 364.8 Phase-Only Synthesis of Aperiodic Reflectarrays with Multi-Frequency Specifications

A. Capozzoli, C. Curcio, A. Liseno, Università di Napoli Federico II, Italy; M. Migliorelli, Space Engineering S.p.A., Italy; G. Toso, European Space Agency, ESA ESTEC, The Netherlands

#### 364.9 Design of Single-Feed Reflectarrays with Asymmetric Multi-Beams

P. Nayeri, F. Yang, A. Z. Elsherbeni, The University of Mississippi / Student, United States

#### 364.10 A New Reflectarray Panel Design Concept for Interferometric SAR

R. E. Hodges, R. C. Hughes, M. W. Thomson, M. S. Zawadzki, Jet Propulsion Laboratory, United States

## 365. Integral Equation Methods II

Session Chairs: Eric Michielssen, David Jackson

- 365.1 Low-Frequency Regularization of the Mixed-Discretized Calderon CFIE** \*\*\*B#5  
F. P. Andriulli, *Ecole nationale supérieure des telecommunications de Bretagne (TELECOM Bretagne), France*; K. Cools, *University of Nottingham, UK*; I. Bogaert, *Gent University, Belgium*; H. Bagci, *KAUST, Saudi Arabia*; P. Ylä-Oijala, *Aalto University, Finland*; E. Michielssen, *University of Michigan, Michigan*
- 365.2 Projection Based Quasi-Helmholtz Decompositions: Loop/Star-like Schemes Without the Search for Global Loops** \*\*\*B#5  
F. P. Andriulli, *Ecole nationale supérieure des telecommunications de Bretagne (TELECOM Bretagne), France*; I. Bogaert, *Gent University, Belgium*; K. Cools, *University of Nottingham, UK*; E. Michielssen, *University of Michigan, Michigan*
- 365.3 Issues in the Evaluation of Strongly near-Singular Integrals Involving Curvilinear Triangles** \*\*\*B#5  
F. Vipiana, *Politecnico di Torino, Italy*; D. R. Wilton, *University of Houston, USA*; W. A. Johnson, *Private Consultant, USA*
- 365.4 Dual Basis for the Fully Linear LL Functions** \*\*\*B#5  
S. P. Kiminki<sup>1</sup>, I. Bogaert<sup>2</sup>, P. Ylä-Oijala<sup>1</sup>  
<sup>1</sup>*Aalto University, Finland*; <sup>2</sup>*Ghent University, Belgium*
- 365.5 On the Low Frequency Behavior of the Mixed Discretized Time Domain Magnetic Field Integral Equation** \*\*\*B#5  
H. A. Ülkü<sup>1</sup>, I. Bogaert<sup>2</sup>, K. Cools<sup>3</sup>, F. P. Andriulli<sup>4</sup>, H. Bagci<sup>1</sup>  
<sup>1</sup>*King Abdullah University of Science and Technology, KSA*; <sup>2</sup>*Ghent University, Belgium*; <sup>3</sup>*University of Nottingham, UK*; <sup>4</sup>*TELECOM Bretagne, France*
- 365.6 Computation of a Conformal Phased Array on an Aircraft Fuselage** \*\*\*B#5  
Q. Carayol, *Dassault Aviation, France*
- 365.7 Current Continuity Enforcement in First Order Locally Corrected Nystrom Method via RWG Moment Method** \*\*\*B#5  
M. Shafieipour, V. Okhmatovski, *University of Manitoba, Canada*
- 365.8 Discretization of Surface Integral Equations Using Conforming and Non-Conforming Basis Functions** \*\*\*B#5  
E. Ubeda<sup>1</sup>, P. Ylä-Oijala<sup>2</sup>, J. M. Tamayo<sup>3</sup>, S. P. Kiminki<sup>2</sup>, J. M. Rius<sup>1</sup>, S. Järvenpää<sup>2</sup>  
<sup>1</sup>*Aalto University, Finland*; <sup>2</sup>*Universitat Politècnica de Catalunya, Spain*; <sup>3</sup>*Université de Toulouse, France*
- 365.9 Integral Representations of the 1D Periodic Layered-Media Green's Function for Periodic Printed Leaky-Wave Antennas** \*\*\*B#5  
G. Valerio, *Université de Rennes, France*; D. R. Jackson, *University of Houston, USA*; A. Galli, *Sapienza University, Italy*
- 365.10 Non-Uniform Time Stepping Scheme for the Explicit Solution of the Time Domain Volume Integral Equation** \*\*\*B#5  
A. Al-Jarro, H. Bagci, *King Abdullah University of Science and Technology, Saudi Arabia*

#### 401. Applications of Frequency Selective Surfaces

Session Chairs: Kamal Sarabandi, George Shaker

- 401.1 **Frequency Selective Surface for Reflector Antenna with Multiple Feeds** <sup>1</sup>  
C.-C. Hunag, N.-W. Chen, *Yuan Ze University, Taiwan*
- 401.2 **Circularly Polarized Resonant Cavity Antenna Using Single-Layer Double-Sided FSS Superstrate** <sup>1</sup>, %  
S.-C. Chiu, S.-Y. Chen, *Graduate Institute of Communication Engineering, Taiwan*
- 401.3 **Frequency Selective Surfaces for High-Power Microwave (HPM) Applications** <sup>1</sup>, '  
M. Li, N. Behdad, *University of Wisconsin Madison, United States*
- 401.4 **A Frequency Selective Surface with Integrated Limiter for Receiver Protection** <sup>1</sup>, %  
S. Scott, C. D. Nordquist, M. J. Cich, T. S. Jordan, C. T. Rodenbeck, *Sandia National Laboratories, United States*
- 401.5 **A Spatial Image Rejection Filter Based on Miniaturized-Element FSS for J-Band Radar Applications** <sup>1</sup>, %  
M. Moallem, K. Sarabandi, *University of Michigan, United States*
- 401.6 **Inkjet-Printed Cylindrical EBG for Low-Cost, Omnidirectional Antennas Using Split-Ring Resonators** <sup>1</sup>, %  
H. Lee<sup>1</sup>, G. Shaker<sup>2</sup>, F. Bush<sup>1</sup>, M. M. Tentzeris<sup>1</sup>  
<sup>1</sup>*Georgia Institute of Technology, United States*; <sup>2</sup>*University of Waterloo, Canada*
- 401.7 **Low Loss FSS Polarizer for 70 GHz Applications** <sup>1</sup>, %  
G. I. Kiani, V. Dyadyuk, *CSIRO, Australia*
- 401.8 **A Broadband Flat Lens Based on Aperture-Coupled Patch FSSs with Four-Pole Resonant Behaviour** <sup>1</sup>, %  
Y. Wang, H. Deguchi, M. Tsuji, *Doshisha University, Japan*
- 401.9 **Novel FSS Filters in Ka Band** <sup>1</sup>, %  
V. Sanphuang, N. K. Nahar, J. L. Volakis, *The Ohio State University, United States*
- 401.10 **An EMI Shielding FSS for Ku-Band Applications** <sup>1</sup>, %  
H.-Y. Chen, Y.-K. Chou, *Yuan Ze University, Taiwan*

## 402. Absorbers and Scattering Control

Session Chairs: Zhongxiang Shen, Yikun Huang

- 402.1 A Dual-Polarized Switchable Microwave Absorber** -  
Q. Zhang, Z. Shen, *Nanyang Technological University, Singapore*
- 402.2 Circularly Polarized Receiving Antenna Systems With Zero Backscattering** %  
A. O. Karilainen, S. A. Tretyakov, *Aalto University, Finland*
- 402.3 Electromagnetic Cloaking of PEC Cylinders with a Single Isotropic and Homogeneous Layer** % '\$'  
C. A. Valagiannopoulos, P. Alitalo, *Aalto University, Finland*
- 402.4 Metasurface Mantle Cloak for Antenna Applications** % '\$)  
A. Monti, A. Toscano, F. Bilotti, *"Roma Tre" University, Italy*
- 402.5 Arbitrary Irregular Polygonal Electromagnetic Superabsorber and Superscatterer** % '\$+  
S. H. Sedighy<sup>1,2</sup>, M. Khalaj-AmirHosseini<sup>1</sup>  
<sup>1</sup>*Iran Univ. of Science & Tech, UC Irvine, Iran*; <sup>2</sup>*University of California, Irvine, USA*
- 402.6 Performance Analysis of the Effective Dielectric Model for Perfect Electric Conducting Objects** % '\$-  
Y. Huang, *Montana state University, United States*; Y. Zhao, G. Wan, *Northweatern Polytechnic University, China*
- 402.7 Thin Wave Absorber Composed of Mushroom Structures** % %  
J. Shinohara, N. Michishita, Y. Yamada, *National Defense Academy, Japan*; H. Hada, *Fujitsu Limited, Japan*
- 402.8 Electromagnetic Power Absorption in Cylindrical Models** % B#  
F. Keshmiri, C. Craeye, *Universite Catholique de Louvain, UCL, Belgium*
- 402.9 RCS of Phased Array with Parallel Feed Network** % B#  
H. Singh, S. Hl, R. M. Jha, *CSIR-National Aerospace Laboratories, Bangalore, India, India*
- 402.10 Fractal Dimension Effect in Scattering of the Multilayered Sphere** % %  
L. Xu, G. Liu, *School of Science, XIDIAN University, China*



### 403. AMTA Special Session - Advances in RF Measurement Technology

Session Chairs: Chris Coleman, Ivan LaHaie

Session Organizers: Ivan LaHaie, Chris Coleman

#### 403.1 Operator Processing **B#5**

C. M. Coleman, *Integrity Applications Inc., United States*

#### 403.2 Equivalent Current Approach as an Advanced Field Interpolation Technique **B#5**

L. J. Foged, L. Scialacqua, F. Saccardi, *SATIMO, Italy*; J. Araque Quijano, *Universidad Nacional de Colombia, Colombia*; M. Sabbadini, *ESA/ESTEC, The Netherlands*; G. Vecchi, *Politecnico di Torino, Italy*

#### 403.3 The NASA Debris Radar for Characterizing Static and Dynamic Ascent Debris Events for Safety of Flight **B#5**

B. M. Kent, P. Ryan, C. Thomas, *Air Force Research Laboratory - Sensors Directorate, United States*

#### 403.4 Reflector Surface Distortion on a Sub-Reflectarray Cassegrain System: Simulations, Measurements, and Microwave Holographic Diagnostics **B#5**

H. Rajagopalan, Y. Rahmat-Samii, *University of California Los Angeles, United States*

#### 403.5 Optimal Mode Filtering in Probe Corrected Cylindrical Near-Field Measurements **B#5**

R. J. Pogorzelski, L. R. Amaro, *California Institute of Technology, United States*

#### 403.6 Parametric Study of Probe Positioning Errors in Spherical Near-Field Test Systems for Millimeter-Wave Applications **B#5**

D. Janse van Rensburg, *Nearfield Systems Inc, USA*

#### 403.7 Free Space Scattering Measurements of Scale 3D Structures **B#5**

J.-M. Geffrin, C. Eyraud, A. Litman, *Institut Fresnel, France*; R. Vaillon, B. Lacroix, *Cethil, France*

#### 403.8 A Cone Shaped Taper Anechoic Chamber for Antenna Measurements in the 200 MHz to 18GHz Frequency Range **B#5**

V. Rodriguez, *ETS-Lindgren, United States*

#### 404. Evaluation Techniques for Compact Multi Element Antennas for MIMO

Session Chairs: Rodney Vaughan, Jane Yun

Session Organizers: Rodney Vaughan, Jane Yun

**404.1 Theoretical Models for Improving OTA Measurement Quality of Throughput of LTE Devices with MIMO and OFDM in Reverberation Chamber** P.-S. Kildal, Chalmers University of Technology, Sweden; C. Orlenius, Bluetest AB, Sweden

**404.2 Evaluation of the MIMO Performance of LTE Handsets** I. Dioum<sup>1</sup>, A. Diallo<sup>2</sup>, S. M. Farssi<sup>1</sup>, C. Luxey<sup>2</sup>  
<sup>1</sup>University of Cheikh Anta Diop, Senegal; <sup>2</sup>University of Nice Sophia-Antipolis, France

**404.3 Design and Verification of MIMO 2x2 Reference Antennas** J. Szini<sup>1</sup>, G. F. Pedersen<sup>2</sup>, J. Estrada<sup>3</sup>, A. Scannavini<sup>4</sup>, L. J. Foged<sup>3</sup>  
<sup>1</sup>Motorola Mobility Inc, USA; <sup>2</sup>Aalborg University, Denmark; <sup>3</sup>SATIMO, USA; <sup>4</sup>SATIMO, Italy

**404.4 Multiplexing Efficiency of MIMO Antennas with User Effects** R. Tian, B. K. Lau, Lund University, Sweden; Z. Ying, Sony Ericsson Mobile Communications AB, Sweden

**404.5 Modeling System Throughput of Single and Multi-Port Wireless LTE Devices** A. Hussain, P.-S. Kildal, G. Durisi, Chalmers University of Technology, Sweden

**404.6 Testing MIMO Devices over the Air** J. Ø. Nielsen, O. N. Alrabadi, W. Fan, A. Yamamoto, AAU, Denmark; T. Sakata, G. F. Pedersen, Panasonic Corporation, Japan

**404.7 A Method to Evaluate the Compactness of MEA** J. X. Yun, R. G. Vaughan, Simon Fraser University, Canada

**404.8 A New Self-Interference and Self-Noise Evaluation Method for MIMO Cellular Devices** Y. Jing, H. Kong, Agilent Technologies, China; S. Duffy, Agilent Technologies, USA; M. Rumney, Agilent Technologies, UK; P. Jensen, Agilent Technologies, Denmark

**404.9 Noise-Based Antenna Terms for Active Receiving Arrays** K. F. Warnick, BYU, United States; M. Ivashina, R. Maaskant, Chalmers University of Technology, Sweden; B. Woestenburg, ASTRON, The Netherlands

**404.10 Evaluation of Multi Element Antennas in Reverberation Chamber** C. Orlenius, C. Lötbäck Patané, A. Skårbratt, J. Åsberg, Bluetest AB, Sweden; P.-S. Kildal, Chalmers University of Technology, Sweden

#### 405. Phased Array Antennas III

Session Chairs: Satish Sharma, John Papapolymerou

- 405.1 **Signal Distortion in Multibeam Broadband Active Transmit Arrays with Time Domain Beamsteering** \*\*\*\*% (%  
R. Haupt, M. Weiss, *Ball Aerospace, United States*
- 405.2 **Time Domain Analysis of a 2-D Phased Array Antennas for near Field Focusing Radiations** \*\*\*\*% ('  
S.-C. Tuan, *Oriental Institute of Technology, Taiwan*; H.-T. Chou, *Yuan Ze University, Taiwan*
- 405.3 **Compact Ultrawideband Beam-Steering Horn Antenna** \*\*\*\*% ( )  
W. Moulder, K. Sertel, J. L. Volakis, *Ohio State University, United States*
- 405.4 **Multimode Antenna Element with Hemispherical Beam Peak and Null Steering** \*\*\*\*% (+  
N. R. Labadie, S. K. Sharma, *San Diego State University, United States*; G. M. Rebeiz, *University of California, United States*
- 405.5 **An Alternative Method for Phase Only Array Pattern Synthesis** \*\*\*\*% (-  
E. Ercil, *ASELSAN INC., Turkey*
- 405.6 **Linear Antenna Array Synthesis Using Gradient-Based Optimization with Analytical Derivatives** \*\*\*\*% )%  
S. Koziel, S. Ogurtsov, *Reykjavik University, Iceland*
- 405.7 **Synthesis of Pencil Beams by Blocked Arrays** \*\*\*\*% )'  
F. J. Ares-Pena, R. Eirey-Pérez, J. A. Rodríguez-González, *University of Santiago de Compostela, Spain*; G. Franceschetti, *University of Naples, Italy*
- 405.8 **Beam Steering Performance of a Wideband Modified E-Shape Microstrip Patch Antenna Array** \*\*\*\*% ) )  
R. N. Damman, J. T. Rayno, S. K. Sharma, *San Diego State University, United States*
- 405.9 **Efficient Evaluation of Radiation Patterns for Periodic Structures Using a Periodic FDTD Method** \*\*\*\*% ) +  
M. Wang, J. Chen, D. R. Jackson, *University of Houston, United States*; W. Wu, *Nanjing University of Science and Technology, China*
- 405.10 **Acceleration of Successive Projection Method in the Synthesis of Phased Array Antennas via Basis Function Transformations** \*\*\*\*% ) -  
H.-T. Chou<sup>1</sup>, S.-C. Tuan<sup>2</sup>, Y.-T. Lin<sup>1</sup>  
<sup>1</sup>*Yuan Ze University, Taiwan*; <sup>2</sup>*Oriental Institute of Technology, Taiwan*

#### 406. Human Body Interaction with Antennas and Other Electromagnetic Devices

Session Chairs: Erdem Topsakal, Gianluca Lazzi

- 406.1 Theory for Exposure Prediction in an Indoor Environment Due to UWB Systems** % \* %  
A. Bamba, E. Tanghe, W. Joseph, G. Vermeeren, D. Plets, L. Martens, *Ghent University, Belgium*
- 406.2 Application of Doppler Radar for the Estimation of Total Energy Expenditure of a Human Subject** B#  
Y. Kim, S. Choudhury, *California State University at Fresno, United States*
- 406.3 The Use of a Multi-Coil Approach with Liquid Metal-Based Coils for the Development of Efficient, Stretchable, Conformable Telemetry Systems for Biomedical Implants** B#  
A. K. RamRakhyani<sup>1</sup>, G. Hayes<sup>2</sup>, A. Qusba<sup>2</sup>, M. Dickey<sup>2</sup>, G. Lazzi<sup>1</sup>  
<sup>1</sup>*University of Utah, United States;* <sup>2</sup>*North Carolina State University, United States*
- 406.4 A Small Implantable Antenna for Medical Wireless Telemetry Applications** B#  
S. Seran, J. P. Donohoe, E. Topsakal, *Mississippi State University, United States*
- 406.5 Implantable/Wearable Microfluidic Antennas** B#  
E. Inci<sup>1</sup>, K. Sharp<sup>2</sup>, U. Gurkan<sup>1</sup>, U. Demirci<sup>1</sup>, E. Topsakal<sup>2</sup>  
<sup>1</sup>*Harvard Medical School, United States;* <sup>2</sup>*Mississippi State University, United States*
- 406.6 A Small Size Wide-Band Implantable Antenna for Medical Wireless Telemetry** B#  
J. W. Ung, T. Karacolak, *Washington State University Vancouver, United States*
- 406.7 Analog Front End with Improved Sensitivity and Evaluation on SIR for Human Body Communication** B#  
K. Park<sup>1</sup>, C. H. Hyoun<sup>2</sup>, S. Kang<sup>2</sup>, Y. T. Kim<sup>1</sup>  
<sup>1</sup>*Chosun University, South Korea;* <sup>2</sup>*Electronics and Telecommunications Research Institute, South Korea*
- 406.8 On the Safety Assessment of Wireless Power Transfer Systems** B#  
C. J. Cela, O. Gandhi, A. K. RamRakhyani, G. Lazzi, *University of Utah, United States*
- 406.9 Evaluation of Dosimetry of Wireless Systems in Complex Indoor Scenarios with Human Body Interaction** B#  
E. Aguirre<sup>1</sup>, J. Arpon<sup>1</sup>, L. Azpilicueta<sup>1</sup>, V. Ramos<sup>2</sup>, E. Falcone<sup>1</sup>  
<sup>1</sup>*Universidad Publica de Navarra, Spain;* <sup>2</sup>*Instituto de Salud Pública Carlos III, Spain*
- 406.10 Investigation of Low Profile Electromagnetic Band Gap Structure on Specific Absorption Rate** B#  
N. H. Mohd Hanafi, M. T. Islam, N. Misran, *Universiti Kebangsaan Malaysia (UKM), Malaysia*

#### 407. Microstrip Antenna Arrays

Session Chairs: Atif Shamim, Sean Hum

- 407.1 **Linear Array of 2x2 Dual-Polarized X-Band Microstrip Patch Sub Arrays for off-the-Grid Radar Array Antenna** \*\*\*\*% \*\*  
P. Sharma, R. A. Rodríguez-Solís, *University of Puerto Rico Mayaguez, United States*
- 407.2 **Linear Aperiodic Array of Microstrip Patch Antennas with Grating Lobes Reduction** \*\*\*\*% \*)  
G. Leon, M. Arrebola, S. Suarez, L. F. Herran, F. Las-Heras, *Universidad de Oviedo, Spain*
- 407.3 **Fast Solution for the Radiation of Microstrip Antenna Arrays Covered with Metamaterial Superstrates** \*\*\*\*% \* +  
O. Siddiqui, H. Attia, N. Suwan, O. Ramahi, *University of Waterloo, Canada*
- 407.4 **Low Profile Multibeam Dual Polarization Antenna Array with Compensated Mutual Coupling** \*\*\*\*% \*-  
L.-P. Shen, H. Trigui, S. Dean, B. Yan, *Ultra Electronics-TCS, Canada*
- 407.5 **Study of LCP Based Flexible Patch Antenna Array** \*\*\*% +%  
F. A. Ghaffar, A. Shamim, *King Abdullah University of Science and Technology (KAUST), Saudi Arabia*; L. Roy, *Carleton University, Canada*
- 407.6 **A 24-GHz Microstrip Grid Array Antenna** \*\*\*\*% +'  
L. Zhang, Y. P. Zhang, Y. Lu, *Nanyang Technological University, Singapore*
- 407.7 **A Narrow Beamwidth Array Antenna Design for Indoor Non-Contact Vital Sign Sensor** \*\*\*\*% +)  
T.-C. Tang, Y.-R. Chuang, K.-H. Lin, *National Sun Yat-sen University, Taiwan*
- 407.8 **A Dual Band and Dual Polarization Array Antenna for AMRFC Application** \*\*\*\*% ++  
Y. Lee, D. Ga, T. Song, J. Choi, *Hanyang University, South Korea*
- 407.9 **Wide Bandwidth Dual-Frequency Dual-Polarized Microstrip Array Antenna for Ku-Band Applications** \*\*\*\*% +  
W. Li, D. Ren, X. Liang, R. Jin, J. Geng, S. Ye, W. Wang, Q. Guo, *Shanghai Jiao Tong University, China*

## 408. Inverse Scattering and Imaging: Methods and Algorithms

Session Chairs: Andrea Massa, Magda El-Shenawee

- 408.1 Minimum-Norm Current Formulation for MT-BCS Inversion of Scattering Data** \*\*\*\*%, %  
G. Oliveri, L. Poli, A. Massa, *ELEDIA Research Center - University of Trento, Italy*
- 408.2 Two-Step (Estimate and Detect) Sparse Imaging** \*\*\*\*%, '  
M. Nikolic<sup>1</sup>, A. Nehorai<sup>2</sup>, A. Djordjevic<sup>1</sup>  
<sup>1</sup>*University of Belgrade, Serbia;* <sup>2</sup>*Washington University in Saint Louis, USA*
- 408.3 A Contrast Source Inversion Method Using Truncated Wavelet Representations** \*\*\*\*%, )  
O. Semerci, M. Li, A. Abubakar, T. M. Habashy, *Schlumberger-Doll Research, United States*
- 408.4 Inversion of EM Scattering Data Through a Multiresolution Regularization Approach Within the Contrast Source Formulation** \*\*\*\*%, +  
G. Oliveri, A. Tommasi, A. Massa, *ELEDIA Research Center - University of Trento, Italy;* A. Randazzo, M. Pastorino, *University of Genova, Italy*
- 408.5 Fast Multifrequency Algorithm for Radar Based Profile Reconstruction** \*\*\*\*%, -  
B. Gonzalez-Valdes, J. A. Martinez-Lorenzo, C. M. Rappaport, *Northeastern University, United States;* A. G. Pino, *University of Vigo, Spain*
- 408.6 Interval Analysis as Applied to Inverse Scattering** \*\*\*\*% - %  
M. Carlin, P. Rocca, G. Oliveri, A. Massa, *ELEDIA Research Center - University of Trento, Italy*
- 408.7 Effective Reconstruction of Small Dielectric Objects in Microwave Imaging** \*\*\*\*% - '  
M. Erramshetty, A. Bhattacharya, *Indian Institute of Technology Kharagpur, India*
- 408.8 Reconstruction of Three-Dimensional Dielectric Objects Through Integral Equation Method** \*\*\*\*% - )  
M. S. Tong, W. T. Sheng, Z. Y. Zhu, Z. Xu, J. H. Zhou, X. F. Yin, *Tongji University, China*
- 408.9 An Initial Guess Method for the Reconstruction Algorithm with Intensity-Only Data** \*\*\*\*% - +  
H. Zheng, M. Wang, J. Luo, *University of Electronic Science and Technology of China, China*
- 408.10 Improvement of Time Reversal Focusing Resolution in Dispersive Media Using Double-Brillouin Pulse** \*\*\*\*% --  
M. K. Bashi, R. Safian, *Isfahan University of Technology, Iran*

## 409. Reconfigurable Antennas

Session Chairs: Fan Yang, Greg Huff

- 409.1 A Reconfigurable Patch Antenna with Quadri-Polarization States Using Dual Feed Ports** \*\*\*\*%\$%  
X. Yang<sup>1</sup>, B. Gong<sup>1</sup>, F. Yang<sup>2,3</sup>, A. Z. Elsherbeni<sup>2</sup>  
<sup>1</sup>Shanghai University, China; <sup>2</sup>The University of Mississippi, USA; <sup>3</sup>Tsinghua University, China
- 409.2 Microstrip Antennas with Full Polarization Diversity Using Packaged RF MEMS Switches** \*\*\*\*%\$'  
K. M. Ho, G. M. Rebeiz, *University of California, San Diego, United States*
- 409.3 Annular Ring Monopole Antenna with Switchable Polarization** \*\*\*\*%(\$)  
S.-P. Phang, N.-W. Chen, *Yuan Ze University, Taiwan*
- 409.4 Circular Polarization Switchable Single Layer Microstrip Array Antenna** \*\*\*\*%\$+  
Y. Ushijima, E. Nishiyama, I. Toyoda, M. Aikawa, *Saga University, Japan*
- 409.5 Single-Feed Polarization Reconfigurable Patch Antenna** \*\*\*\*%\$-  
N. H. Noordin, W. Zhou, N. Haridas, A. O. El-Rayis, A. T. Erdogan, T. Arslan, *University of Edinburgh, United Kingdom*
- 409.6 Ultra Stretchable Fluidic Crossed Dipoles with Mechanical Coupling** \*\*\*\*B#5  
S. C. Desai<sup>1</sup>, G. J. Hayes<sup>1</sup>, J.-H. So<sup>1</sup>, G. Lazzi<sup>2</sup>, M. D. Dickey<sup>1</sup>  
<sup>1</sup>North Carolina State University, United States; <sup>2</sup>University of Utah, United States
- 409.7 A Reconfigurable Dielectric Resonator Antenna Using Movable Dielectric Slabs** \*\*\*\*B#5  
T. Apperley, M. Okoniewski, *University of Calgary, Canada*
- 409.8 Microvascular Conductive Liquid Switches for Frequency Reconfigurable Slot Antennas** \*\*\*\*B#5  
A. J. King<sup>1</sup>, J. F. Patrick<sup>1</sup>, N. R. Sottos<sup>1</sup>, S. R. White<sup>1</sup>, G. H. Huff<sup>2</sup>, J. T. Bernhard<sup>1</sup>  
<sup>1</sup>University of Illinois at Urbana-Champaign, United States; <sup>2</sup>Texas A&M University, United States
- 409.9 A Reconfigurable Antenna with Magnetically-Coupled Switches** \*\*\*\*B#5  
R. A. Fenner, K. E. Lenz, J. M. Tomasic, *Loyola University Maryland, United States*
- 409.10 Multi-Scale Modeling of Antenna Reconfigurations Mechanisms Based on Fluidic Dispersions of Nanoparticles** \*\*\*\*B#5  
G. H. Huff, J. D. Barrera, S. A. Long, *Texas A&M University, United States*

#### 410. Advances in UWB Antennas and Systems

Session Chairs: Justin Kasemodel, Yazid Yusuf

- 410.1 **Bandwidth Enhancement of Bent Monopole Antenna by Closely Locating a Slotted Plate** \*\*\*\*\*% %  
K. Iigusa, H. Harada, *National Institute of Information and Communications Technology, Japan*
- 410.2 **Effect of Substrate Thickness on the Performance of a Printed Planar Monopole Antenna (PMA)** \*\*\*\*\*% %  
J. T. Rayno, S. K. Sharma, *San Diego State University, United States*
- 410.3 **Compact, Low-Profile UWB Antennas Exploiting the Concept of Closely-Coupled Dual-Mode Radiators** \*\*\*\*\*% %  
Y. Yusuf, N. Behdad, *University of Wisconsin, United States*
- 410.4 **Microwave Imaging of near-Field Object Using Ultra-Wideband Synthetic Aperture Radar Algorithm** \*\*\*\*\*% %  
S. S. Fayazi, H.-S. Lui, J. Yang, *chalmers university of technology, Sweden*
- 410.5 **Compact Dual-Polarized Slot UWB Antenna with CPW-Fed Structure** \*\*\*\*\*% %  
L. Xiong, P. Gao, *University of Electronic Science and Technology of China, China*
- 410.6 **Radiative Properties in Planar Printed Vivaldi Antenna Array** \*\*\*\*\*% %  
M. C. Gonzalez, *University of California, Davis, United States*
- 410.7 **Optically Reconfigurable CPW Filters for UWB Applications** \*\*\*\*\*% %  
K. Rabbi, D. Budimir, *Westminster University, United Kingdom*
- 410.8 **Compact, Teflon Embedded, Dual-Polarized Ultra Wideband (UWB) Antenna** \*\*\*\*\*% %  
L. Reichardt, J. Kowalewski, L. Zwirello, T. Zwick, *Karlsruher Institute of Technology, Germany*
- 410.9 **Simple Dual-Band Notched Design for CPW-Coupled-Fed Elliptical UWB Monopole Antenna** \*\*\*\*\*% %  
J. Zhang, X. L. Sun, S. W. Cheung, T. I. Yuk, *The University of Hong Kong, China*
- 410.10 **A Band-Notched UWB Planar Monopole Antenna** \*\*\*\*\*% %  
D. A. Salem, A. S. Abd El-Hameed, E. A. Abdallah, *Electronics Research Institute (ERI), Egypt*, E. A. Hashish, *Faculty of Engineering, Cairo Univ., Egypt*





## 412. Transients and Time-Domain Techniques

Session Chairs: Shanker Balasubramaniam, Tapan SARKAR

- 412.1 A Stable Higher Order TDIE Solver Using a Separable Approximation for Convolution with the Retarded Potential** ( )  
A. J. Pray, N. V. Nair, B. Shanker, *Michigan State University, United States*
- 412.2 A Hybrid Method of Moment (MoM) and Physical Optics (PO) Technique in the Time Domain** ( + )  
Z. Mei<sup>1</sup>, Z. Yu<sup>2</sup>, T. K. Sarkar<sup>1</sup>, M. Salazar-Palma<sup>3</sup>  
<sup>1</sup>Syracuse University, United States; <sup>2</sup>Xidian University, China; <sup>3</sup>Universidad Carlos III de Madrid, Spain
- 412.3 A Random-Plane-Wave Model for Short-Pulse-Excited Ray-Chaotic Enclosures** ( - )  
G. Castaldi, V. Galdi, I. M. Pinto, *University of Sannio, Italy*
- 412.4 A Novel Time Delay Controlling UWB Array Based on Analytical Algorithm** ( ) %  
P. Li, J. Pan, D. Yang, *UESTC, China*
- 412.5 A Comparative Study of Volumetric Vs. Subcell Modeling of Thin-Wire Structures in FVTD** ( )'  
I. Jeffrey, J. LoVetri, *University of Manitoba, Canada*; C. Fumeaux, *University of Adelaide, Australia*
- 412.6 Time Domain Integral Equation Solver for Composite Scatterers Using a Separable Expansion for Convolution with the Retarded Potential** ( ) )  
A. J. Pray, N. V. Nair, B. Shanker, *Michigan State University, United States*
- 412.7 Self-Consistent Modeling of Higher Pressure Microwave PACVD Reactors** ( ) +  
C. S. Meierbachtol, T. A. Grotjohn, B. Shanker, *Michigan State University, United States*
- 412.8 Analysis of Two Methods of Poles Extraction for Antenna Characterization** ( ) -  
F. Sarrazin, A. Shariha, *Institute of Electronics and Telecommunications of Rennes (IETR), France*; P. Pouliguen, P. Potier, J. Chauveau, *Direction Générale de l'Armement (DGA), France*
- 412.9 Time-Domain Method of Moments Accelerated by Adaptive Cross Approximation Algorithm** ( ) \* %  
Y. Yan, Y. Zhang, X.-W. Zhao, *Xidian University, China*; Z. Mei, W. Zhao, T. K. Sarkar, *Syracuse University, United States*

### 413. Millimeter Wave Printed Antennas

Session Chairs: Duixian Liu, Mohammad Fakharzadeh

- 413.1 An Aperture-Coupled Patch Antenna in RFIC Package for 60 GHz Applications** \*\*\*\*%\*  
D. Liu, S. Reynolds, *IBM, United States*
- 413.2 Antenna-in-Package Solution for Millimeter-Wave Applications: Slotted-Patch in a Multilayer PCB** \*\*\*\*%\*  
A. Enayati<sup>1,2</sup>, G. A. E. Vandenbosch<sup>2</sup>, W. D. Raedt<sup>1</sup>  
<sup>1</sup>*IMEC, Belgium*; <sup>2</sup>*KU Leuven, Belgium*
- 413.3 HDI Organic Technology Integrating Built-in Antennas Dedicated to 60 GHz SiP Solution** \*\*\*\*%\*  
R. Pillard<sup>1</sup>, D. Titz<sup>2</sup>, F. Ganesello<sup>1</sup>, P. Calascibetta<sup>1</sup>, J.-M. Riviere<sup>1</sup>, J. Lopez<sup>1</sup>, R. Coffy<sup>1</sup>, E. Saugier<sup>1</sup>, A. Poulain<sup>1</sup>, F. Ferrero<sup>2</sup>, C. Luxey<sup>3</sup>, P. Brachat<sup>4</sup>, G. Jacquemod<sup>3</sup>, D. Gloria<sup>1</sup>  
<sup>1</sup>*STMicroelectronics, France*; <sup>2</sup>*LEAT-CREMANT, France*; <sup>3</sup>*IM2NP, France*; <sup>4</sup>*Orange Labs-CREMANT, France*
- 413.4 Broad E-Plane Beamwidth Zeroth-Order Resonance Patch Antenna** \*\*\*\*%\*-  
S.-T. Ko, J.-H. Lee, *Hongik University, South Korea*
- 413.5 A Compact Dual-Band Aperture-Coupled Microstrip Antenna for Ku-Band Applications** \*\*\*\*%+  
M. Sorouri, P. Rezaei, *Semnan University, Iran*
- 413.6 A Compact 4 by 1 Patch Array Antenna-in-Package for 60 GHz Applications** \*\*\*\*%\*  
M. Fakharzadeh, *Peraso Technologies, Canada*
- 413.7 Simultaneous Optimization of Aperture and Feed Line of a Microstrip Patch Antenna** \*\*\*\*%\*  
F. Deek, C. Wan, *Mentor Graphics, United States*
- 413.8 Numerical Comparison of Exact and Asymptotic Methods for Sommerfeld Integral Evaluation with Applications to Microstrip Antennas** \*\*\*\*%\*  
D. Chatterjee, *University of Missouri Kansas City (UMKC), United States*; S. M. Rao, M. S. Kluskens, *Naval Research Laboratory, United States*
- 413.9 Wideband Shorted Higher-Order Mode Millimeter-Wave Patch Antenna** \*\*\*\*%\*  
D. Wang, H. Wong, K. B. Ng, C. H. Chan, *City University of Hong Kong, China*
- 413.10 A High Selectivity Band-Notched UWB Antenna with Controllable Notched Bandwidths** \*\*\*\*%\*, %  
G. Yang, Q.-X. Chu, *School of Electronic and Information Engineering, South China University of Technology, China*

#### 414. Propagation in Complex Environments

Session Chairs: Benjamin Bush, DaHan Liao

- 414.1 **Practical Modeling of Radio Wave Propagation in Shallow Seawater** \*\*\*\*%, '   
 B. F. Bush, K. Naishadham, V. K. Tripp, *Georgia Institute of Technology, United States*
- 414.2 **Evaluation of Ricean K-Factor of an Ultra-Wideband Channel in an Underground Mine** \*\*\*\*%, )   
 B. Nkakanou, *Université Laval, Canada*; N. Hakem, G. Y. Delisle, *LRTCS-UQAT, Canada*
- 414.3 **Characterization of the 60 GHz Channel in Underground Mining Environment** \*\*\*\*%, +   
 C. Lounis, N. Hakem, G. Y. Delisle, *LRTCS-UQAT, Canada*
- 414.4 **Experimental Characterization of MIMO-UWB Multipath Underground Mine Radio Channels** \*\*\*\*%, -   
 I. Ben Mabrouk<sup>1</sup>, L. Talbi<sup>2</sup>, M. Nedil<sup>1</sup>, K. Hettak<sup>3</sup>   
 <sup>1</sup>*Underground Communication Research Laboratory, Canada*; <sup>2</sup>*UQO, Canada*; <sup>3</sup>*Communications Research Centre Canada, Canada*
- 414.5 **Antenna Directivity Impact on MIMO System Performance.** \*\*\*\*% - %   
 A. Salim, N. Kandil, M. Nedil, *UQAT, Canada*; I. Ben Mabrouk, L. Talbi, *UQO, Canada*
- 414.6 **Peer to Peer Propagation in Vegetation Media for Wireless Sensor Networks** \*\*\*\*% - '   
 J. A. Gay-Fernández, I. Cuñas, *Universidad de Vigo, Spain*
- 414.7 **Radar Target Discrimination for Infrastructure-Based Navigation** \*\*\*\*% - )   
 C. O. Hargrave, *CSIRO, Australia*; A. Abbosh, V. Clarkson, N. V. Shuley, *The University of Queensland, Australia*
- 414.8 **Further Investigation of Empirical Path-Loss Modeling for Short Forested Paths** \*\*\*\*% - +   
 Y. H. Lee, *Nanyang Technological University, Singapore*; Y. S. Meng, *National Metrology Centre, A\*STAR, Singapore*
- 414.9 **RF Leakage Radiation from Microwave Oven for Aircraft Interior Applications** \*\*\*\*% - -   
 S. Narayan, A. K., R. M. Jha, *CSIR-National Aerospace Laboratories, India*; J. P. Bommer, *Boeing Research & Technology, USA*
- 414.10 **Channel Model for in-Body WBAN** \*\*\*\*% \$%   
 Y. Y. Hui, *Kunming University, China*; D. Shen, *Yunnan University, China*; E. Dutkiewicz, G. Fang, *Macquarie University, Australia*

#### 415. Fast Integral Equation Solvers and Stable Discretizations

Session Chairs: Francesco Andriulli, Levent Gurel

- 415.1 **Stable Discretization of the Electric-Magnetic Field Integral Equation with the Divergence Taylor-Orthogonal Basis Functions** <sup>1</sup>E. Ubeda<sup>1</sup>, J. M. Tamayo<sup>2</sup>, J. M. Rius<sup>1</sup>  
<sup>1</sup>Universitat Politècnica de Catalunya (UPC), Spain; <sup>2</sup>Université de Toulouse, France
- 415.2 **A Singularity Cancellation Technique on Arbitrary Higher Order Patch Descriptions** N. V. Nair<sup>1</sup>, A. J. Pray<sup>1</sup>, J. Villa-Giron<sup>2</sup>, B. Shanker<sup>1</sup>, D. R. Wilton<sup>3</sup>  
<sup>1</sup>Michigan State University, United States; <sup>2</sup>AFRL, United States; <sup>3</sup>University of Houston, United States
- 415.3 **A Theoretical Proof on the Error-Bounded Low-Rank Representation of Integral Operators for Large-Scale 3-D Electrodynamic Analysis** W. Chai, D. Jiao, Purdue, United States
- 415.4 **A Provably Stable MoT Scheme Based on Quadratic Spline Basis Functions** E. van 't Wout, H. van der Ven, National Aerospace Laboratory NLR, Netherlands; D. R. van der Heul, C. Vuik, Delft University of Technology, Netherlands
- 415.5 **New Preconditioning Methods Based on Calderon's Formulae for PMCHWT Formulation** K. Niino, N. Nishimura, Kyoto University, Japan
- 415.6 **Low-Frequency CMP-EFIE with Perturbation Method for Open Capacitive Problems** Q. S. Liu<sup>1</sup>, S. Sun<sup>1</sup>, W. C. Chew<sup>1,2</sup>  
<sup>1</sup>The University of Hong Kong, China; <sup>2</sup>University of Illinois at Urbana-Champaign, USA
- 415.7 **A Helmholtz Subspaces Preserving Fast Solver Based on Multigrid Inversions of the Loop-Star Decompositions** S. B. Adrian, F. P. Andriulli, Ecole nationale supérieure des telecommunications de Bretagne (TELECOM Bretagne), France
- 415.8 **Fast Wideband Integral Solution for Hybrid Finite Element / Boundary Integral Problems with Higher Order Boundary Functions** D. T. Schoberl, T. F. Eibert, TU Muenchen, Germany
- 415.9 **An Hp-Refinement Scheme for Surface Integral Equations Using the Generalized Method of Moments** N. V. Nair, B. Shanker, Michigan State University, United States
- 415.10 **Integral Equation Methods at Very Low Frequency** E. Vico, M. Ferrando-Bataller, A. Valero-Nogueira, D. Sanchez-Escuderos, Universidad Politecnica de Valencia, Spain

## IF41 Antennas for MIMO and Diversity Systems

Session Chairs: Buon Kiong Lau, Marco Migliore

- IF41.1 Small Size Conformal UWB Arrays for MIMO and Diversity Applications** [E. Yetisir](#), D. Psychoudakis, J. L. Volakis, *ElectroScience Laboratory, The Ohio State University, United States*
- IF41.2 Design of a MIMO Antenna to Enhance Channel Capacity for Indoor Base Stations** [D. Uchida](#), H. Arai, *Yokohama National University, Japan*
- IF41.3 A Broadband E-Plane Omnidirectional Antenna for 4G LTE Applications with MIMO** [F. Jolani](#), Y. Yu, Z. D. Chen, *Dalhousie University, Canada*
- IF41.4 Discrete Lens Array Modeling and Design for Optimum MIMO Communications at Mm-Wave** [J. Brady](#), N. Behdad, A. Sayeed, *University of Wisconsin - Madison, United States*
- IF41.5 A Novel 4-Shaped Dual-Band 780/2450 MHz 4-Element MIMO Antenna for Handheld Devices** [M. S. Sharawi](#), M. A. Jan, *King Fahd University of Petroleum and Minerals (KFUPM), Saudi Arabia*; D. N. Aloii, *Oakland University, USA*
- IF41.6 Exploiting ADS-Arrays for the Synthesis of MIMO Systems** [G. Oliveri](#), A. Massa, *ELEDIA Research Center - University of Trento, Italy*; M. D. Migliore, *Microwave Laboratory - University of Cassino, Italy*
- IF41.7 Effective Degree-of-Freedom of a Compact Six-Port MIMO Antenna** R. Tian, [B. K. Lau](#), *Lund University, Sweden*
- IF41.8 A Systematic Spherical Vector Wave Approach for Multi-Antenna Systems** [M. Mohajer](#), S. Chaudhuri, S. Safavi-Naeini, *University of Waterloo, Canada*
- IF41.9 A Slot Dipole Antenna with Polarization Diversity for WLAN Application** [W.-Y. Chen](#), *Graduate Institute of Communication Engineering National Taiwan University, Taiwan*; P. Hsu, *Department of Electrical Engineering National Taiwan University, Taiwan*
- IF41.10 Multi-Band MIMO Antenna for Wireless Devices** [M. M. Morsy](#), M. Basha, *Sensor Networks and Cellular System (SNCS) Research Center, Saudi Arabia*; M. Khan, *University of Saskatchewan, Canada*
- IF41.11 Design of Dual-Band B-Shaped Monopole Antenna for MIMO Application** [H. U. Iddi](#), M. R. Kamarudin, T. A. Rahman, R. A. Dewan, *Universiti Teknologi Malaysia (UTM), Malaysia*

## IF42 Chirality and Bianisotropy in Metamaterials

Session Chairs: Douglas Werner, Marco Antoniades

- IF42.1 Polarization Rotation by Multilayered Helix Metamaterial** ( ' )  
N. Burford, S. Marsh, Y. Zhang, J. N. Dahiya, *Southeast Missouri State University, United States*
- IF42.2 Experimental Verification of Substrate-Induced Bianisotropy in Optical Metamaterials** ( )  
Z. H. Jiang, S. Yun, D. Ma, P. Gorman, D. H. Werner, Z. Liu, T. S. Mayer, *The Pennsylvania State University, United States*
- IF42.3 Statistical Analysis of Affect of Parameter Variations on Double-Negative Behavior of Metamaterials** ( + )  
Y. Li, N. Bowler, *Iowa State University, United States*
- IF42.4 A Controllable Chiral Metamaterial Resonators with Four Cut Wires** ( B# )  
Z. Mousavi Razi, I. Arghand Lafmajani, P. Rezaei, *Semnan university, Iran*
- IF42.5 Multifaceted Frequency-Selective Split Ring Resonators (SRR)** ( B# )  
I. Arghand Lafmajani, Z. Mousavi Razi, P. Rezaei, *Semnan university, Iran*
- IF42.6 Effects of Magnetic Resonance on the Band Structure of 3D Dielectric Metamaterial Arrays** ( - )  
A. Hosseinzadeh, E. Semouchkina, *Michigan Technological University, United States*
- IF42.7 Effect of Complementary Rose Curve Resonator (CRCRs) on the Effective Negative Permeability** ( ) %  
B. Savitri, I. Sassi, L. Talbi, *Université du Québec en Outaouais, Canada*; K. Hettak, *Communication Research Center (CRC), Canada*; A. Kabiri, *Harvard University, USA*
- IF42.8 Longitudinal Chirality, Particle Clusters, and Planar Nanoscale One-Way Guiding** ( ' )  
Y. Mazor, B. Z. Steinberg, *Tel-Aviv University, Israel*
- IF42.9 Asymptotic Evaluation of Field of a Magnetic Dipole over a Chiral Half-Space Medium** ( B# )  
H. Hatefi<sup>1</sup>, M. Dehmolaian<sup>2</sup>, K. Sarabandi<sup>1</sup>  
<sup>1</sup>Radiation Laboratory, University of Michigan, Ann Arbor, MI, United States; <sup>2</sup>ECE Department, University of Tehran, Iran

### IF43 Circuit-Based Metamaterials

Session Chairs: John Donohoe, Dan Sievenpiper

- IF43.1 Extremely Low-Profile Metamaterial-Based Curl Antenna** \*\*\*%))  
H. Nakano, J. Miyake, T. Sakurada, M. Oyama, Y. Iitsuka, J. Yamauchi, *Hosei University, Japan*
- IF43.2 Metamaterial-Inspired Circularly Polarized Slot Dipole Antenna Fed by Coplanar Waveguide** \*\*\*%)+  
Y.-J. Lu, *Graduate Institute of Communication Engineering, National Taiwan University, Taiwan*; P. Hsu, *Department of Electrical Engineering, National Taiwan University, Taiwan*
- IF43.3 Beam Scannable Patch Array Antenna Employing Tunable Metamaterial Phase Shifter** \*\*\*%)-  
Y.-K. Jung, B. Lee, *Kyunghee Univ., South Korea*
- IF43.4 Reconfigurable Zero-Order Loop Antenna** \*\*\*%)\*%  
M. Faccio<sup>1,2</sup>, D. Piazza<sup>2</sup>  
*University of Padova, Italy; <sup>2</sup>Adant Srl, Italy*
- IF43.5 Control of Radiation on Metamaterial Leaky Wave Antennas with Wing-Shaped Structures** \*\*\*%)\*  
D. Jeon, B. Lee, *Kyung Hee University, South Korea*
- IF43.6 Electronically Steerable Antenna Using Superluminal Waveguide and Tunable Negative Capacitors** \*\*\*%)\*  
J. Long, M. Jacob, D. Sievenpiper, *University of California, San Diego, United States*
- IF43.7 The Memristor in Reconfigurable Radio Frequency Devices** \*\*\*%)\*+  
M. D. Gregory, D. H. Werner, *The Pennsylvania State University, United States*
- IF43.8 Matching Elements and a Directional Coupler Based on ENZ Narrow Channels** \*\*\*%)\*-  
S. Seran, J. P. Donohoe, *Mississippi State University, United States*
- IF43.9 A Metamaterial-Inspired High-Q X-Band Oscillator** \*\*\*%)\*+  
K. Y. Park, N. Wiwatcharagoses, P. Chahal, *Michigan State University, United States*
- IF43.10 Parametric Signal Behaviour in a Nonlinear Left-Handed Transmission Line** \*\*\*%)\*+  
G. N. Milford, L. Chen, *University of New South Wales, Australia*



## IF44 Plasmonics

Session Chairs: Andrea Alu, Ali Kabiri

- IF44.1 Wideband Absorbers in the Visible Spectrum Based on Optimizing Quasicrystal Nanosphere Arrays** +)  
F. A. Namin, X. Wang, D. H. Werner, *Pennsylvania State University, United States*
- IF44.2 Influence of Disorder on the Optical Properties of Spherical Plasmonic Nanoclusters** ++  
A. Vallecchi, M. Albani, *University of Siena, Italy*, F. Capolino, *University of California Irvine, USA*
- IF44.3 Subwavelength Imaging of Plasmon Superlens with 3-Dimensional Small Surface Roughness** +-  
S. Huang, L. Tsang, *University of Washington, United States*
- IF44.4 Enhanced Local Fields in Aperiodic Rotationally Symmetric Nanosphere Arrays** , %  
F. A. Namin, X. Wang, D. H. Werner, *Pennsylvania State University, United States*
- IF44.5 Optical Properties of Quasicrystalline Gold Nanoparticle Arrays in the Visible Spectrum** , '  
F. A. Namin, S. Yun, X. Wang, D. H. Werner, T. S. Mayer, *Pennsylvania State University, United States*
- IF44.6 Multi-Layered Plasmonic Cloaks to Engineer the Scattering Signature of Resonant Nanoparticles** , )  
F. Monticone, A. Alù, *The University of Texas at Austin, United States*
- IF44.7 Leaky Wave Antennas Based on Spoof Surface Plasmons Transmission Waveguides** , +  
O. Quevedo-Teruel, Y. Hao, *Queen Mary, University of London, United Kingdom*
- IF44.8 One-Way Optical Waveguides for Perfectly Matched Non-Reciprocal Nano-Antennas** , -  
Y. Hadađ, B. Z. Steinberg, *Tel-Aviv University, Israel*
- IF44.9 An Ultrathin Quarter-Wave Nano-Plate Based on Detuned Plasmonic Nanoantennas** - %  
Y. Zhao, A. Alu, *The University of Texas at Austin, United States*
- IF44.10 Angle-Independent Antireflective Layer Based on Buried IR Nanoantennas** - '  
A. Kabiri, F. Capasso, *Harvard University, United States*

## IF45 RFID antenna performance on materials

Session Chairs: Leena Ukkonen, Jasmin Grosinger

- IF45.1 Investigation on Placement Sensitivity of Meandered Dipole Performance for RFID Systems** - - )  
J. E. Ruyle, *University of Oklahoma, United States*
- IF45.2 The Effect of Lossy Dielectric Objects on a UHF RFID Meander Line Antenna** - + )  
M. Kanesan, D. V. Thiel, S. G. O'Keefe, *Griffith University, Australia*
- IF45.3 Small Slot Antenna for Metal Mountable UHF RFID Tags** - - )  
T. Bjorninen, L. Ukkonen, *Tampere University of Technology, Finland*
- IF45.4 A Bend Transducer for Backscatter RFID Sensors** - - ) %  
J. Grosinger, J. D. Griffin, *Disney Research Pittsburgh, USA*
- IF45.5 Read Range and Sensitivity Study of RFID Temperature Sensors** - - ) \$'  
Q. Qiao<sup>1</sup>, F. Yang<sup>1,2</sup>, A. Elsherbeni<sup>1</sup>  
<sup>1</sup>*The University of Mississippi, United States*; <sup>2</sup>*Tsinghua University, China*
- IF45.6 Reconfigurable RFID Tag Antenna for Wireless Temperature Monitoring** - - ) \$)  
Z. Jiang, *Tsinghua University, China*; F. Yang, *The University of Mississippi, USA*
- IF45.7 Multi-Loop-Bridge Antenna for Improved Positioning Using HF-RFID** - - ) \$+  
M. Y. Ahmad, A. S. Mohan, *University of Technology Sydney, Australia*
- IF45.8 Precise Positioning of RFID Tags Using a Phased Array Antenna** - - ) \$-  
C. C. Bantin, *C.C.Bantin & Associates Ltd., Canada*; C. Schwellnus, W. Kinio, *Thales Rail Signalling Solutions, Canada*; A. Luttgen, *University of Toronto, Canada*
- IF45.9 Rfid-Grids for Deformation Sensing** - - ) % %  
S. Caizzone<sup>1,2</sup>, G. Marrocco<sup>2</sup>  
<sup>1</sup>*German Aerospace Center (DLR), Germany*; <sup>2</sup>*University of Roma Tor Vergata, Italy*
- IF45.10 Conformal UHF RFID Tag Antenna Mountable on Winebottle Neck** - - ) % %  
J. Xi, T. Ye, *Hong Kong R&D Centre for Logistics and Supply Chain Management, China*

## IF46 Small Antennas: Designs and Applications

Session Chairs: Nicholas Buris, Mats Gustafsson

- IF46.1 Sum Rule for Conductor-Backed Thin-Wire Dipole Antennas**  
D.-H. Kwon, *University of Massachusetts Amherst, United States*
- IF46.2 Optimal Charges and Currents on Small Wire Antennas**  
M. Cismasu, *M. Gustafsson, Lund University, Sweden*
- IF46.3 2-Port Antenna Based on the Selective Excitation of Characteristic Modes**  
R. Martens, *D. Manteuffel, University of Kiel, Germany*
- IF46.4 Characteristic Mode Analysis of a Shorted Microstrip Patch Antenna**  
C. Van Niekerk, *J. T. Bernhard, University of Illinois at Urbana-Champaign, United States*
- IF46.5 Direct Pulse Generation and Radiation Through Small Antennas Weakly Coupled to Switched Circuits**  
X. Wang, *Nanjing University of Aeronautics and Astronautics, China*
- IF46.6 Capacitively Excited and Fully Planar Small Size Printed Antenna**  
G. Fontgalland, *UFCEG, Brazil*; C.-C. Chen, *J. L. Volakis, OSU, United States*
- IF46.7 A Study of Planar Folded Dipole Antenna with Feed Line for MIMO**  
T. Ito, *M. Nagatoshi, H. Morishita, National Defense Academy, Japan*
- IF46.8 A Compact Folded Ring Resonator Antenna with Multiband Characteristics**  
N. R. Labadie, *S. K. Sharma, San Diego State University, United States*; G. Rebeiz, *University of California, San Diego, United States*
- IF46.9 Compact Pentamode, Tri-Band Metamaterial Antenna for Wireless Applications**  
S. K. I., *P. K. Sahu, N.I.T. ROURKELA, India*; S. K. Behera, *National Institute of Technology, India*; N. Dakhli, *(6Tel) Sup'Com, Tunisia*
- IF46.10 CPW Fed Elliptical Zeroth Order Resonant Antenna for WiMax Applications**  
S. K. I., *P. K. Sahu, N.I.T. ROURKELA, India*
- IF46.11 Spherical Mode Coupling in Multimode Electrically Small Antennas**  
J. J. Adams, *J. T. Bernhard, University of Illinois at Urbana-Champaign, United States*

## IF47 Wireless Power Transfer

Session Chairs: Majid Manteghi, Karl Warnick

- IF47.1 Investigation of Material Effects on Near-Field Wireless Power Transfer** ( )  
I.-J. Yoon, H. Ling, *The University of Texas at Austin, United States*
- IF47.2 Wireless Powering Based on Strongly Coupled Magnetic Resonance with SRR Elements** ( ) +  
H. Hu, S. V. Georgakopoulos, *Florida International University, United States*
- IF47.3 Wireless Power Transmission to Device in Concrete via Magnetic Resonance** ( ) -  
Q. Jonah, S. Georgakopoulos, *FIU, United States*
- IF47.4 Wireless Power Transmission to Sensors in Reinforced Concrete via Magnetic Resonance** ( ) (%  
Q. Jonah, S. V. Georgakopoulos, *FIU, United States*
- IF47.5 Analysis of Misalignments in Efficiency of Mid-Range Magnetic Resonance Wireless Power Link** ( ) ('  
K. Y. Kim, Y.-H. Ryu, E. Park, K.-S. Song, C.-H. Ahn, *Samsung Advanced Institute of Technology, South Korea*
- IF47.6 A Phased Coil Array for Efficient Wireless Power Transmission** ( )  
D. Liang, H. T. Hui, T. S. Yeo, *National University of Singapore, Singapore*
- IF47.7 Adaptive Impedance Matching of Wireless Power Transfer Using a Multi-Loop Feeding** ( ) B#  
B.-C. Park, J.-H. Park, J.-H. Lee, *Hongik University, South Korea*
- IF47.8 Near-Field Antenna Systems for Wireless Power Transfer to Embedded Sensors** ( ) B#  
X. Jin, J. M. Caicedo, M. Alj, *University of South Carolina, United States*
- IF47.9 A Study on Power Transmission Through the Human Body for Implantable Device** ( ) B#  
J. Kim<sup>1</sup>, J.-H. Hwang<sup>2</sup>, S. Kang<sup>2</sup>, Y. T. Kim<sup>1</sup>  
<sup>1</sup>*Chosun University, South Korea;* <sup>2</sup>*Electronics and Telecommunications Research Institute, South Korea*
- IF47.10 Power Transmission Through the Human Body Using Magnetic Coupling** ( ) B#  
M. Jeong<sup>1</sup>, J.-H. Hwang<sup>2</sup>, S. Kang<sup>2</sup>, Y. T. Kim<sup>1</sup>  
<sup>1</sup>*Chosun University, South Korea;* <sup>2</sup>*Electronics and Telecommunications Research Institute, South Korea*
- IF47.11 Tri-Loop Antenna for Impedance Matching and Frequency Tuning of High-Q Resonators in Wireless Power Transfer** ( ) B#  
D. S. Ricketts, A. Hillenius, *Carnegie Mellon University, United States*
- IF47.12 Impact of Pitch and Ground Plane on Helical Antennas in near Field Wireless Power Transfer System** ( ) B#  
S. M. Khan, N. D. Maresch, *Kansas State University, United States*

#### 451. Analysis and Design of Frequency Selective Surfaces

Session Chairs: Raj Mittra, Juan Mosig

- 451.1 Three-Dimensional FSS Elements with Wide Frequency and Angular Responses ( +  
R. Mittra, C. Pelletti, *The Pennsylvania State University, United States*
- 451.2 Dichroic FSS Design for Angularly Stable Response Using Homogenization ( -  
C. D. Emiroglu, D.-H. Kwon, *University of Massachusetts Amherst, United States*
- 451.3 A New Technique for Efficient and Accurate Analysis of Arbitrary 3D FSSs, EBGs and Metamaterials ( + ) %  
R. Mittra, R. K. Arya, C. Pelletti, *The Pennsylvania State University, United States*
- 451.4 Reconfiguration Schemes of Parallel Metallic Strips for Nimble Antennas ( + ) '  
M. N. Jazi, T. A. Denidni, *University of Quebec, EMT-INRS, Canada*
- 451.5 Scattering of Cylindrical FSS with Rectangular Patch Array ( + ) )  
Y.-R. Jeong<sup>1</sup>, K.-W. Lee<sup>1</sup>, I.-P. Hong<sup>2</sup>, H.-J. Chun<sup>1</sup>, M.-G. Lee<sup>3</sup>, J.-G. Yook<sup>1</sup>  
<sup>1</sup>Yonsei University, South Korea; <sup>2</sup>Kongju National University, South Korea; <sup>3</sup>Agency for Defense and Development, South Korea
- 451.6 Fully Conformal FSS via Rapid 3D Prototyping ( + ) +  
J. M. Ehrenberg, S. E. Sarma, *MIT, United States*; B.-I. Wu, *Air Force Research Laboratory, United States*
- 451.7 Design of a Bandpass FSS on Dual Layer Energy Saving Glass for Improved Rf Communication in Modern Buildings ( + ) -  
I. S. Syed, K. Esselle, G. Kiani, *Macquarie University, Australia*
- 451.8 Experimental Characterization of Origami Tunable Frequency Selective Surfaces ( + ) B  
J. Tang, K. Fuchi, E. J. Rothwell, A. R. Diaz, R. O. Ouedraogo, *Michigan State Univ, United States*
- 451.9 Design of Customized Fractal FSS ( + ) \* %  
A. Sonker<sup>1</sup>, A. Patnajak<sup>2</sup>, S. N. Sinha<sup>1</sup>, J. R. Mosig<sup>3</sup>  
<sup>1</sup>IIT Roorkee, India; <sup>2</sup>IIT, India; <sup>3</sup>EPFL, Switzerland
- 451.10 A Novel Printed Circular Antenna Array Based on V-Shaped Elements ( + ) \* \*  
M. S. Sharawi, F. Sultan, *King Fahd University of Petroleum and Minerals (KFUPM), Saudi Arabia*; D. N. Aloï, *Oakland University, USA*
- 451.11 Temperature Dependent EM Performance Predictions of Dielectric Slab Based on Inhomogeneous Planar Layer Model ( + ) \*  
P. Gupta, *CSIR-National Aerospace Laboratories Bangalore, India*; R. U. Nair, *CSIR-National Aerospace Laboratories, India*; R. M. Jha, *CSIR-National Aerospace Laboratories, India*

## 452. Antennas with Novel Materials

Session Chairs: Steve Weiss, Per-Simon Kildal

- 452.1 Development of Magnetodielectric Materials for Antenna Applications** \*\*\*B#  
H. Zhu, S. Stoyanov, M. B. McLaughlin, *Spectrum Magnetics LLC, United States*; J. Q. Xiao, *University of Delaware, United States*
- 452.2 A Dual-Polarized Antenna Excited by a Meta-Surface Lens** \*\*\*B#  
M. Sabatini, E. Martini, G. Minatti, S. Maci, *University of Siena, Italy*
- 452.3 Comparison of Negative Impedance Inverters and Converters in the Design of Non-Foster Reactive Elements** \*\*\*B#  
A. M. Elfrgani, R. G. Rojas, *The Ohio State University, United States*
- 452.4 Circular Polarization Metamaterial Superstrate Excited by a CRLH Antenna** \*\*\*B#  
K. Kahng, S. Kahng, I. Yang, *University of Incheon, South Korea*; J. Ju, *ETRI, South Korea*
- 452.5 Electromagnetic Analysis on Arbitrary Material Coated Slot Antenna** \*\*\*B#  
B. K. Kim, S. O. Park, *Korea Advanced Institute of Science and Technology (KAIST), South Korea*
- 452.6 Ultra-Wide-Band Slot Antenna with Graded Index Superstrate** \*\*\*B#  
H. A. Bukhari, K. Sarabandi, *University of Michigan - Ann Arbor, United States*
- 452.7 A Novel Antenna for Thru-Wall Communications** \*\*\*B#  
F. Schettino, D. Pinchera, *University of Cassino, Italy*
- 452.8 Evaluation of Losses in Microstrip Gap Waveguide for Slot Antennas Applications** \*\*\*\*%\* +  
E. Pucci<sup>1</sup>, E. Rajo-Iglesias<sup>2</sup>, P.-S. Kildal<sup>1</sup>  
<sup>1</sup>*Chalmers University of Technology, Sweden*; <sup>2</sup>*University Carlos III of Madrid, Spain*
- 452.9 Self-Filtering Low-Noise Horn Antenna** \*\*\*\*%\* -  
F. Bilotti, L. Di Palma, D. Ramaccia, A. Toscano, *"Roma Tre" University, Italy*
- 452.10 Radiation from a Vertical Electric Dipole above an Optically Plasma-Induced Semiconductor Layer Superimposed on a Dielectric Slab** \*\*\*\*% +%  
K. Nishimura, *Ryukoku University, Japan*

#### 453. Challenging canonical scattering problems and new EM problems involving special materials

Session Chairs: Guido Lombardi, Andrea Alu

Session Organizers: Guido Lombardi, Andrea Alu

- 453.1 Electromagnetic Scattering by a Circular Impedance Cone: Diffraction Coefficients and Surface Waves** B#  
M. A. Lyalinov, *Saint Petersburg University, Institute in Physics, Russian Federation*
- 453.2 Spectral Properties of Wedge Problems** % +  
V. Daniele, G. Lombardi, *Politecnico di Torino, Italy*
- 453.3 Reduction of RCS of a Canonical Shape with a Metamaterial Coating** B#  
A. Osipov, E. Culhaoglu, *Microwaves and Radar Institute, German Aerospace Center (DLR), Germany*
- 453.4 Zero Scattering from a Finite Homogeneous DNG Metamaterial Body** B#  
P. L. E. Uslenghi, *University of Illinois at Chicago, United States*; V. G. Daniele, *Politecnico di Torino, Italy*
- 453.5 Passive and Active Cylindrical and Spherical Coated Nano-Particle Systems at IR and Visible Wavelengths and Their Applications** B#  
R. W. Ziolkowski, S. D. Campbell, *University of Arizona, United States*; S. Arslanagic, *Technical University of Denmark, Denmark*
- 453.6 Coated Nano-Particle Jamming of Quantum Emitters** % +  
S. Arslanagic, *Technical University of Denmark, Denmark*; R. W. Ziolkowski, *University of Arizona, USA*
- 453.7 Resonances and Fields near Metamaterial Inclusions** % ++  
R. C. McPhedran, *CUDOS, University of Sydney, Australia*; J. Helsing, *Lund University, Sweden*; G. W. Milton, *University of Utah, USA*
- 453.8 Large Absorption Efficiency in Ultralow Loss, Composite Plasmonic Nanoparticles** % +-  
N. Mohammadi Estakhri, A. Alu, *The University of Texas at Austin, United States*
- 453.9 Scattering vs. Absorption Tradeoff Revisited in the Presence of Transformation Media** % , %  
G. Castaldi, V. Galdi, *University of Sannio, Italy*; A. Alu, *The University of Texas at Austin, USA*; N. Engheta, *University of Pennsylvania, USA*
- 453.10 An Overview of Techniques for the Efficient Solution of Multilayered Media Problems Using the MPIE** B#  
D. R. Wilton, D. R. Jackson, *University of Houston, United States*; G. Valerio, *Université de Rennes, France*; M. A. Francavilla, *Istituto Superiore Mario Boella, Italy*
- 453.11 Comparisons of Heterogeneous Multiscale Finite Element Method and Localized Homogenization Process for Modeling Aperiodic Metamaterials** % , '  
J.-F. Lee, Z. Peng, *The Ohio State University, United States*

#### 454. Slotted and Guided Wave Antennas I

Session Chairs: BARKA Andre, Alejandro Valero-Nogueira

- 454.1 Design, Fabrication and Performance Tests of Horn Elliptical Antennas with Low Side Lobe and Coupling Levels \*\*\*\*% , )  
A. Barka, ONERA French Aerospace Lab, France; O. Seguin, C. Breuil, INOVEOS, France
- 454.2 Analysis of a Longitudinal Slot Excited by a Metal Support on a Hollow Rectangular Coaxial Line \*\*\*\*% , +  
M. Sano, J. Hirokawa, M. Ando, Tokyo Institute of Technology, Japan
- 454.3 Waveguide-Fed Cavity Backed Slot Antenna Array with High Efficiency in the Ku-Band \*\*\*\*% , -  
G.-L. Huang, S.-G. Zhou, T.-H. Chio, Temasek Laboratories@NUS, Singapore
- 454.4 Shaped Beam Synthesis Technique for Linear Arrays of Waveguide Longitudinal Slots \*\*\*\*% - %  
G. A. Casula, G. Mazzarella, G. Montisci, Università di Cagliari, Italy
- 454.5 Reduced-Cost Bayesian Support Vector Regression Modeling and Optimization of Planar Slot Antennas \*\*\*\*% - '  
P. Jacobs, University of Pretoria, South Africa; S. Koziel, S. Ogurtsov, Reykjavik University, Iceland
- 454.6 Receptionable Area Enlargement in MMW Short Range Communication Using Waveguide Slot Antennas with Large Number of Elements \*\*\*\*% - )  
M. Zhang, J. Hirokawa, M. Ando, Tokyo Institute of Technology, Japan
- 454.7 Equivalent-Admittance Slot Representation in Periodic Waveguides \*\*\*\*% - +  
A. Valero-Nogueira, J. I. Herranz-Herruzo, M. Baquero-Escudero, R. Hernández-Murcia, Universidad Politécnica de Valencia, Spain
- 454.8 A Broad Angle Frequency Scanning Antenna Based on a Meandre Waveguide \*\*\*\*% --  
F. Siaka, A. Mirkamali, J.-J. Laurin, Ecole Polytechnique de Montreal, Canada
- 454.9 A Horizontally Polarized Omnidirectional Slot Antenna Array \*\*\*\*%-%  
X. Qing, Z. N. Chen, C. K. Goh, Institute for Infocomm Research, Singapore, Singapore
- 454.10 An Open-Ended Circular Waveguide Radiating the TM<sub>01</sub> Mode \*\*\*B#  
T. R. Cameron, A. T. Sutinjo, M. Okoniewski, University of Calgary, Canada
- 454.11 CPW-Fed Wideband Circularly Polarized Slot Antenna \*\*\*B#  
S.-P. Pan<sup>1,2</sup>, J.-Y. Sze<sup>1</sup>, K. K. Cheng<sup>1</sup>  
<sup>1</sup>Chung Cheng Institute of Technology, National Defense University, Taiwan; <sup>2</sup>Army Academy R.O.C, Taiwan



#### 455. Phased Array Antennas IV

Session Chairs: Paul Werntz, Laila Salman

- 455.1 Dual-Polarized, X-Band, Flat-Panel Phased Array** \*\*\*\*%\$'  
J. N. Hansen, D.-J. Jung, K. Chang, *Texas A&M University, United States*
- 455.2 Application of Phased Array Antenna for Radar Respiration Measurement** \*\*\*\*%\$)  
H. Ren, J. Shao, B. Arigong, H. Zhang, *University of North Texas, United States*; C. Gu, C. Li, *Texas Tech University, United States*
- 455.3 Phased Array Scanning with Sequential Commands** \*\*\*\*%\$+  
R. Haupt, B. Thrall, A. Lyons, M. B. Davis, R. Fitzgeralds, *Ball Aerospace, United States*
- 455.4 Beam Steering Performance of a C- and X-Band Compact Spirograph PMA (SPMA) Array** \*\*\*\*%\$-  
J. T. Rayno, S. K. Sharma, *San Diego State University, United States*
- 455.5 A Comparison of Microstrip Patch ESPAR Array and Uniformly-Illuminated Array Performance** \*\*\*\*%\$%%  
J. J. Luther, S. Ebadi, X. Gong, *University of Central Florida, United States*
- 455.6 Efficient Time Domain Method for Calculating Phased Array Dispersive Effects** \*\*\*\*%\$%  
P. C. Werntz, *Boeing Space Systems El Segundo, United States*
- 455.7 A Broadband Phased Array Antenna with Wide Angular Coverage in a Low-Cost Organic Laminate Package for 60-GHz Wireless Chipsets** \*\*\*\*%\$%)  
M. Spella, A. de Graauw, S. Drago, *NXP Semiconductors, Netherlands*
- 455.8 Schelkunoff Multi Diagrams Receive Arrays** \*\*\*\*%\$+  
J. Euzière, R. Guinvarc'h, *Supélec, France*; B. Uguen, R. Gillard, *European University of Brittany, France*
- 455.9 Calibration Quality Analysis of Phased Array Antennas** \*\*\*\*%\$%  
O. Kiliç, A. Yalim, C. Cetintepe, S. Demir, *Middle East Technical University, Turkey*
- 455.10 Effect of Mutual Coupling in Active RCS Reduction** \*\*B#  
H. Singh, R. Rathore, R. Jha, *CSIR-National Aerospace Laboratories, Bangalore, India, India*

## 456. Advances in Numerical Methods

Session Chairs: Jian-Ming Jin, Robert Adams

- 456.1 Improve the Accuracy of the Second-Kind Integral Equations for Generally Shaped Objects** \*\*\*\*%&#%  
S. Yan, J.-M. Jin, *University of Illinois at Urbana-Champaign, United States*; Z. Nie, *University of Electronic Science and Technology of China, China*
- 456.2 Symmetric Coupling of Finite Element Method and Method of Moments Using Higher Order Elements** \*\*\*\*%&#%  
A. B. Manic<sup>1</sup>, M. M. Ilic<sup>2</sup>, B. M. Notaros<sup>1</sup>  
<sup>1</sup>*Colorado State University, United States*; <sup>2</sup>*University of Belgrade, Serbia*
- 456.3 Accurate and Conforming Mixed Discretization of the Chiral Müller Equation** \*\*\*\*%&#%  
Y. Beghein<sup>1</sup>, K. Cools<sup>2</sup>, F. P. Andriulli<sup>3</sup>, D. De Zutter<sup>1</sup>, E. Michielssen<sup>4</sup>  
<sup>1</sup>*Ghent University, Belgium*; <sup>2</sup>*University of Nottingham, UK*; <sup>3</sup>*TELECOM Bretagne, France*; <sup>4</sup>*University of Michigan, USA*
- 456.4 Fast Monostatic Radar Imaging by Hierarchical Disaggregation** \*\*\*\*%&#%  
G. Schnattinger, T. F. Eibert, *TUM, Germany*
- 456.5 PEMC-Backed Perfectly Matched Layer as a Truncation Boundary** \*\*\*\*%&#%  
V. Nayyeri, M. Soleimani, *Iran University of Science and Technology, Iran*; M. Dehmollaian, *University of Tehran, Iran*
- 456.6 Solution of the Vectorial 3D Inverse Source Problem by Adjoint Near-Field Fast Multipole Translations** \*\*\*\*%&#%  
G. Schnattinger, T. F. Eibert, *TUM, Germany*
- 456.7 Efficient Computation of in-Situ Antenna Performance Using Platform Characteristic Modes** \*\*\*\*%&#%  
J. Chalas, K. Sertel, *The Ohio State University, United States*
- 456.8 The MSMM/GA Design of Non-Uniform Planar Dipole Antenna Arrays** \*\*\*\*%&#%  
S. Kawdungta, *Rajamangala University of Technology Lanna Chiangmai, Thailand*; C. Phongcharoenpanich, *King Mongkut's Institute of Technology Ladkrabang, Thailand*; D. Torrungrueng, *Asian University, Thailand*
- 456.9 A Meshless Scheme for Solving Volume Integral Equations with Inhomogeneous Media** \*\*\*\*%&#%  
K. Yang, M. S. Tong, *Tongji University, China*
- 456.10 A Hierarchical Multi-Level Fast Multipole Method for Wideband Multiscale Electromagnetic Wave Scattering from Non-Penetrable Targets in R<sup>3</sup>** \*\*\*\*%&#%  
J. Wej, Z. Peng, J.-F. Lee, *The Ohio State University, United States*

## 457. Microstrip and Slot Arrays

Session Chairs: Dimitris Anagnostou, Antoine Roederer

- 457.1 Analysis of a Linear Series-Fed Rectangular Microstrip Antenna Array** \*\*\*\*\*%\*( %  
S. Sengupta, D. R. Jackson, S. A. Long, *University of Houston, United States*
- 457.2 Broadside 6-Element Series-Fed Slot-Coupled Microstrip Antenna Array** \*\*\*\*\*%\*( '  
B. Zivanovic, T. Weller, *University of South Florida, United States*; C. Costas, *Raytheon Company, United States*
- 457.3 Half-Power Beamwidth of a Self-Adapting Conformal 1 X 4 Microstrip Array** \*\*\*\*\*%\*( )  
B. D. Braaten, M. A. Aziz, S. Roy, S. Nariyal, *North Dakota State University, United States*; N. F. Chamberlain, *California Institute of Technology, United States*; D. E. Anagnostou, *South Dakota School of Mines and Technology, United States*
- 457.4 Microstrip Slot Antenna Array in LTCC Technology for a 122 GHz System-in-Package** \*\*\*\*\*%\*( +  
S. Beer<sup>1</sup>, L. Pires<sup>1</sup>, C. Rusch<sup>1</sup>, C. Heine<sup>1</sup>, J. Paaso<sup>2</sup>, T. Zwick<sup>1</sup>  
<sup>1</sup>*Karlsruhe Institute of Technology, Germany*; <sup>2</sup>*Selmic Oy, Finland*
- 457.5 A Circularly Polarized Loop Antenna with Parallel Wires - An Application to Microstrip-Line Antennas** \*\*\*\*\*%\*( -  
K. Hirose, T. Ogo, *Shibaura Institute of Technology, Japan*; H. Nakano, *Hosei University, Japan*
- 457.6 Design of a Highly Efficient Wideband Suspended Solar Array Antenna** \*\*\*\*\*%\*( ) %  
O. Yurduseven, D. Smith, N. Pearsall, I. Forbes, *NORTHUMBRIA UNIVERSITY, United Kingdom*
- 457.7 A W-Band 8 X 8 Series Fed Patch Array Detector on Liquid Crystal Polymer** \*\*\*\*\*%\*( ) '  
J.-C. S. Chieh, A.-V. Pham, *University of California Davis, United States*; G. Kannell, A. Pidwerbetsky, *LGS Innovations, United States*
- 457.8 Differential Mode Rectenna Array** \*\*\*\*\*%\*( ) )  
T. Sakamoto, Y. Ushijima, E. Nishiyama, I. Toyoda, M. Aikawa, *Saga University, Japan*
- 457.9 A Wideband RCS Reduction of Slot Array Antennas** \*\*\*\*\*%\*( ) +  
S. Genovesi<sup>1,2</sup>, F. Costa<sup>1,2</sup>, A. Monorchio<sup>1,2</sup>  
<sup>1</sup>*University of Pisa, Italy*; <sup>2</sup>*CNIT, Italy*
- 457.10 SIW-Based Slot Array Antenna and Power Management Circuit for Wireless Energy Harvesting Applications** \*\*\*\*\*%\*( ) -  
T. Mishra, S. K. Panda, *National University of Singapore, Singapore*; M. F. Karim, M. L. C. Ong, T. M. Chiam, *Institute for Infocomm Research, Singapore*
- 457.11 Monopole Lozange Antenna for 60 GHz Applications** \*\*\*\*\*%\*( ) \*%  
J. Hautcoeur, L. Talbi, *Quebec University of Quataouais, Canada*; K. Hettak, *Communication Research Center, Canada*

#### 458. Inverse Scattering and Imaging: Technologies and Applications

Session Chairs: Joe LoVetri, Sima Noghianian

- 458.1 **Retina Design for 100GHz MST Imaging System** \*\*\*\*%\*<sup>1</sup>  
M. Alonso del Pino<sup>1</sup>, V. Garg<sup>1</sup>, E. Nova<sup>1</sup>, J. Abril<sup>1</sup>, J. Romeu<sup>1</sup>, N. Llombart<sup>2</sup>, L. Jofre<sup>1</sup>  
<sup>1</sup>*Technical University of Catalonia, Spain;* <sup>2</sup>*Complutense University of Madrid, Spain*
- 458.2 **A Study of Terahertz Scanning Probe Microscopy for Pcb Inspection** \*\*\*\*B#  
H. Cetinkaya, M. Tekbas, A. Vertiy, *TUBITAK-MAM, Material Institute, Turkey*
- 458.3 **The Blade Beam Reflector Antenna for Stacked Nearfield Millimeter-Wave Imaging** \*\*\*\*%\* )  
C. M. Rappaport, B. González-Valdés, *Northeastern University, United States*
- 458.4 **Correcting Mutual Coupling and Poor Isolation a 1-D Microwave Imaging Array** \*\*\*\*%\* +  
J. T. Case, M. T. Ghasr, R. Zoughi, *Missouri University of Science and Technology, United States*
- 458.5 **Enhancement of Near-Field Probing in a Microwave Tomography System** \*\*\*\*%\* -  
M. Ostadrahimi, P. Mojabi, J. LoVetri, L. Shafai, *University of Manitoba, Canada*; S. Noghianian, *University of North Dakota, USA*
- 458.6 **Evaluation of a Microwave Tomography System for Animal Tissue Imaging** \*\*\*\*%\*+ %  
M. Ostadrahimi, A. Zakaria, P. Mojabi, J. LoVetri, L. Shafai, *University of Manitoba, Canada*
- 458.7 **Theory and Experiment on Imaging of Walls' Interior Structures Using Diffraction Tomography** \*\*\*\*%\*+ '  
C. Thajudeen<sup>1</sup>, W. Zhang<sup>2</sup>, A. Hoorfar<sup>1</sup>  
<sup>1</sup>*Villanova University, United States;* <sup>2</sup>*Duke University, United States*
- 458.8 **Three-Dimensional Real-Time Through-the-Wall Imaging** \*\*\*\*%\*+ )  
W. Zhang<sup>1</sup>, A. Hoorfar<sup>2</sup>, Q. H. Liu<sup>1</sup>  
<sup>1</sup>*Duke University, USA;* <sup>2</sup>*Villanova University, USA*
- 458.9 **Tunnel Detection Using Underground-Focusing Spotlight SAR and Rough Surface Estimation** \*\*\*\*%\*+ +  
B. Gonzalez-Valdes, F. Quivira, J. A. Martinez-Lorenzo, C. M. Rappaport, *Northeastern University, United States*
- 458.10 **A Clutter Cancellation Method for Through-Wall SAR Imaging** \*\*\*\*%\*+ -  
B. Yektakhah, M. Dehmolaian, *University of Tehran, Iran*

## 459. Frequency Configurable Antennas I

Session Chairs: Harish Rajagopalan, Atef Elsherbeni

- 459.1 A Planar Ultrawideband Antenna with Photonically Controlled Notched Bands** \*\*\*\*%, %  
D. Draskovic, J. R. O. Fernandez, C. Briso-Rodriguez, *Universidad Politecnica de Madrid, Spain*; D. Budimir, *University of Westminster, UK*
- 459.2 Reconfigurable Slotted Microstrip Patch Using VO2** \*\*\*\*%, '  
R. A. Rodriguez Solis<sup>1</sup>, N. Sepúlveda<sup>2</sup>, H. L. Pacheco González<sup>1</sup>, N. Dávila<sup>2</sup>  
<sup>1</sup>*University of Puerto Rico, United States*; <sup>2</sup>*Michigan State University, United States*
- 459.3 Reconfigurable Dual-Band Patch Antenna Using Varactor Loaded Slot** \*\*\*\*%, )  
A. Khidre<sup>1</sup>, F. Yang<sup>1,2</sup>, A. Elsherbeni<sup>1</sup>, X. Liu<sup>2</sup>  
<sup>1</sup>*University of Mississippi, United States*; <sup>2</sup>*Tsinghua University, China*
- 459.4 Frequency-Tunable CMOS-MEMS Slot Antenna** \*\*\*\*%, +  
C.-C. Lin, S.-C. Hsieh, C.-Y. Huang, C.-C. Chang, *National Chung Cheng University, Taiwan*
- 459.5 A Tunable Slot Loop Antenna Using Interdigitated Ferroelectric Varactors** \*\*\*\*%, -  
H.-Y. Li, H.-P. Chen, S.-C. Chen, C.-H. Tai, J.-S. Fu, *National Central University, Taiwan*
- 459.6 Miniaturized and Reconfigurable Notch Antennas Using a BST Thin Film Varactor** \*\*\*\*%, - %  
V. H. Nguyen<sup>1,2</sup>, C. Borderon<sup>1</sup>, R. Benzerga<sup>2</sup>, C. Delaveaud<sup>1</sup>, A. Sharaiha<sup>1</sup>, H. W. Gundel<sup>1</sup>  
<sup>1</sup>*IETR, UMR-CNRS 6164, France*; <sup>2</sup>*CEA-LETI, MINATEC, France*
- 459.7 Reconfigurable Notched Tapered Slot Ultra Wideband Antenna for Cognitive Radio Applications** \*\*\*\*%, -'  
T. Aboufoul, A. Alomainy, *Queen Mary University Of London, United Kingdom*
- 459.8 Frequency Reconfigurable Wideband E-Shaped Patch Antenna: Design, Fabrication, and Measurements** \*\*\*\*%, - )  
H. Rajagopalan, J. M. Kovitz, Y. Rahmat-Samii, *University of California, Los Angeles, United States*
- 459.9 Design of a Broadband Reconfigurable Antenna for Cognitive Radio** \*\*\*\*%, +  
D. T. Le, Y. Karasawa, *The University of Electro-Communications, Japan*
- 459.10 Switchable UWB Antenna with Defected Ground Plane** \*\*\*\*%, - -  
A. Taat<sup>1</sup>, M. R. Kamarudin<sup>1</sup>, M. F. Jamlós<sup>2</sup>, M. H. Jamaluddin<sup>1</sup>, M. R. Hamid<sup>1</sup>, M. Jusoh<sup>2</sup>  
<sup>1</sup>*Universiti Teknologi Malaysia, Malaysia*; <sup>2</sup>*Universiti Malaysia Perlis, Malaysia*

#### 460. Broadband/wideband antennas

Session Chairs: Jaehoon choi, Youssef Tawk

##### 460.1 Two-Arm Power-Spiral Antennas \*\*\*\*% \$%

M. A. Elmansouri, D. S. Filipovic, *University of Colorado at Boulder, United States*

##### 460.2 A Novel Polygonal Spiral Antenna \*\*\*\*% \$'

N. Rahman, M. N. Afsar, *Tufts University, United States*; R. Cheung, *Microwave Engineering Corporation, United States*

##### 460.3 Compact Broadband Tapered Slot Antennas \*\*\*% \$)

A. Boryszenko, E. Boryszenko, *A&E Partnership, United States*

##### 460.4 Wideband Stepped Reflector for Archimedean Spiral Antenna \*\*\*\*% \$+

C. Djoma<sup>1,2</sup>, X. Begaud<sup>1</sup>, A.-C. Lepage<sup>1</sup>, S. Mallegol<sup>2</sup>, M. Jousset<sup>2</sup>  
<sup>1</sup>Institut TELECOM, TELECOM ParisTech - LTCI CNRS UMR 5141, France; <sup>2</sup>THALES Systèmes Aéroportés, France

##### 460.5 Boresight Gain Enhancement of an UWB Planar Monopole Antenna \*\*\*\*% \$-

W. Zhang, A. Hoorfar, C. Thajudeen, *Villanova University, United States*

##### 460.6 An Investigation on the Transmission Response of a Miniaturized Double-Ridged Horn Antenna for Radar-Based Imaging \*\*\*% %%

S. Latif<sup>1,2</sup>, D. Flores-Tapia<sup>1,2</sup>, L. Shafai<sup>2</sup>, S. Pistorius<sup>1,2</sup>  
<sup>1</sup>CancerCare Manitoba, Canada; <sup>2</sup>University of Manitoba, Canada

##### 460.7 Circularly Polarized Broadband Antenna Using Waveguide and an L-Shaped Feed Probe \*\*\*\*% %

S. Yamaura, T. Fukusako, *Graduate School of Science & Technology, Kumamoto University, Japan*

##### 460.8 Hybrid Equi-Angular to Archimedean Spiral Antenna \*\*\*\*% %)

K. Louertani, T.-H. Chio, *Temasek Laboratories, NUS, Singapore*

##### 460.9 Input Impedance Behavior of a Planar Elliptical Ring Dipole Antenna. \*\*\*\*% %/

V. A. De Noia, A. E. Alves, *Universidad Catolica Andres Bello, Venezuela*; R. H. Barroso, M. A. Diaz, *Universidad Simon Bolivar, Venezuela*

##### 460.10 A Novel Low-Profile Circularly Polarized Antenna with Low Angle Coverage \*\*\*\*% %

T. Dong<sup>1,2</sup>, X. Ma<sup>1,1</sup>, R. Mittra<sup>2</sup>  
<sup>1</sup>Xi'an Jiaotong University, China; <sup>2</sup>Pennsylvania State University, USA

#### 461. Advances in Adaptive and Smart Antenna Systems

Session Chairs: liang zhang, Jon Wallace

- 461.1 Integrated Board-Level Phased Array Antenna Solution for 60 GHz Radio**   
W. Hong, K.-H. Baek, A. Goudelev, *Samsung Electronics, South Korea*
- 461.2 60 GHz Multi-Antenna in Multi-Core System**   
H.-H. Yeh, K. L. Melde, *University of Arizona, United States*
- 461.3 Energy Efficiency for Implanted Wireless Communication Sensor Nodes**   
Y. Huang, *Montana state University, United States*; D. Qiao, Y. Li, H. Li, Y. Zhang, L. Wang, *Shenzhen Institutes of Advanced Technology, China*
- 461.4 Novel Wideband Multilayer Butler Matrix Using CPW Technology**   
M. BEN Kilani, M. Nedil, N. Kandil, *Université de Québec en Abitibi-Témiscamingue (UQAT), Canada*; T. A. Denidni, *Université de Québec, Canada*
- 461.5 A Novel Optimized Broadband Reconfigurable RHCP/LHCP E-shaped Patch Antenna**   
J. M. Kovitz, H. Rajagopalan, Y. Rahmat-Samii, *University of California Los Angeles, United States*
- 461.6 Linear-to-Circular Polarization Transformer Using Electrically Small Antennas**   
M. Barbuto, F. Bilotti, A. Toscano, *Roma Tre University, Italy*
- 461.7 X-Band Substrate Integrated Waveguide (SIW) Active Antenna Self-Oscillating Mixer (SOM)**   
A. Collado, R. Diaz, A. Georgiadis, *Centre Tecnologic de Telecomunicacions de Catalunya, Spain*
- 461.8 An Active Discrete Lens Antenna for Ka-Band Multibeam Applications**   
G. Ruggerini, P. Nicolaci, *Space Engineering SpA, Italy*; G. Toso, P. Angeletti, *European Space Agency, Netherlands*
- 461.9 Design of Conformal Microstrip Butler Matrix at 2.4 GHz**   
M. BEN Kilani, M. Nedil, N. Kandil, *Université de Québec en Abitibi-Témiscamingue (UQAT), Canada*; T. A. Denidni, *Université de Québec, Canada*

## 462. Time-domain techniques and analysis

Session Chairs: Costas Sarris, Abdullah Eroglu

- 462.1 A Post-Processing Procedure for the Efficient Calculation of Resonant Fields from Time Domain Simulations** ""B#  
R. Schuhmann, C. Classen, *Technische Universität Berlin, Germany*
- 462.2 A New Formulation of the MRTD Technique with Sub-Cellular Resolution** ""B#  
C. D. Sarris, A. C. M. Austin, *University of Toronto, Canada*
- 462.3 Progress in Space, Time, and Spectrally Adaptive Time-Domain Integral Equation Solvers** ""B#  
E. Michielssen, *University of Michigan, United States*
- 462.4 Alternative TDIE Formulations for Lossy Inhomogeneous Dielectrics** ""B#  
G. Kaur, A. E. Yilmaz, *University of Texas at Austin, United States*
- 462.5 Analysis of Time Domain Integral Equations Using the Frequency Domain Techniques** ""B#  
M. E. Ozturk, E. Korkmaz, *Fatih University, Turkey*; A. A. Ergin, *Gebze Institute of Technology, Turkey*
- 462.6 Construction of an hp-refinement Technique for Transient Scattering Using the Generalized Method of Moments** ""B#  
A. J. Pray, N. Nair, B. Shanker, *Michigan State University, United States*
- 462.7 A Circuit-Driven Subcell Thin-Wire Model for the Discontinuous Galerkin Time Domain Method** ""B#  
I. Jeffrey, J. LoVetri, *University of Manitoba, Canada*
- 462.8 Adaptive Load Balancing for the MPI Application in Non-Conformal Discontinuous Galerkin Finite Element Time-Domain Method** ""B#  
B. Zhao, J. Wang, Y. Shao, J.-F. Lee, *The Ohio State University, United States*
- 462.9 Conformal PML Modeling in DGTD Using Continuous Material Properties** ""B#  
J. Wang, Z. Peng, J.-F. Lee, *The Ohio State University, United States*
- 462.10 Time Domain Discontinuous Galerkin Method with Exact Absorbing Boundary Conditions for Analyzing Three-Dimensional Diffraction Gratings** ""B#  
K. Sirenko<sup>1</sup>, A. Krivchikova<sup>2</sup>, Y. Sirenko<sup>2</sup>, H. Bagci<sup>1</sup>  
<sup>1</sup>King Abdullah University of Science and Technology (KAUST), Saudi Arabia; <sup>2</sup>Institute of Radiophysics and Electronics of National Academy of Sciences of Ukraine (IRE NASU), Ukraine



### 463. Slot Antennas and Arrays

Session Chairs: Dejan Filipovic, Dirk Plettemeier

- 463.1 **Dual-Polarized Vivaldi Array for X- and Ku-Band** ( +  
R. Hahnel, D. Plettemeier, *Technische Universitaet Dresden, Germany*
- 463.2 **Dual-Polarization Cylindrical Long-Slot Array Antenna Integrated with Hybrid Ground Plane** ( -  
H.-S. Youn, L. Lee, N. Celik, M. Iskander, *College of Engineering, United States*
- 463.3 **Long Slot Array (LSA) Antenna Integrated with Compact Broadband Coupled Microstrip Impedance Transformer** ( %  
Y.-L. Lee, H.-S. Youn, M. Iskander, *Hawaii Center for Advanced Communication, United States*
- 463.4 **Artificial Dielectric Layers for the Performance Enhancement of Slot Antennas on a Dielectric Lens** ( '  
W. H. Syed, A. Neto, *TU Delft, Netherlands*
- 463.5 **Improvement of Far Field Patterns of Antipodal Vivaldi Antennas with Step Impedance Resonator** ( B#  
N.-T. Huang, Y.-L. Hshieh, C. Yeh, H.-T. Chiu, *Yuan-Ze University, Taiwan*
- 463.6 **V-Band Monolithically Integrated Four-Arm Spiral Antenna and Beamforming Network** ( % ( )  
N. A. Sutton, D. S. Filipovic, *University of Colorado, Boulder, United States*
- 463.7 **An On-chip W-Band Bowtie Slot Antenna in Silicon** ( +  
S. Pan, L. Gilreath, P. Heydari, F. Capolino, *University of California, Irvine, United States*
- 463.8 **Microstripline-Coupled Printed Wide-Slot Antenna with Loop Loadings for Dual-Band WiMAX/WLAN Operations** ( -  
M. H. B. Ucar, Y. E. Erdemli, *Kocaeli University, Turkey*
- 463.9 **Miniaturized DTV Broadband Slot Antenna for Handheld Devices** ( % ) %  
J.-H. Chou, H.-J. Li, *National Taiwan University, Taiwan*; D.-B. Lin, W.-C. Shih, *National Taipei University of Technology, Taiwan*
- 463.10 **Design of Dual-Polarization Waveguide Slot Array Antenna Using Diffusion Bonding of Laminated Thin Plates for the 60 GHz-Band** ( % ) '  
D. Kim, M. Zhang, J. Hirokawa, M. Ando, *Tokyo Institute of Technology, Japan*

#### 464. Communication Channel Management

Session Chairs: Jean-Francois Chamberland, Kevin Sowerby

##### 464.1 Analyzing the Impact of Delays from Antenna Reconfiguration on Virtual Channel Management ""B#

J.-F. Chamberland, G. H. Huff, S. S. Shakkottai, *Texas A&M University, United States*

##### 464.2 A Heuristic Tool for Exposure Reduction in Indoor Wireless Networks ""%) )

D. Plets, W. Joseph, K. Vanhecke, L. Martens, *Ghent University/IBBT, Belgium*

##### 464.3 Uplink Spectrum Sharing for Heterogeneous Networks Based on Reconfigurable Antenna System ""%) +

R.-T. Juang, *Automotive Research & Testing Center, Taiwan*; D.-B. Lin, H.-P. Lin, *National Taipei University of Technology, Taiwan*

##### 464.4 The Effects of Modified Building Propagation on Frequency Reuse in a Single Channel Indoor Wireless Communication System""B#

K. W. Sowerby, M. J. Neve, *The University of Auckland, New Zealand*

##### 464.5 Monitoring of HF Spectral Occupancy over the Eastern Mediterranean ""B#

H. Haralambous, P. Vryonides, *Frederick University, Cyprus*; L. Economou, *Intercollege, Cyprus*

#### **465. Sensor Networks and Sensor Arrays**

Session Chairs: Mohammad Ali, Hao Xin

##### **465.1 A near-Isotropic Pattern 3-D Loop Antenna for Networked Sensors'''B#**

X. Jin, M. Ali, *University of South Carolina, United States*

##### **465.2 Direction of Arrival Estimation with Two Planar Inverted-F Antennas and a Scatterer '''B#**

X. Yu, H. Xin, *University of Arizona, United States*

##### **465.3 Array Calibration for a Sequential Beamspace Device '''B#**

Y. Huang, W. Tidd, *Montana state University, United States*

##### **465.4 A Novel Vector Electromagnetic Sensor for Direction Finding HF Applications'''B#**

R. Shavit, Y. Barash, R. Nevo, *Ben-Gurion University of the Negev, Israel*; B. Almog, *ELTA Sys. Ltd., Israel*

##### **465.5 Through-the-Wall Moving Target Detection with Compressed Sensing '''B#**

Y. Lu, L. Huang, *Nanyang Technological University, Singapore*

## 501. Hybrid Methods and Method Comparisons

Session Chairs: Raj Mittra, Shanker Balasubramaniam

- 501.1 vFDTD: a Novel Algorithm for Dealing with Curved Objects in the Context of FDTD** B#  
K. Panayappan, R. Mittra, *The Pennsylvania State University, United States*
- 501.2 A Fourier Envelope Hybrid Field-Circuit Simulator for Transient Simulation of Microwave Circuits and Antennas** B#  
V. Subramanian, A. E. Yilmaz, *The University of Texas at Austin, United States*
- 501.3 Method of Moments Analysis of Microstrip Antennas in Cylindrically Stratified Media Using Closed-Form Green's Functions** B#  
S. Karan, V. B. Ertürk, *Bilkent University, Turkey*
- 501.4 Self-Consistent Modeling of Quantum Electronic Devices in the Presence of Electromagnetic Fields** B#  
C. S. Meierbachtol, O. Tuncer, B. Shanker, *Michigan State University, United States*
- 501.5 Placement and Simulation of Antennas Attached to Large Platforms Modeled with Parametric Surfaces** ) -  
A. Tayebi, J. Gomez, J. Moreno, I. Gonzalez, F. Catedra, *University of Alcalá, Spain*
- 501.6 A Stable Hybrid Multi-Region Finite-Difference Time-Domain Method** B#  
Y. Q. Lin, D. S. Weile, *University of Delaware, United States*
- 501.7 The Coupled Field Propagator Applied to Two Widely Separated Cylinders** B#  
R. D. Nevels, *Texas A&M University, United States*
- 501.8 Evaluating the Generalized Scattering Matrix Between Horn Antennas on a Circular Conducting Cylinder by Hybridizing Mode Matching/FEM with the Spectral Rotation Approach** B#  
D. Bianchi, A. Monorchio, G. Tiberi, M. De Gregorio, *University of Pisa, Italy*
- 501.9 Radiation Performance Prediction of Antennas Mounted on Re-Entry Vehicles** B#  
J. A. Tobon Vasquez<sup>1</sup>, F. Vipiana<sup>1</sup>, J. L. Araque Quijano<sup>2</sup>, M. Sabbadini<sup>3</sup>, G. Vecchi<sup>1</sup>  
<sup>1</sup>Politecnico di Torino, Italy; <sup>2</sup>Universidad Nacional de Colombia, Colombia; <sup>3</sup>ESA/ESTEC, The Netherlands
- 501.10 The Substructure Method Combined with PML Absorption Boundary for Dielectric Layer PBG Structure in a Waveguide** B#  
H. Yang, S. Jiang, Z. Mu, *College of Applied Sciences, Beijing University of Technology, China*

## 502. Electromagnetic Properties of Advanced Materials and Circuits

Session Chairs: Keith Whites, Christopher Holloway

- 502.1 Effects of Cavity Dimensions in Split-Post Dielectric Resonator Technique for Complex Permittivity Measurements** \*\*\*\*%\*%  
F. Chen, S. Mao, X. Wang, E. Semouchkina, *Michigan Technological University, United States*; M. Lanagan, *Pennsylvania State University, United States*
- 502.2 Complementary Split-Ring Resonator as a High Sensitivity Sensor** \*\*\*\*%\*\*  
A. M. Albishi, Q. M. Ramahi, M. S. Boybay, *University of Waterloo, Canada*
- 502.3 Non-Contact Probes for THz Circuits and Integrated Devices** \*\*\*\*%\*)  
K. Topalli, G. C. Trichopoulos, K. Sertel, *ElectroScience Laboratory, The Ohio State University, United States*
- 502.4 Optimised Second-Order Debye Parameters for Head Tissues at Microwave Frequencies** \*\*\*\*%\*+  
D. J. Ireland, A. Abbosh, *University of Queensland, Australia*
- 502.5 Modeling-Based Printed Electronics Characterization** \*\*\*\*%\*-  
R. M. Mäkinen, A. R. Rasku, H. P. Sillanpää, *Tampere University of Technology, Finland*
- 502.6 Microwave Sensors for a Long Term Monitoring of Snow Conditions and Avalanche Prevention** \*\*\*\*%+%  
A. Carta, D. Trincherò, *Politecnico di Torino, Italy*
- 502.7 Electromagnetic Analysis of Effective Anisotropic Material Parameters for Metal Dummies in a CMOS Chip** \*\*\*\*%+\*  
T. Hirano, K. Okada, J. Hirokawa, M. Ando, *Tokyo Institute of Technology, Japan*
- 502.8 Spatial Dependence of Microstrip Line Properties on Artificial Substrates** \*\*\*\*%+)  
A. K. Amert, K. W. Whites, *South Dakota School of Mines and Technology, United States*
- 502.9 The Influence of Refractive Index, Excitation and Observation on PEC/PMC Boundary Realization** \*\*\*%++  
C. A. Valagiannopoulos, A. H. Sihvola, *Aalto University, Finland*
- 502.10 Analysis of Surface-Wave Dispersion Properties of Infinite Planar Corrugated Surfaces Using Asymptotic Corrugations Boundary Conditions** \*\*\*B#  
T.-L. Yen, M. Ng Mou Kehn, *National Chiao Tung University, Taiwan*

### 503. Cognitive radio: improvements through the integration of electromagnetic and communications theory

Session Chairs: Natasha Devroye, Agostino Monorchio

Session Organizers: Daniela Tuninetti, Natasha Devroye, Agostino Monorchio

- 503.1 Simultaneous Transmit and Sense for Cognitive Radios Using Full-Duplex: a First Study** +  
E. Ahmed, A. Eitawil, *University of California Irvine, United States*; A. Sabharwal, *Rice University, United States*
- 503.2 Spatio-Temporal Spectrum Sensing Using Distributed Antenna Systems and Direct Localization Methods** , %  
D. Cabric, *UCLA, United States*; M. Eric, *University of Belgrade, Serbia*
- 503.3 Aspects of Cognition and Echolocation** , '  
C. J. Baker, G. E. Smith, *OSU, United States*
- 503.4 Opportunistic Signals for Localization of Cognitive Radio Terminals** ( , )  
A. Emmanuele, M. Luise, *Università di Pisa, Italy*
- 503.5 Cost and Power Efficient Ultra-Wideband Digital Beamforming for Cognitive Sensing** B#  
E. A. Alwan, K. Sertel, W. Khalil, J. L. Volakis, *The Ohio State University, Electroscience Laboratory, United States*
- 503.6 Reconfigurable Null Scanning Antenna for Spatial Filtering in Cognitive Radios** B#  
S. Yong, J. T. Bernhard, *University of Illinois at Urbana-Champaign, United States*
- 503.7 Data Multiplexing with a Single Antenna Structure and Front-End: Antenna-Coding Techniques and Design Examples** B#  
J. Perruisseau-Carrier, M. Yousefbeiki, *Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland*; O. N. Alrabadi, *Aalborg University, Denmark*; A. Kalis, *Athens Information Technology (AIT), Greece*
- 503.8 A Frequency and Radiation Pattern Reconfigurable Antenna System with Sensing Capabilities for Cognitive Radio** +  
Y. Tawk, C. Christodoulou, *University of New Mexico, United States*; J. Costantine, *California State University Fullerton, United States*; S. Barbin, *Universidade de Sao Paulo, Brazil*
- 503.9 Reconfigurable Antenna for a Software-Defined Radio System** B#  
S. Genovesi, A. Monorchio, *University of Pisa, Italy*; F. M. Valeri, *Microwave Communications, Italy*

## 504. Guided Waves and Wave-Guiding Structures

Session Chairs: Edward Rothwell, Ryan Adams

### 504.1 End-Launched Coaxial to Partial H-Plane Waveguide Adapter ""B#

K. H. Kloke<sup>1,2</sup>, J. Joubert<sup>2</sup>, J. W. Odendaal<sup>2</sup>  
<sup>1</sup>CSIR, South Africa; <sup>2</sup>University of Pretoria, South Africa

### 504.2 Localization and Manipulation of Microwave Fields by Small Resonant Ferrite Particles ""B#

M. L. Sigalov<sup>1</sup>, E. Kamenetskii<sup>2</sup>, M. Berezin<sup>2,3</sup>, R. Joffe<sup>2</sup>, R. Shavit<sup>2</sup>  
<sup>1</sup>Applied Electromagnetics Ltd, Israel; <sup>2</sup>Ben-Gurion University of the Negev, Israel; <sup>3</sup>Goji Israel Ltd, Israel

### 504.3 Computer Simulation for Transmission and Reflection Properties of Dielectric Slab Waveguides Connected with Photonic Crystal Waveguide ""B#

M. Tanaka, K. Tanaka, Gifu University, Japan

### 504.4 Characterization of Gyromagnetic Material Using a Reduced Aperture Waveguide ""B#

B. R. Crowgey, O. Tuncer, E. J. Rothwell, B. Shanker, L. C. Kempel, Michigan State Univ, United States; M. J. Havrilla, Air Force Institute of Technology, United States

### 504.5 Study of Losses and High-Order Modes Coupling on Bends for Wire-Type Waveguides at THz Frequencies ""B#

A. Berenguer, M. Baquero-Escudero, D. Sánchez-Escuderos, M. Ferrando-Bataller, Universitat Politècnica de València, Spain

### 504.6 Design of Waveguide Filters at W-Band by Means of Machining Techniques ""B#

C. A. Leal-Sevillano<sup>1</sup>, J. A. Ruiz-Cruz<sup>2</sup>, J. R. Montejo-Garai<sup>1</sup>, J. M. Rebolgar<sup>1</sup>  
<sup>1</sup>Universidad Politécnica de Madrid, Spain; <sup>2</sup>Universidad Autónoma de Madrid, Spain

### 504.7 Far Field Pattern from Slanted Rectangular Apertures ""B#

M. C. Gonzalez<sup>1</sup>, B. P. Kumar<sup>2</sup>, G. R. Branner<sup>1</sup>  
<sup>1</sup>University of California, Davis, United States; <sup>2</sup>Sacramento State University, United States

### 504.8 A Trans-Impedance Green's Function Model for the Dielectric Ring Circulator ""B#

A. K. Hatley, R. S. Adams, The University of North Carolina at Charlotte, United States

### 504.9 Locating Small Apertures in Cable Shielding ""B#

L. Thomson, B. Jones, C. Furse, University of Utah, United States

### 504.10 Equivalent Network Extraction of a Coplanar Waveguide ""B#

R. Masood, National Engineering and Scientific Commission, Pakistan; S. A. Mohsin, The Univ of Faisalabad, Pakistan

## 505. Antennas for Mobile Handsets

Session Chairs: Wen-Shan Chen, Kin-Lu Wong

- 505.1 **Internal LTE/WWAN Handset Antenna Integrated with Solar Cells for Performance Improvement** \*\*\*\*% , -  
W.-Y. Li, C.-Y. Wu, W.-J. Chen, H.-H. Lin, *Industrial Technology Research Institute, Taiwan*
- 505.2 **A Multi-Line Monopole with a Meandered Loop Antenna for 4G Mobile System** \*\*\*\*% - %  
W.-S. Chen, J.-W. Wang, *Southern Taiwan University, Taiwan*; B.-Y. Lee, *Tung Fang Design University, Taiwan*
- 505.3 **A Reconfigurable PIFA Using a PIN-Diode for LTE/GSM850/GSM900/DCS/PCS/UMTS** \*\*\*\*% - '  
J. H. Lee, Y. Sung, *Kyonggi University, South Korea*
- 505.4 **Novel SAR-Reducing Add-on Cover for MIMO Handheld Device** \*\*\*\*% - )  
T. C. Pu, J. H. Chen, H. H. Lin, C. Y. Wu, *Industrial Technology Research Institute, Taiwan*
- 505.5 **SAR Study of Different MIMO Antenna Designs for LTE Application in Smart Mobile Phones** \*\*\*\*% - +  
K. Zhao<sup>1,2</sup>, S. Zhang<sup>1,2</sup>, Z. Ying<sup>2</sup>, T. Bolin<sup>2</sup>, S. He<sup>1</sup>  
<sup>1</sup>*KTH Royal Institute of Technology, Sweden*; <sup>2</sup>*Sony Ericsson Mobile Communication AB, Sweden*
- 505.6 **Penta-Band WWAN Handset Antenna Embedded in a Small Notch in the System Ground Plane** \*\*\*\*% - -  
F.-H. Chu, Y.-C. Kao, K.-L. Wong, *National Sun Yat-sen University, Taiwan*
- 505.7 **Investigation of Radiation Characteristics of a PIFA-Based Semi-Populated Handset Model for LTE B13** \*\*\*\*% %  
A. J. Wahidi<sup>1</sup>, S. M. Ali<sup>2</sup>, R. Abhari<sup>1</sup>  
<sup>1</sup>*McGill University, Canada*; <sup>2</sup>*Research In Motion, Canada*
- 505.8 **Compact Multiband Antenna for Wireless Communications** \*\*\*B#5  
K. S. Sultan, H. H. Abdullah, E. A. F. Abdullah, *Electronic Research institute, Egypt*; E. A. Hashish, *Faculty of engineering/Cairo University, 'Egypt*
- 505.9 **Design of Pifa Handset Antenna for Lte/wimax Applications** \*\*\*B#5  
M. Yousefnia, *Mazandaran Telecommunication Company, Iran*; H. R. Dalili Oskoei, *University of Aeronautical Science & Technology (Shahid Sattari), Iran*



## 506. Numerical Techniques

Session Chairs: Amir Boag, Jin-Fa Lee

- 506.1 Study of First and Second Order Methods for Neural Network Characterization of Reflectarray Elements** ""B#  
P. Robustillo, J. Zapata, *Universidad Politecnica de Madrid, Spain*; J. Rubio, *Universidad de Extremadura, Spain*
- 506.2 A New Efficient Numerical Technique for the Analysis of Microstrip Circuits Characterized by Rough Profiles** ""B#  
G. Bianconi, C. Pelletti, K. Panayappan, R. Mittra, *The Pennsylvania State University, United States*
- 506.3 Electromagnetic Scattering Analysis of a Large and Deep Inlet Embedded in an Arbitrarily Shaped Host Body** ""B#  
Z. Peng, K.-H. Lim, J.-F. Lee, *ElectroScience Lab., United States*
- 506.4 Error Analysis for Sparse Factorizations Using Overlapped, Localizing LOGOS Modes on a Shifted Grid** ""B#  
R. J. Adams, *University of Kentucky, United States*; X. Xu, *Sigrity, Inc., United States*
- 506.5 A Set of Div-Conforming Shannon Basis Functions** ""B#  
M. A. Francavilla, F. Vipiana, *Istituto Superiore Mario Boella (ISMB), Italy*; G. Vecchi, *Politecnico di Torino, Italia*
- 506.6 Rapid Fourier Transform Evaluation of Satellite Coverage Performance** ""B#  
S. M. Canta, L. Ersoy, *Space Systems/Loral, United States*
- 506.7 Investigation of the Use of Radial Basis Functions in the Determination of Electromagnetic Scattering by Dielectric Interfaces** ""B#  
R. K. Gordon<sup>1</sup>, E. Hutchcraft<sup>1</sup>, Z. Liu<sup>2</sup>, D. Owusu-Banson<sup>1</sup>  
<sup>1</sup>*University of Mississippi, United States*; <sup>2</sup>*Chongqing University, China*
- 506.8 Generalized Equivalence Integral Equations** ""B#  
A. Boag, *Tel Aviv University, Israel*; V. Lomakin, *University of California, San Diego, USA*
- 506.9 Boundary Differential Equations and Their Applications** ""B#  
G. Wen, *Fudan University, China*

## 507. Microstrip-Fed Arrays

Session Chairs: Benjamin Braaten, Hualiang Zhang

- 507.1 Bunny Ear Antenna Array for 60 GHz Applications** \*\*\*\*% \$  
M. Jenning, D. Plettemeier, *Technische Universitaet Dresden, Germany*
- 507.2 Near-Field Focussed Array with Two Simultaneous and Independent Spots** \*\*\*\*% \$)  
G. Leon, J. J. Tomas, M. Arrebola, F. Las-Heras, *Universidad de Oviedo, Spain*
- 507.3 Steerable Antenna Array at 24 GHz Using Butler Matrices & MEMS-Switches** \*\*\*\*% \$+  
M. Arias-Campo, W. Simon, R. Baggen, *IMST GmbH, Germany*
- 507.4 Metamaterial-Line Based Feed-Networks for Wideband Circularly Polarized Antennas** \*\*\*\*% \$-  
K. L. Chung, X. Sun, J. Zhang, H. Zhu, S. Cheung, T. Yuk, *University of Hong Kong, China*
- 507.5 Design of a Passive Multifaceted Phased Array for Hemispherical Coverage** \*\*\*\*% %%  
W. Wang, A. Cao, S. Ye, X. Liang, Q. Guo, W. Li, R. Jin, J. Geng, *Shanghai Jiao Tong University, China*
- 507.6 Planar Single-Wire Antennas at Millimeter-Wave Frequencies** \*\*\*\*% %  
D. Sánchez-Escuderos, M. Ferrando-Bataller, J. I. Herranz, A. Berenguer, *Universitat Politècnica de València (UPV), Spain*
- 507.7 Design of High Gain Microstrip Yagi Array Antenna for Avalanche Radar** \*\*\*\*% %  
F. N. Mohd Isa<sup>1,2</sup>, P. V. Brennan<sup>1</sup>  
<sup>1</sup>University College London, United Kingdom; <sup>2</sup>International Islamic University Malaysia, Malaysia
- 507.8 Design of Wideband Low Profile Ku Band Antenna Array** \*\*\*\*% %  
M. M. Bilgic, K. Yegin, *Yeditepe University, EE Eng. Dept., Turkey*; T. Turkkan, M. Sengiz, *Neta Electronic Equipment Ind. Corp., Turkey*
- 507.9 A Parallel Feeding Omnidirectional Array Antenna** \*\*\*\*% %  
C. Ma, Z. Kuai, X. Zhu, C. Liu, *southeast university, China*
- 507.10 Broadband Dual-Polarized Omnidirectional Antennas** \*\*\*\*% &%  
X. Quan, R. Li, *South China University of Technology, China*

## 508. Analytical and Numerical Techniques in Scattering and Imaging

Session Chairs: Hao Ling, Qing Liu

- 508.1 Application of a Compressed Sensing Based Time-Frequency Distribution for Radar Signature Analysis** & N. Whitelonis, H. Ling, *The University of Texas at Austin, United States*
- 508.2 Revised Range Point Migration Method for Rapid 3-D Imaging with UWB Radar** & T. Sakamoto<sup>1,2</sup>, T. G. Savelyev<sup>2</sup>, P. J. Aubry<sup>2</sup>, A. G. Yarovoy<sup>2</sup>  
<sup>1</sup>*Kyoto University, Japan*; <sup>2</sup>*Delft University of Technology, Netherlands*
- 508.3 3D Whole Body Imaging for Detecting Explosive-Related Threats** & Y. Alvarez<sup>1</sup>, B. Gonzalez-Valdes<sup>2</sup>, J. A. Martinez-Lorenzo<sup>2</sup>, C. M. Rappaport<sup>2</sup>, F. Las-Heras<sup>1</sup>  
<sup>1</sup>*Universidad de Oviedo, Spain*; <sup>2</sup>*Northeastern University, USA*
- 508.4 Analysis of Scattered Fields by an Impedance Discontinuity of a Planar Surface by Using Helmholtz-Kirchhoff Integral Theorem** & T. Kawano, K. Goto, T. Ishihara, *NATIONAL DEFENSE ACADEMY, Japan*
- 508.5 Optimized Design of a Low-RCS Patch Antenna Using a Frequency Selective Surface** & E. Sarbazi, Z. Mostaani, M. Dehmollaian, *University of Tehran, Iran*
- 508.6 Reducing Complexity in Electromagnetics Problems** & E. Garcia Garcia, C. Delgado Hita, M. F. Catedra Perez, *Universidad de Alcala, Spain*
- 508.7 Analytical Modeling of Radiation Patterns for a Bond-Wire Antenna** & M. V. T. Westeinde, U. Johannsen, B. Smolders, *Eindhoven University of Technology, Netherlands*
- 508.8 Near Field Far Field Transformation : Calculation and Application** & R. Cariou, *DGA/MI, France*; P. Massaloux, *CEA/CESTA, France*
- 508.9 Analytical Solution of Scattering by a PEMC Cylinder Coated with Anisotropic Media** & N. Montaseri, V. Navyeri, A. Abdolali, M. Soleimani, *Iran University of Science and Technology, Iran*

## 509. Frequency Configurable Antennas II

Session Chairs: Prem Chahal, Satish Sharma

- 509.1 A Miniature Broadband Printed Reconfigurable Antenna for Cognitive Radio** \*\*\*\*% ' -  
A. M. Yadav, C. J. Panagamuwa, R. D. Seager, *Loughborough University, United Kingdom*
- 509.2 Embedding a Reconfigurable Band-Pass/Band-Stop Filter into an Antenna**\*\*\*\*% ( %  
M. Zamudio, Y. Tawk, C. G. Christodoulou, *University of New Mexico, United States*; J. Costantine, *California State University Fullerton, United States*
- 509.3 Ka-Band Frequency Tunable Patch Antenna**\*\*\*\*% ( '  
C. Fritzsch, S. Bildik, R. Jakoby, *Technische Universitaet Darmstadt, Germany*
- 509.4 A Compact Spiral Loaded Planar Dipole Antenna with Frequency Reconfiguration**\*\*\*\*% ( )  
S. K. Sharma, A. N. Kulkarni, M. R. Thyagarajan, B. Shanmugam, *San Diego State University, United States*
- 509.5 A Novel Tunable Frequency Dipole-Yagi Antenna for Wireless Body Area Network (WBAN) Applications** \*\*\*\*% ( +  
E. N. Ahyat<sup>1</sup>, M. R. Kamarudin<sup>1</sup>, T. Abdul Rahman<sup>1</sup>, M. F. Jamlos<sup>2</sup>, M. R. Hamid<sup>1</sup>, M. H. Jamaluddin<sup>1</sup>, N. H. Ramli<sup>1</sup>, M. Jusoh<sup>2</sup>  
<sup>1</sup>*Universiti Teknologi Malaysia, Malaysia*; <sup>2</sup>*Universiti Malaysia Perlis, Malaysia*
- 509.6 An Experimental Setup for Measuring the Tuning Time of an Optically Pumped Frequency Reconfigurable Antenna System** \*\*\*\*% (-  
Y. Tawk, S. Hemmady, C. Christodoulou, *University of New Mexico, United States*; J. Costantine, *California State University Fullerton, United States*
- 509.7 A Modified Split Ring Resonator Loaded Miniaturized Reconfigurable Antenna** \*\*\*\*% ) %  
N. Wiwatcharagoses, K. Y. Park, P. Chahal, *Michigan State University, United States*
- 509.8 Frequency Agile Mechanical Antenna for Low-Cost Millimeter-Wave Applications** \*\*\*\*% ) '  
Y. Orlic<sup>1</sup>, B. Lacroix<sup>2</sup>, N. Tiercelin<sup>1</sup>, V. Preobrazhensky<sup>1</sup>, P. Pernod<sup>1</sup>, P. Coquet<sup>1</sup>, J. Papapolymerou<sup>2</sup>  
<sup>1</sup>*IEMN, UMR CNRS 8520, PRES Lille Nord de France, ECLille, France*; <sup>2</sup>*Georgia Institute of Technology, USA*
- 509.9 Tuning of Reconfigurable Antennas by Motion Detection** \*\*\*\*% ) )  
J. Costantine, E. Funicari, A. Kajikawa, M. Shiva, *California State University Fullerton, United States*; Y. Tawk, C. G. Christodoulou, *University of New Mexico, United States*
- 509.10 A Tunable Filter Antenna for Cognitive Radio Systems** \*\*\*\*% ) +  
M. Al-Husseini, A. Ramadan, A. El-Hajj, K. Y. Kaban, *American University of Beirut, Lebanon*

## 510. Wideband Antennas

Session Chairs: Amir Zaghloul, Mauro Ettore

### 510.1 Two Designs for Dual/triple Band Patch Antennas ""B#5

K. F. Lee, C. S. R. Kaipa, *University of Mississippi, United States*; K. M. Luk, *City University of Hong Kong, Hong Kong*

### 510.2 Miniaturized Multimode Dielectric Resonator Antenna with Consistent Radiation Patterns for Wideband Applications ""B#5

A. Rashidian<sup>1</sup>, D. M. Klymyshyn<sup>2</sup>, L. Shafai<sup>1</sup>  
<sup>1</sup>*University of Manitoba, Canada*; <sup>2</sup>*University of Saskatchewan, Canada*

### 510.3 Novel Multiport Non-Foster Loading Technique for Wide Band Antennas ""B#5

E. A. Elghannai, R. G. Rojas, *The Ohio State University, United States*

### 510.4 Short-Time Pulses on Leaky-Wave Antennas

J. T. Williams, L. I. Basilio, J. J. Borchardt, W. L. Langston, *Sandia National Laboratories, United States*

### 510.5 An Optically Transparent, Wideband UHF Antenna and Ground Plane System for Radio Communication ""B#5

M. Kashanianfard, K. Sarabandi, *University of Michigan, United States*

### 510.6 Effect of Layer-Misalignment on the Performance of Double-Layer Planar UWB Monopole Antennas ""B#5

A. Mohamed, L. Shafai, *University of Manitoba, Canada*

### 510.7 The Planar Lateral Wave Antenna """"%) -

F. Tokan, N. Türker Tokan, A. Neto, *TU Delft, Netherlands*

### 510.8 A CMOS Switching-Based UWB Impulse Transmitter with Oscillator Leakage Cancelling Technique ""B#5

J.-F. Kiang, Y.-T. Lo, C.-C. Yui, *National Taiwan University, Taiwan*

### 510.9 Exponentially Curved Aperture Antenna for Broadband Circular Polarization Operation ""% \* %

F.-Y. Chao, *HTC Corporation, Taiwan*; S.-K. Lin, Y.-C. Lin, *National Taiwan University, Taiwan*

### 510.10 A Ku Band Dual Frequency Aperture Coupled Microstrip Antenna with a Wideband EBG ""B#5

M. Sorouri, *Semnan University, Iran*

## 511. Multi-Frequency Antennas: Design and Analysis #1

Session Chairs: Herbert Aumann, Wonbin Hong

- 511.1 Multifunction Solar Panel Antenna for Cube Satellites \*\*\*\*% \*\*  
O. C. Fawole, R. Baktur, *Utah State University, United States*
- 511.2 Tunable Compact Printed Monopole Antenna for Passive UHF RFID Tags \*\*\*\*% \*)  
A. E. Abdulhadi, R. Abhari, *McGill University, Canada*
- 511.3 12/21GHz Dual-Band Feed for Circularly Polarized Satellite Broadcasting Receiving Antenna \*\*\*\*% \* +  
M. Nagasaka, S. Nakazawa, S. Tanaka, *Japan Broadcasting Corporation, Japan*
- 511.4 A New Compact Antenna Combination with High Efficiency for Reception of SDARS- and GPS Signals \*\*\*\*% \* -  
J. Kammerer, S. Lindenmeier, *Universität der Bundeswehr München, Germany*
- 511.5 Broadband Dual-Frequency and Dual-Polarized Antennas for GSM/3G/LTE Base Stations \*\*\*\*% +%  
Y. Cui, R. Li, *South China University of Technology, China*
- 511.6 Dual Band CPW-Fed Butterfly-Shaped Slot Antenna \*\*\*\*% +'  
Y.-W. Liu, P. Hsu, *National Taiwan University, Taiwan*
- 511.7 An Asymmetrical Dipole Tag with Optimum Harmonic Conversion Efficiency \*\*\*\*% +)  
H. Aumann<sup>1</sup>, E. Kus<sup>1</sup>, B. Cline<sup>2</sup>, N. W. Emanetoglu<sup>1</sup>  
<sup>1</sup>*University of Maine, United States;* <sup>2</sup>*University of Maine, United States*
- 511.8 Double-Band Backfire Antenna for Low-Terahertz Frequencies \*\*\*\*% ++  
H. D. Hristov, H. E. Carrasco, *Universidad Tecnica Federico Santa Maria, Chile*
- 511.9 Dipole Excited Wideband Circularly Polarized Slot Antenna \*\*\*\*% +-  
A. R. Harish, T. Kumar, *Indian Institute of Technology Kanpur, India*
- 511.10 Novel X+Ku Dual Band Monopulse Array Antenna \*\*\*\*% , %  
D. R. Jahagirdar, *Research Center Imarat, India*

## 512. Satellite Communication Antennas

Session Chairs: Rainee Simons, Lorenzo Lo Monte

- 512.1 A Planar Passive Dual Band Array Feed Antenna for Ku Band Satellite Communication Terminals** \*\*\*\*%, '   
*Z. Yang, K. F. Warnick, Brigham Young University, United States*
- 512.2 A Deployable Quadrifilar Helix Antenna for CubeSat** \*\*\*\*%, )   
*J. Costantine, D. Tran, M. Shiva, California State University Fullerton, United States; Y. Tawk, C. G. Christodoulou, University of New Mexico, United States; S. E. Barbin, Polytechnic University of Sao Paulo, Brazil*
- 512.3 A X/Ka Bands Feeder Antenna for a Planetary Exploration High Gain Reflector Antenna** \*\*\*\*%, +   
*K. Kagoshima, S. Takeda, K. Ikeda, Ibaraki University, Japan; T. Kobayashi, Y. Kato, H. Iijima, Tokyoudenki University, Japan; A. Tomiki, T. Toda, Japan Aerospace Exploration Agency, Japan*
- 512.4 A Deployable Conical Log-Spiral Antenna Design for CubeSat Applications** \*\*\*\*%, -   
*A. J. Ernest, Y. Tawk, C. G. Christodoulou, University of New Mexico, United States; J. Costantine, California State University Fullerton, United States*
- 512.5 Volumetric Ring Array for Uniform Global Coverage in Satellite Applications** \*\*\*\*% - %   
*A. Reyna, University of Tamaulipas UAT, Mexico; M. A. Panduro, C. Del Rio, Public University of Navarra, Spain*
- 512.6 Ground-Based Polarization-Forming Technique for Polarization-Tracking-Free Ku-Band Mobile Satellite Communication Systems** \*\*\*\*% - '   
*Y. Suzuki, T. Sugiyama, NTT Access Network Service Systems Laboratories, Japan*
- 512.7 Q-Band (37-41 GHz) Satellite Beacon Architecture for RF Propagation Experiments** \*\*\*\*% - )   
*R. N. Simons, E. G. Wintucky, NASA Glenn Research Center, United States*
- 512.8 A Broadband Soft Horn Antenna with Inhomogeneous Metasurface Coatings** \*\*\*\*% - +   
*Q. Wu, C. P. Scarborough, D. H. Werner, The Pennsylvania State University, United States; E. Lier, R. K. Shaw, Lockheed Martin, United States*
- 512.9 A Ring Probe Fed Metallic Cavity Antenna for Circular Polarization** \*\*\*\*% - -   
*K. Wei, Z. Zhang, Z. Feng, Tsinghua Univ., China*
- 512.10 A New Corrugated Dielectric Loaded Expo-Profiled Conical Feed Horn** \*\*\*\*B#5   
*S. M. Razavi zadeh, IRIB University, Iran*

### 513. Theoretical and Nonlinear Electromagnetics

Session Chairs: George Hanson, Ioannis Besieris

**513.1 EM Wave Scattering by Objects Moving on Bowditch-Lissajous Trajectories** ""B#5

D. Censor, *Ben-Gurion University of the Negev, Israel*

**513.2 Airy Beams in the Presence of Inhomogeneities** ""B#5

I. M. Besieris, *Virginia Polytechnic, United States*

**513.3 Rules for Parameter Selection in a Complex Point Beam Expansion** ""B#5

E. Martini, *S. Maci, University of Siena, Italy*

**513.4 Electromagnetic Transmission Through a Slit Surrounded with Grooves in a Conducting Plane** ""B#5

D. Y. Na, *J. H. Kim, Y. B. Park, Ajou University, South Korea*; *K.-Y. Jung, Hanyang University, South Korea*

**513.5 A Novel Non-Local Polarizabilities Model for Accurate Homogenization of Metamaterials** ""B#5

D. L. Sounas, *C. Caloz, École Polytechnique de Montréal, Canada*

**513.6 Analytic Computation and Computer Simulations of Radiated Power and Surface Wave Power for a Hertzian Dipole over Planar Stratified Media** ""B#5

S. Weiss, *Army Research Laboratory, United States*

**513.7 Electromagnetic Modeling of Nonlinear, Spatially-Dispersive Materials** ""B#5

G. Hanson, *University of Wisconsin, Milwaukee, United States*

**513.8 Evolutionary Approach to Electromagnetics as an Alternative to the Time-Harmonic Field Method** ""B#5

*O. A. Tretyakov, Gebze Institute of Technology, Turkey*; F. Erden, *University of Illinois at Urbana-Champaign, USA*

**513.9 Nonlinear Wave Scattering by Semiconductor Periodic Structure with Defect** ""B#5

O. V. Kostlyova, *Institute of Radiophysics and Electronics of NAS of Ukraine, Ukraine*; *O. V. Shramkova, Queen's University Belfast, UK*

**513.10 Electromagnetic Fields Generated by a Point Charge Moving with Uniform Velocity** ""B#5

S. R. Seshadri, *4502 Phyllis Court, Livermore, California 94550-7284, USA, United States*



#### 514. Analysis of Propagation and Radiation in Complex Media

Session Chairs: Ahmad Hoorfar, muhammad dawood

- 514.1 **The Electromagnetic Field Structure in a Ferrite-Filled Transversely-Magnetized Waveguide** \*\*\*&\$\$%  
A. K. Hatley, R. S. Adams, *The University of North Carolina at Charlotte, United States*
- 514.2 **Microstrip Dipoles Printed on Biaxial Substrates** \*\*\*&\$\$  
J. W. Graham, *SRC, United States*; J. K. Lee, *Syracuse University, United States*
- 514.3 **RFID Performance in High-Voltage Corona** \*\*\*&\$\$  
M. M. Morys, G. D. Durgin, *Georgia Institute of Technology, United States*
- 514.4 **RF Power Harvesting for Underground Sensors** \*\*\*&\$\$+  
S. Jiang, S. Georgakopoulos, O. Jonah, *Florida International University, United States*
- 514.5 **Analysis of Inhomogeneous Chiral Slab Using Taylor's Series Expansion** \*\*\*&\$\$-  
D. Zarifi, M. Soleimani, A. Abdolali, V. Nayyeri, *Iran University of Science and Technology, Iran*
- 514.6 **Brillouin Precursors Through Concrete Walls for Through-the-Wall Imaging at Microwave Frequencies** \*\*\*&\$\$%  
M. Dawood, Z. Zeeshan, *New Mexico State University, United States*; A. V. Alejos, *University of Vigo, Spain*
- 514.7 **Microwave Pulse Optimization for Low Attenuation in Lossy Dispersive Media** \*\*\*&\$\$%  
G. K. Zhu, S. V. Hum, C. D. Sarris, *University of Toronto, Canada*
- 514.8 **A Simple Procedure to Evaluate Sommerfeld Integrals in Layered Media Problems** \*\*\*&\$\$%  
S. M. Rao, *Naval Research Laboratory, United States*; D. Chatterjee, *University of Missouri Kansas City (UMKC), United States*
- 514.9 **Electric Dipole Radiation in Proximity of a Wall and a Ground Plane** \*\*\*&\$\$%  
K. Hosseini, *Tarbiat Modares University, Tehran*; M. Dehmollaian, *University of Tehran, Iran*
- 514.10 **Power Transmission for Sensors Embedded in Reinforced Concrete Structures** \*\*\*&\$\$%  
S. Jiang, S. Georgakopoulos, O. Jonah, *Florida International University, United States*

## IF51 MIMO Communication Strategies

Session Chairs: Jon Wallace, Hai Deng

- IF51.1 Optimization of Antenna Excitation Phases for Transmit Beam Nulling with MIMO Radar** <sup>1</sup> L. Guo, T. Ma, H. Deng, *Florida International University, United States*
- IF51.3 Adaptive Beamforming Using Sequential Beamspace Approach** <sup>1</sup> Y. Huang, *Montana State University, United States*; C. Wang, *The Cooper Union for the Advancement of Science and Art, United States*
- IF51.4 Increased Interference-Limited MIMO Capacity with Parasitic Reconfigurable Aperture Antennas** <sup>1</sup> R. Mehmood, J. W. Wallace, *Jacobs University Bremen, Germany*
- IF51.5 A Hardware Demonstration of Wireless Power Transmission Based on Retro-Reflective Beamforming** <sup>1</sup> S. Sha, M. Lu, *University of Texas at Arlington, United States*
- IF51.6 Effect of Metal Wire on Channel Capacity in Near-Field MIMO System** <sup>1</sup> D. Zhang, T. Hori, M. Fujimoto, *University of Fukui, Japan*
- IF51.7 DOF of Indoor MIMO Systems** <sup>1</sup> J. Xu, *Loyola Marymount University, United States*
- IF51.8 Multiple Polarization Communications** <sup>1</sup> R. B. Dybdal, S. J. Curry, F. Lorenzelli, D. J. Hinshilwood, *The Aerospace Corporation, United States*
- IF51.9 A High-Rate MIMO Receiver in an FPGA** <sup>1</sup> M. Véstias, *INESC-ID/ISEL/IPL, Portugal*; P. Pinho, *Instituto de Telecomunicações, Portugal*
- IF51.10 Compensation of Undesired Effects in MIMO Wireless Transceivers** <sup>1</sup> M. Cabarkapa<sup>1</sup>, M. Bozic<sup>1</sup>, N. Neskovic<sup>2</sup>, A. Neskovic<sup>2</sup>, D. Budimir<sup>1</sup>  
<sup>1</sup>Westminster University, United Kingdom; <sup>2</sup>University of Belgrade, Serbia

## IF52 Volumetric Metamaterials

Session Chairs: Ashwin Iyer, Marco Antoniades

- IF52.1 Switchable near-Zero-Index Magnetic Metamaterial for Dynamic Beam-Scanning Lens** -  
J. P. Turpin, D. H. Werner, *Pennsylvania State University, United States*
- IF52.2 A Fully Printed Multilayer Metamaterial with Broadband, Low-Loss Negative Index** %  
H.-L. Nguyen, A. K. Iyer, *University of Alberta, Canada*
- IF52.3 Dual Polarized Negative Refraction in a Volumetric Transmission-Line Metamaterial** ' %  
M. Selvanayagam, G. V. Eleftheriades, *University of Toronto, Canada*
- IF52.4 Suppression of Chromatic Aberrations Based on a Metamaterial with Anomalous Dispersion** %  
J. T. Costa, M. G. Silveirinha, *Instituto de Telecomunicacoes, Universidade de Coimbra, Portugal*
- IF52.5 Network Modeling of Multi-Layer Magnet-Less Non-Reciprocal Gyrotropic Metamaterials** % (+  
D. L. Sounas<sup>1</sup>, T. Kodera<sup>2</sup>, C. Caloz<sup>1</sup>  
<sup>1</sup>*Ecole Polytechnique de Montréal, Canada*; <sup>2</sup>*Yamaguchi University, Japan*
- IF52.6 Hiding and Absorbing the Power Emitted by a Dipole at the Interface of an Indefinite Medium** % (-  
C. Guclu, S. Campione, S. H. Sedighy, F. Capolino, *University of California, Irvine, USA*
- IF52.7 Numerical Modeling of the Electromagnetic Response of Complex Shaped Spatially Dispersive Bodies** % %  
J. T. Costa, M. G. Silveirinha, *Instituto de Telecomunicacoes, Universidade de Coimbra, Portugal*
- IF52.8 Wideband Negative Permeability Metamaterial with Non-Foster Compensation of Parasitic Capacitance** % % '  
K. Miehle, T. P. Weldon, R. S. Adams, K. Daneshvar, *Univ. of N. Carolina at Charlotte, United States*
- IF52.9 Bandwidth Enhancement of a Patch Antenna Using a Wire-Ferrite Substrate** % % )  
A. Shahvarpour, S. Couture, C. Caloz, *Ecole Polytechnique de Montreal, Canada*
- IF52.10 On Bandwidth of Transmission-line-based and Inclusion-based Non-Foster ENZ Metamaterials** % % #  
S. Hrabar, I. Krois, A. Kirichenko, I. Bonic, *University of Zagreb, Croatia*
- IF52.11 Resonance Mode Splitting in Split-Ring Resonator Arrays Used in the Microwave Invisibility Cloak** % % +  
F. Chen, X. Wang, E. Semouchkina, *Michigan Technological University, United States*
- IF52.12 Live Electrooptic Imaging for Visual Observations and Phase Velocity Evaluation of Internal Backward Waves in Two-Dimensional DNG Metamaterial** % % ) -  
M. Tsuchiya, *National Institute of Information and Communications Technology, Japan*; T. Shiozawa, *Kagawa National College of Technology, Japan*
- IF52.13 Nonlinear Spiral Metamaterials** % % % %  
A. P. Slobozhanyuk<sup>1</sup>, D. S. Filonov<sup>1</sup>, M. Lapine<sup>1</sup>, I. V. Shadrivov<sup>2</sup>, P. A. Belov<sup>1</sup>, Y. S. Kivshar<sup>2</sup>  
<sup>1</sup>*National Research University of Information Technologies, Mechanics and Optics (ITMO), Russian Federation*; <sup>2</sup>*Australian National University, Australia*
- IF52.14 Integrating Metamaterials Within a Structural Composite Using Additive Manufacturing Methods** % % % %  
P. Pa<sup>1</sup>, K. Duncan<sup>2</sup>, R. McCauley<sup>1</sup>, S. Yarlagadda<sup>1</sup>, M. Mirotznik<sup>1</sup>  
<sup>1</sup>*University of Delaware, United States*; <sup>2</sup>*US Army, United States*
- IF52.15 Performance of Miniature GPS Arrays Loaded with SRRs** % % %  
A. A. Gheethan, G. Mumcu, *University of South Florida, United States*
- IF52.16 Neuro-Modelling of CSRR for Antenna Applications** % % % % +  
D. Pal, A. Patnaik, S. N. Sinha, *IIT Rorkee, India*

## IF53 Nano-electromagnetics

Session Chairs: Nader Behdad, Brian Lail

- IF53.1 A Biologically-Inspired Nanoantenna Array** -  
Y. Yusuf, N. Behdad, *University of Wisconsin, United States*
- IF53.2 Studies of a Nanometer Antenna Combined with Open and Closed Cylindrical Active Coated Nano Particles** -  
J. Geng<sup>1</sup>, R. Jin<sup>1</sup>, X. Liang<sup>1</sup>, R. W. Ziolkowski<sup>2,2</sup>  
<sup>1</sup>*Shanghai Jiao Tong University, China*; <sup>2</sup>*University of Arizona, USA*
- IF53.3 Design and Optimization of Bow-Tie Optical Antennas** -  
S. Kokici, E. Korkmaz, *Fatih University, Turkey*
- IF53.4 Metamaterials with Angle Selective Emissivity in the Near-IR** -  
J. A. Bossard, D. H. Werner, *The Pennsylvania State University, United States*
- IF53.5 Absorption Enhancement in Silicon Solar Cells Due to Surface Plasmons of Nanotoroids** -  
N. Burford, M. El-Shenawee, *University of Arkansas, United States*
- IF53.6 On Understanding the Enhancement of Optical Absorption in Nanostructure Photovoltaic Solar Cells** -  
T. J. Brockett, H. Rajagopalan, Y. Rahmat-Samii, *University of California, Los Angeles, United States*
- IF53.7 Integrated Infrared Nanodevices Based on Graphene Monolayers** -  
P. Y. Chen, A. Alù, *University of Texas at Austin, United States*
- IF53.8 Superquadric Nanostructures for Enhanced Absorption in Solar Cells** -  
H. Rajagopalan, T. J. Brockett, Y. Rahmat-Samii, *University of California, Los Angeles, United States*
- IF53.9 An X-Wave Pulse Train as a Tractor Beam** -  
M. A. Salem, H. Bagci, *King Abdullah University of Science and Technology, Saudi Arabia*
- IF53.10 Field Enhancement Due to Surface Structuring During Aluminum Induced Crystallization of Amorphous Silicon** -  
N. M. Burford, M. El-Shenawee, *University of Arkansas, United States*; S. Shumate, D. Hutchings, H. Naseem, *Silicon Solar Solutions LLC, United States*
- IF53.11 Antenna-Coupled Microbolometers for Enhanced Absorption in Reduced-Pitch Infrared Detector Arrays** -  
J. Larsen, B. A. Lail, *Florida Institute of Technology, United States*
- IF53.12 Novel Silicon-Based Hybrid Plasmonic Waveguide with Nano-Scale Gap at the Interface of Metal and Si** -  
A. Amirhosseini, R. Safian, *Isfahan University of Technology, Iran*

## IF54 Non-Antenna Applications of Metasurfaces

Session Chairs: Daniel Gregoire, Zhi Hao Jiang

- IF54.1 Enhancement of the Strips Electromagnetic Soft Surfaces Using Ledge Edges** \*\*\*\*&\$, -  
S. A. Abushamleh<sup>1</sup>, H. Al-Rizzo<sup>1</sup>, A. Kishk<sup>2</sup>, H. Khaleel<sup>1</sup>  
<sup>1</sup>University of Arkansas at Little Rock, United States; <sup>2</sup>Concordia University, Canada
- IF54.2 A Reconfigurable Near-infrared Circularly Polarizing Reflector Based on Phase Changing Anisotropic Metamaterials** \*\*\*\*&\$- %  
P. E. Sieber, D. H. Werner, *The Pennsylvania State University, United States*
- IF54.3 Broadband Infrared (IR ) Metamaterial Absorber** \*\*\*\*&\$- '  
H. M. Jaradat, *Umass Lowell, United States*
- IF54.4 Surface-Wave Waveguides** \*\*\*&\$- )  
D. J. Gregoire, A. V. Kabakian, *HRL Laboratories, United States*
- IF54.5 A Leaky Radial Waveguide for Generating Propagating Bessel Beams** \*\*\*&\$- +  
M. Ettore, *IETR, University of Rennes 1, UMR CNRS 6164, France*; S. M. Rudolph, *Naval Research Laboratory, USA*; A. Grbic, *University of Michigan, USA*
- IF54.6 Experimental Demonstration of an Optical Artificial Perfect Magnetic Mirror Using Dielectric Resonators** \*\*\*\*&\$- -  
Z. H. Jiang, S. Yun, D. Ma, D. Brocker, D. H. Werner, Z. Liu, T. S. Mayer, *The Pennsylvania State University, United States*
- IF54.7 A Low Profile AMC for Flexible and Conformal Applications** \*\*\*\*&\$% %  
H. R. Khaleel, H. M. Al-Rizzo, D. G. Rucker, S. Abushamleh, *University of Arkansas at Little Rock, United States*
- IF54.8 3D Artificial Impedance Surfaces** \*\*\*\*&\$% '  
D. J. Gregoire, *HRL Laboratories, United States*
- IF54.9 Faraday Rotation by Artificial Electric Gyrotropy in a Transparent Slot-Ring Metamaterial Structure** \*\*\*\*&\$% )  
T. Koderu, *Yamaguchi University, Japan*; D. L. Sounas, C. Caloz, *Ecole Polytechnique de Montreal, Canada*
- IF54.10 Synthesizing a Twist Polarizer** \*\*\*\*&\$% +  
T. P. Niemi, A. O. Karijainen, S. A. Tretyakov, *Aalto University School of Electrical Engineering, Finland*

## IF55 RFID Reader Design

Session Chairs: Majid Manteghi, Mahmoud EL Sabbagh

- IF55.1 Dual-Band Circularly Polarized Antenna for RFID Reader Applications** \*\*\*\*&%%-  
H.-T. Hsu, S.-C. Lin, T.-J. Huang, *Yuan Ze University, Taiwan*
- IF55.2 Antenna with Wide Beamwidth and High Return Loss for UHF RFID Reader** \*\*\*\*&%%%  
H.-W. Son, H. Park, J.-H. Cho, *Chonbuk National University, South Korea*; K.-H. Lee, G.-J. Jin, M.-K. Oh, *Electronics and Telecommunications Research Institute (ETRI), South Korea*
- IF55.3 A Spirally Complementary Split-Ring Resonators Antenna for Circular Polarization and RFID Reader Application** \*\*\*&%%  
J.-P. Chen, P. Hsu, *National Taiwan University, Taiwan*
- IF55.4 Log-Periodic Dipole Array with Improved Front-to-Back Ratio for Universal UHF RFID Handheld Reader Applications** \*\*\*\*&%%  
H.-T. Hsu, T.-J. Huang, *Yuan Ze University, Taiwan*
- IF55.5 A Circular Polarization Hybrid-Integrated Rectangular Ring Antenna for RFID Reader** \*\*\*&%%-  
Y. Li<sup>1,2</sup>, S. Sun<sup>2</sup>, L. Jiang<sup>2</sup>, T. T. Ye<sup>3</sup>  
<sup>1</sup>*University of Electronic Science and Technology of China, China*; <sup>2</sup>*The University of Hong Kong, China*; <sup>3</sup>*Hong Kong R&D Centre, China*
- IF55.6 The Phase Difference Method for Transmit Diversity in Monostatic RFID Systems** \*\*\*\*&%%  
A. Hasan, *Georgia Institute of Technology, United States*; C. Zhou, J. D. Griffin, *Disney Research Pittsburgh, United States*
- IF55.7 Technology-Independent Table-Based Diode Model for Rectenna Design in RF Energy Harvesting** \*\*\*&%%  
M. He<sup>1,2</sup>, H. Sun<sup>1</sup>, Z. Zhong<sup>1</sup>, Y.-X. Guo<sup>1</sup>, M.-Y. Xia<sup>2</sup>  
<sup>1</sup>*National University of Singapore, Singapore*; <sup>2</sup>*Peking University, China*
- IF55.8 Simple and Planar near-Field Reader Antenna** \*\*\*\*&%%  
J. Choo, D. Kim, *KAIST, South Korea*; J. Ryoo, *LS Industrial Systems, South Korea*
- IF55.9 Double-Layer Folded Loop Antenna for UHF near-Field RFID Applications** \*\*B#  
X. Li, Z. Sun, *Beijing University of Posts and Telecommunications, China*
- IF55.10 Segmented Loop Antenna Analysis and Optimal Design for UHF RFID Near-field Applications** \*\*B#  
W. Li, X. Li, *Beijing University of Posts and Telecommunications, China*

## IF56 Sensing the Environment

Session Chairs: William Davis, John Donohoe

- IF56.1 A Novel Technique to Compute Impedance of an Arbitrarily Oriented Coil Antenna for Well Logging Applications**  
T. Zhao, G. Minerbo, J. Hunka, J. C. Goswami, *Schlumberger Technology Corporation, United States*
- IF56.2 Localization of Buried Object Using BackPropagation Neural Network**  
A. Z. Ashoor, Z. Ren, O. M. Ramahi, *University of Waterloo, Canada*
- IF56.3 Feasibility Study for Non-Metallic IED Detection Using Forward-Looking Ground Penetrating Radar Integrated with Target Feature Classification**  
J. S. K. Nakatsu, H.-S. Youn, M. F. Iskander, *University of Hawaii at Manoa, United States*
- IF56.4 Coupling of Underground Objects to Antennas and Transmission Lines at Antiresonance**  
J. P. Donohoe, *Mississippi State University, United States*; J. R. Fairley, L. N. Lynch, *US Army Engineer Research and Development Center, United States*
- IF56.5 Direction and Polarization Estimations of Signals Using Vector Circular Array**  
Y. Lu, *Nanyang Technological University, Singapore*; S. Yang, *University of Electronics Science and Technology of China, China*
- IF56.6 A Circuit Parameter Identification of Personal Area Networks under the Magnetic Coupling**  
T. Ogasawara<sup>1</sup>, A.-I. Sasaki<sup>1</sup>, K. Fujii<sup>1</sup>, Y. Fujino<sup>2</sup>, T. Fujita<sup>2</sup>, M. Yaita<sup>1</sup>, M. Shimizu<sup>2</sup>, H. Morimura<sup>1</sup>  
<sup>1</sup>NTT Microsystem Integration Laboratories, Japan; <sup>2</sup>NTT Network Innovation Laboratories, Japan
- IF56.7 Experimental Design of the Micro-Strip Moisture Sensors**  
C. Guo, R. C. Liu, *Chang'an University, China*
- IF56.8 Foliage Obstacle Detection Exploiting Scattering and Depolarization of 2.4 GHz Waves Used for Communication Links**  
S. Nikolaou<sup>1</sup>, C. Eracleous<sup>2</sup>, M. Milis<sup>3</sup>, C. G. Panayiotou<sup>2</sup>  
<sup>1</sup>Frederick University Cyprus (FUC), Cyprus; <sup>2</sup>University of Cyprus, Cyprus; <sup>3</sup>SignalGenerix Ltd, Cyprus
- IF56.9 Wireless Temperature Measurements Using an Acoustically Modulated Sensor**  
W. A. Davis, T. Yang, *Virginia Tech, United States*; J. Coggin, R. G. May, *Prime Photonics, United States*
- IF56.10 Combined Measured Characteristics of Microwave Radiometer and Free-Space Optical Link**  
P. Dvorak, J. Libich, S. Zvanovec, *Czech Technical University in Prague, Czech Republic*
- IF56.11 Inkjet-Printed and Organic/Nanofluidic-Based Conformal Wireless Sensors for Smart Temperature Monitoring**  
A. Traile<sup>1,2</sup>, S. Bouaziz<sup>2</sup>, P. Pons<sup>2</sup>, H. Aubert<sup>2</sup>, M. M. Tentzeris<sup>1</sup>  
<sup>1</sup>Georgia Institute of Technology, United States; <sup>2</sup>CNRS, France

## IF57 Small mobile antennas

Session Chairs: Thomas Wong, Koichi Ogawa

- IF57.1 A Wideband Composite Right/Left Hand Rectenna for UHF Energy Harvesting Applications** \*\*\*&% %  
B. L. Pham, J.-C. S. Chieh, A.-V. Pham, *University of California Davis, United States*
- IF57.2 A TBH Antenna with Parasitic Element for Bandwidth Enhancement** \*\*\*&% '  
T. T. Y. Wong, A. Celebi, *Illinois Institute of Technology, United States*; M. Kenkel, *Shure, Inc., United States*
- IF57.3 An Arrow Shaped Printed Antenna for ZigBee Applications** \*\*\*&% )  
M. Sharaf, *National Telecommunication Institute, Egypt*, R. El-adjl, S. Shams, A. Allam, *German University in Cairo, Egypt*
- IF57.4 Multiband Planar Branched Monopole Antenna for GSM/GPS/WLAN/WiMAX Applications** \*\*\*&% +  
B. Tlili, *Rochester institute of Technology/ Dubai Campus, United Arab Emirates*; S. Yousuf, *Rochester Institute of Technology Dubai, UAE*
- IF57.5 A Dual-Polarization Single-Layered Antenna for GPS and ISM Bands** \*\*\*&% -  
M. Matsunaga, *Ehime University, Japan*; T. Matsunaga, *Fukuoka Institute of Technology, Japan*
- IF57.6 Stacked Package Loop Antenna for WLAN Based on IPD Manufacturing Technology** \*\*\*&% %  
C.-H. Lee, T.-C. Tang, K.-H. Lin, *National Sun Yat-sen University, Taiwan*
- IF57.7 Dynamic Efficiency Degradation of BAN Antennas Due to the Movement of the Arms** \*\*\*&% '  
K. Ogawa, K. Honda, *Toyama university, Japan*
- IF57.8 Multisystem Microstrip Antenna for Mobile Communications** \*\*\*\*\*&% )  
M. Gruszczyński, M. Wnuk, L. Nowosielski, *Military University of Technology, Poland*
- IF57.9 Radiation Properties of Quadrifilar-Helix Antenna- an Analytical Approach** \*\*\*&% +  
W. J. Krzysztofik, *Wroclaw University of Technology, Poland*
- IF57.10 A Compact Curl Antenna with a Cavity-Backed Absorber** \*\*\*B#5  
A. M. Mehrabani, L. Shafai, *The University of Manitoba, Canada*
- IF57.11 Analysis and Design Process of a Stripline Archimedean Spiral Antenna** \*\*\*B#5  
T.-K. Chen, G. H. Huff, *Texas A&M University, United States*
- IF57.12 UHF RFID Antenna Package Employing Shielded Parallel-Plate for Metallic Surface Installations** \*\*B#5  
D. Liu, X. Zhu, *University of Michigan-Shanghai Jiao Tong University Joint Institute, Shanghai Jiao Tong University, China*; W. Hong, *Samsung Electronics, South Korea*



## 551. Fast Methods

Session Chairs: Dan Jiao, Joe Kotulski

### 551.1 Massively Parallel FFT and Interpolation Based Methods on GPU and CPU Systems ``B#

S. Li<sup>1</sup>, R. Chang<sup>1</sup>, A. Boag<sup>2</sup>, V. Lomakin<sup>1</sup>  
<sup>1</sup>University of California, San Diego, United States; <sup>2</sup>Tel Aviv University, Israel

### 551.2 On the MLMDA/Butterfly Compressibility of Inverse Integral Operators ``B#

H. Guo<sup>1,2</sup>, J. Hu<sup>1</sup>, E. Michielssen<sup>2</sup>  
<sup>1</sup>University of Electronic Science and Technology of China, China; <sup>2</sup>University of Michigan, United States

### 551.3 Further Considerations on the Use of Parallel Matrix Compression and Calderon Preconditioning in the Method of Moments Code EIGER ``B#

J. Kotulski, Sandia National Labs, United States

### 551.4 Parallel Truncated Multigrid Preconditioning of AIM for Bioelectromagnetics ``B#

F. Wei, A. E. Yilmaz, Electrical and Computer Engr., United States

### 551.5 A Scalable Parallel Implementation of the Plane Wave Time Domain Algorithm on Graphics Processing Unit-Augmented Clusters ``B#

Y. Liu<sup>1</sup>, A. C. Yucel<sup>1</sup>, V. Lomakin<sup>2</sup>, E. Michielssen<sup>1</sup>  
<sup>1</sup>University of Michigan, United States; <sup>2</sup>University of California, United States

### 551.6 An Efficient FFT-Based Algorithm for 3-D Structures Residing in Multiple Layers of Layered Media ``B#

K. Yang, A. E. Yilmaz, The University of Texas at Austin, United States

### 551.7 Unified FFT Based Acceleration of Near and Far Interactions in Moment Method for Microstrip Circuits Embedded in Shielded Multilayered Media ``B#

B. J. Rautio<sup>1</sup>, V. Okhmatovski<sup>2</sup>, J. K. Lee<sup>1</sup>, A. Cangellaris<sup>3</sup>  
<sup>1</sup>Syracuse University, United States; <sup>2</sup>University of Manitoba, Canada; <sup>3</sup>University of Illinois at Urbana-Champaign, United States

### 551.8 Envelope Tracking Adaptive Integral Method for Volume Integral Equations ``B#

G. Kaur, A. E. Yilmaz, University of Texas at Austin, United States

### 551.9 Multilevel Model Order Reduction for Finite Element Analysis of Microwave Structures ``B#

G. Fotyga, K. Nyka, L. Kulas, Gdansk University of Technology, Poland

## 552. EM Metrology and Materials

Session Chairs: William Davis, Reuven Shavit

- 552.1 Circuit Modeling Methodology with Application to RF via Transitions** ``B#  
R. Shavit, L. Arazi, *Ben-Gurion University of the Negev, Israel*
- 552.2 Estimating Effective Depth of Gas Wellbore Using Electromagnetic Techniques** ``B#  
M. K. Hassan, K. Panayappan, R. Mitra, *Pennsylvania State University, United States*
- 552.3 Embedded Actives for Heterogenous Integration of Millimeter Wave Circuits** ``B#  
X. Yang, K. Y. Park, P. Chahal, *Michigan State University, United States*
- 552.4 A New Non-Spurious Discontinuous Galerkin Finite-Element Time Domain Method** ``B#  
Q. Ren, L. E. Tobón, Q. H. Liu, *Duke University, United States*
- 552.5 Electromagnetic Fields near Wireless Power Transfer Systems** ``B#  
Y. G. Kim, S. Nam, *Seoul National University, South Korea*
- 552.6 Waveguide Probe to on-Wafer Waveguide Transition for Measurement of the Scattering Parameters at Millimeter- and Sub-Millimeter-Wave Frequencies** ``B#  
A. Jam, J. R. East, K. Sarabandi, *University of Michigan, United States*
- 552.7 Three Dimensional Printing of Graded Dielectrics Using an Ultrasonic Powder Deposition System** ``B#  
J. Smith, S. Yarlagadda, M. Mirotznik, *University of Delaware, United States*
- 552.8 Broadband Electromagnetic Modeling of Woven Fabric Composite Laminates** ``B#  
M. Mirotznik, S. Yarlagadda, P. Pa, R. McCauley, *University of Delaware, United States*; S. Simmons, *Naval Surface Warfare Center, United States*
- 552.9 The Evaluation of the Dielectric Breakdown Voltages of Pultruded Composites Comprised of Different Constituent Materials** ``B#  
E. Hutchcraft, R. K. Gordon, E. Lackey, J. G. Vaughan, *University of Mississippi, United States*
- 552.10 Two-Port Scalar Microwave Network Analyzer with an Analog Source and Software Error Correction** ``B# -  
A. Kawalec, D. Erricolo, *University of Illinois at Chicago, United States*

### 553. Advances in Commercial Electromagnetic Simulation Tools

Session Chairs: C.J. Reddy, Jay Kralovec, Aldo Petosa

Session Organizers: C.J. Reddy, Jay Kralovec, Aldo Petosa

#### 553.1 Advances in TICRA EM Tools

H.-H. Viskum, TICRA, Denmark

#### 553.2 New Capabilities and Extensions to the Commercial EM Code FEKO

J. van Tonder<sup>1</sup>, M. Bingle<sup>1</sup>, U. Jakobus<sup>1</sup>, D. Ludick<sup>1</sup>, E. Lezar<sup>2</sup>, M. Schoeman<sup>1</sup>  
<sup>1</sup>EM Software & Systems, South Africa; <sup>2</sup>EM Software & Systems GmbH, Germany

#### 553.3 Parameterized Compact Model Synthesis Based on Sonnet Electromagnetic Analysis Data

J. C. Rautio, Sonnet Software, inc., United States

#### 553.4 Recent Developments in Antenna Magus

S. R. Clarke, B. K. Woods, T. Sickel, N. Marais, K. F. Brand, D. D. Barnard, Magus (Pty) Ltd, South Africa

#### 553.5 FDTD Simulations with 10<sup>11</sup> Unknowns Using AVX and SSD on a Consumer PC

W. Simon, A. Lauer, A. Wien, IMST, Germany

#### 553.6 Computational Platform for Multidisciplinary Electromagnetic Simulations

X. L. Chen, E. Ofli, M. Fueterer, M. Minana, N. Chavannes, N. Kuster, SPEAG, Schmid and Partner Engineering AG, Switzerland

#### 553.7 WASP-NET: Recent Advances in Fast EM CAD and Optimization of Waveguide Components, Feeds and Aperture Antennas

F. Arndt<sup>1,2</sup>

<sup>1</sup>University of Bremen, Germany; <sup>2</sup>Microwave Innovation Group, Germany

#### 553.8 Efficient Method of Moment Simulation Based on Higher Order Bases and CPU/GPU Parallelization

B. M. Kolundzija, D. I. Olcan, UNIV OF BELGRADE, Serbia; D. P. Zoric, WIPL-D d.o.o., Serbia

#### 553.9 Advanced Features to Enhance the FDTD Method in GEMS Simulation Software Package

W. Yu<sup>1,2</sup>, X. Yang<sup>2</sup>, W. Li<sup>1</sup>

<sup>1</sup>COMU, United States; <sup>2</sup>Harbin Engineering University, China

#### 553.10 Useful Techniques Included in NEWFASANT Tool for Electromagnetic Analysis and Design

F. Catedra, E. Garcia, C. Delgado, L. Lozano, I. Gonzalez, NEWFASANT SL, Spain; M. J. Algar, A. Somolinos, D. Moreno, Alcala University, Spain

#### 553.11 Recent Technology Advances in the Computational Electromagnetics Code Efield® for Large Scale Sensor Integration Simulations

B. Strand, E. Abenius, B. Wastberg, Efield AB, ESI Group, Sweden

## 554. Slotted and Guided Wave Antennas II

Session Chairs: Miao Zhang, Ozlem Aydin Civi

- 554.1 Circularly Polarized Slot Antenna with a Simple Feed Design for Solar Cell Integration** \*\*\*\*&#x2191;  
M. Chandak, R. Baktur, *Utah State University, United States*
- 554.2 Analysis of an X-Shaped Cavity-Backed Slot 2x2-Element Sub-Array by Hybrid MoM/FEM with Numerical Eigenmode Basis Functions** \*\*\*&#x2194-  
T. Tomura, J. Hirokawa, T. Hirano, M. Ando, *Tokyo Institute of Technology, Japan*
- 554.3 Loss Reduction & Bandwidth Enhancement by Air-Region Insertion to LTCC Rectangular-Waveguide Slot Arrays in the Millimeter-Wave Band** \*\*\*\*&#x2192;%  
Y. She, R. Fujino, J. Hirokawa, M. Ando, *Tokyo Institute of Technology, Japan*; D. Hanatani, M. Fujimoto, *Hiraiseimitsu Cooperation, Japan*
- 554.4 A Slotted Waveguide EM-CAD Design Method** \*\*\*\*\*&#x2192;'  
S. Mosca, L. Infante, *SELEX Sistemi Integrati SpA, Italy*
- 554.5 A Circularly Polarized Omni-Directional Low Loss Ka-Band Slot Antenna** \*\*\*\*\*&#x2192; )  
C. B. Top, D. Dogan, *Aselsan Inc., Turkey*
- 554.6 Design and Performance Analysis of a Slot Antenna Integrated in a Photovoltaic Panel** \*\*\*\*&#x2192; +  
A. Michel, R. Caso, L. Tavanti, L. Gazzarrini, R. Garroppo, P. Nepa, *University of Pisa, Italy*
- 554.7 A Study of Basic Slot Antenna Configurations Using Simulation-Driven Optimization** \*\*\*&#x2192;-  
S. Koziel, S. Ogurtsov, *Reykjavik University, Iceland*
- 554.8 Miniaturized on-Chip Slot Antenna in 90nm CMOS** \*\*\*B#5  
M. R. Khan, Z. C. Zhang, A. Dinh, L. Chen, *University of Saskatchewan, Canada*; M. Morsy, H. Gorla, *Southern Illinois University, USA*
- 554.9 Design of Beamforming Slot Antenna Arrays Using Substrate Integrated Waveguide** \*\*\*&#x2192;%  
F. D. L. Peters, S. O. Tatu, T. A. Denidni, *University of Quebec - INRS, Canada*
- 554.10 Eigenvalue Analysis of a Ridged Waveguide Using a Spectral Domain Green's Functions** \*\*\*\*&#x2192;'  
T. Suzuki, *Ibaraki University, Japan*; J. C. Young, *University of Kentucky, USA*
- 554.11 Slots on Cylindrical Substrate Integrated Waveguide** \*\*\*\*\*&#x2192; )  
O. Bayraktar, O. Aydin Civi, *Middle East Technical University, Turkey*

## 555. Antennas for mobile and wireless applications

Session Chairs: Sungtek Kahng, Powen Hsu

- 555.1 **Comparison Between CTIA Hand Phantom and Different Human Hands for OTA Power Measurements** \*\*\*\*&% +  
Q. A. Ojerinde, C. J. Panagamuwa, R. M. Edwards, W. G. Whittow, *Loughborough University, United Kingdom*
- 555.2 **Compact MIMO Antenna of the Open-Loop and Meandered-Line 1-Layer Radiators with Improved Isolation** \*\*\*\*\*&% -  
S. Yoo, S. Kahng, S.-G. Mok, *University of Incheon, South Korea*; G. Jang, *RF System Research Group, Korea*
- 555.3 **Effective Formulations of Objective Functions for Optimizing U-Shaped Folded Dipole Antenna by PSO** \*\*\*\*\*&\$\$%  
N. T. Hung, H. Morishita, *National Defense Academy, Japan*; K. Izui, S. Nishiwaki, *Graduate School of Engineering, Kyoto University, Japan*; Y. Koyanagi, *Panasonic Mobile Communications Company Limited, Japan*
- 555.4 **Fundamental Study on Lowering Frequency of J-Shaped Folded Monopole Antenna** \*\*\*\*&\$\$'  
H. Kobayashi, N. T. Hung, H. Morishita, *National Defense Academy, Japan*
- 555.5 **Three Designs of Dual-Polarized MIMO Antennas with Slender Columnar Structure** \*\*\*\*\*&\$\$)  
Y. Li, F. Liu, Z. Zhang, Z. Feng, *Tsinghua University, China*
- 555.6 **Penta-Band PIFA with Tunable Antenna Height for Wireless Multistandard Terminals** \*\*\*\*\*&\$\$+  
H. K. Tseng, *Graduate Institute of Communication Engineering/National Taiwan University, Taiwan*; P. Hsu, *Department of Electrical Engineering/National Taiwan University, Taiwan*
- 555.7 **Evaluation of Diversity and MIMO Performance of a New High Port to Port Isolation Dual-Band System** \*\*\*\*\*&\$\$-  
R. Addaci, A. Diallo, P. Le Thuc, R. Staraj, *LEAT\_UNSA, France*; H. Katsuyuki, P. Vainikainen, *SMARAD Centre of Excellence, Finland*
- 555.8 **Multi-Band PIFA Loaded with Folded Slot Antenna** \*\*\*\*\*&\$\$%  
D. M. N. Elsheakh, E. A. Abdallah, *Electronics Research Institute, Egypt*
- 555.9 **Band-Stop Filter Effect of Multiple Slots in Mobile Phone Antennas** \*\*\*\*\*&\$\$%  
C. R. Rowell<sup>1,2</sup>, E. Y. Lam<sup>2</sup>  
<sup>1</sup>*Hong Kong Applied Science and Technology Research Institute, China*; <sup>2</sup>*University of Hong Kong, China*
- 555.10 **Tuning the Band-Stop Filter Effect in Mobile Phone Antennas** \*\*\*\*&\$\$)  
C. R. Rowell<sup>1,2</sup>, E. Y. Lam<sup>2</sup>  
<sup>1</sup>*Hong Kong Applied Science and Technology Research Institute, China*; <sup>2</sup>*University of Hong Kong, China*

## 556. Analysis and Application of Numerical Methods

Session Chairs: Ali Yilmaz, Vikram Jandhyala

- 556.1 Error Measures for Comparing Bioelectromagnetic Simulations** \*\*\*\*\*  
F. Wei, J. W. Massey, C. S. Geyik, A. E. Yilmaz, *University of Texas at Austin, United States*
- 556.2 Using Natural-Mode Basis Functions to Represent Broadband Responses of a Thin-Wire Scatterer** \*\*\*\*\*  
J. K. Lawrence, A. Q. Martin, *Clemson University, United States*
- 556.3 Statistical Characterization of Wave Propagation in Mine Environments** \*\*\*\*\*  
O. Bakir<sup>1</sup>, A. C. Yuçel<sup>1</sup>, H. Bağcı<sup>2</sup>, E. Michielssen<sup>1</sup>  
<sup>1</sup>*University of Michigan, United States;* <sup>2</sup>*King Abdullah University of Science and Technology, KSA*
- 556.4 Stochastic Analysis for Interconnect Channels** \*\*\*\*\*  
C. Gao, J. Shen, J. Chen, *University of Houston, United States*
- 556.5 A Multi-Resolution System of Domain Decomposition Spectral Functions for the Analysis of Large Smooth Bodies** \*\*\*\*\*  
M. A. Francavilla, M. Righero, F. Vipiana, *Istituto Superiore Mario Boella (ISMB), Italy*; G. Vecchi, *Politecnico di Torino, Italia*
- 556.6 Spurious Fields Suppression in Domain Decomposition Algorithms Using Lagrange Multipliers** \*\*\*\*\*  
T. Peng, K. Sertel, J. L. Volakis, *ElectroScience Laboratory, The Ohio State University, United States*
- 556.7 Large Orthogonal Array-Based Optimization for High-Dimensional Parametric Systems** \*\*\*\*\*  
W. Cui<sup>1</sup>, S. Chakraborty<sup>2</sup>, V. Jandhyala<sup>1</sup>  
<sup>1</sup>*U of Washington, United States;* <sup>2</sup>*Nimbic, Inc., United States*
- 556.8 High-Dimensional Electromagnetic Design Sensitivity** \*\*\*\*\*  
W. Cui, V. Jandhyala, *U of Washington, United States*
- 556.9 The Method of Manufactured Solutions in 3D for the Verification of Computational Electromagnetics.** \*\*\*\*\*  
R. G. Marchand, D. B. Davidson, *University of Stellenbosch, South Africa*
- 556.10 Analysis of Microwave Cavities Using an Eigenmode Projection Approach** \*\*\*\*\* )  
M. A. Othman, T. M. Abuelfadl, I. A. Eshrah, *Cairo University, Egypt*
- 556.11 GUI for High Power Toroidal Inductor Characterization and Design** \*\*\*\*\*  
A. Eroglu, *Purdue University Fort Wayne, United States*

## 557. Modeling in Urban and Terrestrial Communication Systems

Session Chairs: Agostino Monorchio, Costas Sarris

- 557.1 Subcarrier Fading in UWB OFDM Symbols** \*\*\*\*&&' +  
V. Sival, D. Edwards, *University of Oxford, United Kingdom*; B. Allen, *University of Bedfordshire, United Kingdom*
- 557.2 Distance-Dependent Enhancement of a Measurement Based Channel Model for Large Concert Halls** \*\*\*\*\*&&' -  
S. Dortmund, S. Sczyslo, I. Rolfes, *Ruhr-Universität Bochum, Germany*
- 557.3 Ridge Feature Extraction and Effect on Radio Propagation for Wireless Communications** \*\*\*\*\*&&' %  
Z. Yun, N. Omaki, M. F. Iskander, *University of Hawaii, United States*
- 557.4 Ultra-Wideband Interference Modelling for Indoor Wireless Channels Using the FDTD Method** \*\*\*\*\*&&' '  
A. C. M. Austin, C. D. Sarris, *University of Toronto, Canada*
- 557.5 Channel Characterization of Wireless Systems on Board of Ships by Using an Efficient Ray-Tracing** \*\*\*\*&&' )  
A. Monorchio<sup>1</sup>, G. Nastasia<sup>2</sup>, M. Falzarano<sup>2</sup>, A. Corucci<sup>1</sup>, P. Usai<sup>1</sup>  
<sup>1</sup>*University of Pisa, Italy*; <sup>2</sup>*Naval Support & Experimentation Centre - Italian Navy, Italy*
- 557.6 A Hybrid Approach for Optimizing Medium Frequency Communication Networks in Coal Mines** \*\*\*&&' +  
D. E. Brocker, P. E. Sieber, P. L. Werner, D. H. Werner, *The Pennsylvania State University, United States*
- 557.7 Intelligent Ray Tracing for the Propagation Prediction** \*\*\*\*\*&&' -  
Y.-K. Yoon, M.-W. Jung, J. Kim, *Electronics and Telecommunications Research Institute, South Korea*
- 557.8 Radio Propagation Modeling in Indoor Stairwell: a K-Means Clustering Approach** \*\*\*\*&&' %  
S. Y. Lim, *Sunway University, Malaysia*; Z. Yun, M. F. Iskander, *University of Hawaii, USA*
- 557.9 Distribution of Cross-Polar Discrimination in Nakagami-M Fading Channels** \*\*\*\*\*&&' '  
Y. Yao, J. Zheng, Z. Feng, *Department of Electric Engineering, Tsinghua University, China*
- 557.10 Reformulation of the Ikegami Propagation Model for Modern Scenarios at Frequencies up to 6 GHz** \*\*\*\*\*&&' )  
P. Wanderley<sup>1,2</sup>, M. Terada<sup>2</sup>  
<sup>1</sup>*Federal Institute of Brasilia, Brazil*; <sup>2</sup>*University of Brasilia, Brazil*
- 557.11 A Novel Channel Model for Mobile Communications** \*\*\*\*\*&&' +  
D. Shen, *Yunnan University, China*; X. Zhang, *Concordia University, Canada*

## 558. Rough Surface Scattering Phenomenology

Session Chairs: Akira Ishimaru, Saba Mudaliar

- 558.1 **Imaging of Objects Located Close to Rough Surfaces Based on Surface Flattening Transform and Time-Reversal Imaging** ""B#  
A. Ishimaru, M. Stoneback, Y. Kuga, *University of Washington, United States*
- 558.2 **HF Radar Ground Wave Propagation in a Maritime Complex Environment** ""B#  
C. Bourlier, *IETR - Lunam universit , France*; G. Kubick , *DGA Information Superiority, France*
- 558.3 **A Study of the Third Field Series Term in the Small Slope Approximation for Rough Surface Scattering** ""B#  
J. T. Johnson, J. D. Ouellette, *The Ohio State University, United States*
- 558.4 **Beam Propagation over Rough Surfaces**""B#  
J.-F. Kiang, Z.-H. Lai, *National Taiwan University, Taiwan*
- 558.5 **Multiple Scale Rough Sea Surface Scatter Cross Sections Expressed as Weighted Sums of Two Cross Sections That Account for Physical Optics and Diffuse**""B#  
**Scattering by Capillary Waves.**  
E. Bahar, *University of Nebraska-Lincoln, United States*
- 558.6 **Comparison of Kirchhoff Approximation and the Stabilized Extended Boundary Condition Method for Specular Scattering from Layered Rough Surfaces** ""B#  
X. Duan, A. Tabatabaeejad, M. Moghaddam, *University of Southern California, United States*
- 558.7 **Coherent and Incoherent Components of the Scattering from an Object above a Rough Sea Surface: Asymptotic and Rigorous Approaches** ""B#  
G. Kubick , *DGA Information Superiority, France*; C. Bourlier, *IETR Laboratory, France*
- 558.8 **Backscattering and Emissivity in Microwave Remote Sensing of Soil Moisture at L-Band Based on 3-D Full Wave Simulations** ""B#  
S. Huang, L. Tsang, *University of Washington, United States*; J. Johnson, *Ohio State University, United States*; K.-S. Chen, *National Central University, Taiwan*
- 558.9 **Stochastic Boundary Method for Fast Computation of Three-Dimensional Electromagnetic Wave Scattering by Random Targets** ""B#  
J. S. Ochoa, A. C. Cangellaris, *University of Illinois at Urbana-Champaign, United States*
- 558.10 **Accelerated Extraction of Wireless Channel Statistics via Stochastic Collocation** ""B#  
A. C. M. Austin, C. D. Sarris, *University of Toronto, Canada*



## 559. Reconfigurable Arrays

Session Chairs: Pedram Mousavi, Christos Christodoulou

- 559.1 An Effective Framework for the Optimal Synthesis of Reconfigurable Array Antennas** \*\*\*\*\*&&)-  
A. F. Morabito, T. Isernia, L. Di Donato, *Università Mediterranea di Reggio Calabria, Italy*
- 559.2 Interference Rejection Using Frequency and Pattern Reconfigurable Antennas** \*\*\*\*&&%  
D. Rodrigo, J. Romeu, L. Jofre, *Universitat Politècnica de Catalunya, Spain*
- 559.3 Synthesis of Reconfigurable Planar Arrays for Monopulse Radars** \*\*\*\*\*&&+  
P. Rocca, A. De Matteis, A. Massa, *ELEDIA Research Center - University of Trento, Italy*; A. F. Morabito, T. Isernia, *LEMMA Research Group - University 'Mediterranea' of Reggio Calabria, Italy*
- 559.4 Wireless Control of Reconfigurable Antenna Arrays** \*\*\*\*&&+  
M. A. Iskander, D. Anagnostou, *South Dakota School of Mines & Technology, United States*
- 559.5 Instantaneous Expansion of a Collimated Beam to a Wider Pattern to Cope with System Emergencies** \*\*\*\*&&+  
T. Takano, K. Saegusa, *Nihon University, Japan*
- 559.6 Half-Phase-Gradient Partially Reflective Surface for a Reconfigurable Dual-Beam Scanning Cavity Antenna** \*\*\*\*&&-  
H. Moghadas<sup>1,2</sup>, M. Daneshmand<sup>1,2</sup>, P. Mousavi<sup>1,2</sup>  
<sup>1</sup>*University of Alberta, Canada*; <sup>2</sup>*TRLabs, Canada*
- 559.7 Detection of Failures in Switch Reconfigurable Antenna Arrays Using Embedded Sensing Lines** \*\*\*\*&&+  
M. Rivera<sup>1</sup>, J. Costantine<sup>2</sup>, Y. Tawk<sup>1</sup>, C. Christodoulou<sup>1</sup>  
<sup>1</sup>*University of New Mexico, United States*; <sup>2</sup>*California State University Fullerton, United States*
- 559.8 Orthogonally-Polarized Dual-Band MEMS-Tunable Double-Slotted Unit Cell for Reflectarray Applications** \*\*\*\*&&+  
H. Moghadas<sup>1,2</sup>, M. Daneshmand<sup>1,2</sup>, P. Mousavi<sup>1,2</sup>, M. R. Chaharmir<sup>3</sup>, J. Shaker<sup>3</sup>  
<sup>1</sup>*University of Alberta, Canada*; <sup>2</sup>*TRLabs, Canada*; <sup>3</sup>*Communication Research Center, Canada*
- 559.9 Wideband Unit-Cell Based on Liquid Crystals for Reconfigurable Reflectarray Antennas in F-Band** \*\*\*\*&&+  
G. Perez-Palomino, J. A. Encinar, M. Barba, *Polytechnic University of Madrid, Spain*; R. Dickie, P. Bain, R. Cahill, *Queen's University Belfast, United Kingdom*; R. Florencio, R. R. Boix, *University of Seville, Spain*
- 559.10 Reconfigurable Sectoral Antenna Using an Cylindrical Frequency Selective Surface** \*\*\*\*\*&&+  
L. Y. Wang, *University of Electronic Science and Technology of China, China*

## 560. Wideband Antennas and Arrays

Session Chairs: Dejan Filipovic, Wajih Elsallal

### 560.1 Top-Loaded UWB Monopole Antenna for Automotive Applications \*\*\*\*&&+-

D. N. Aloji, E. Ghafari, *Oakland University, United States*

### 560.2 Comparison of Pulse Distortion Properties for UWB Antennas \*\*\*B#

N. Turker Tokan, F. Tokan, A. Neto, *TU Delft, Netherlands*

### 560.3 Wideband Printed Rectangular Monopole Antenna for Circularly Polarization \*\*\*\*&&, %

T. Fujiimoto, K. Jono, *Nagasaki University, Japan*

### 560.4 Wideband Unidirectional Circularly Polarized Antenna for GPS/Galileo/GLONASS \*\*\*\*&&, \*

X. Bao, M. Ammann, *Dublin Institute of Technology, Ireland*

### 560.5 Base-Station of Modified Collinear Antenna for Correspondence to Multimedia Broadcasting \*\*\*B#

H. Kawakami, T. Haga, S. Kon, K. Hosoi, S. Okuno, M. Fujita, *Antenna giken Co.,Ltd., Japan*

### 560.6 Performance of Two Linearly-Polarized Broadband Horns on a Small Circular Platform \*\*\*\*&&, )

M. J. Radway, D. S. Filipovic, *University of Colorado at Boulder, United States*

### 560.7 A TEM Horn Antenna with Non-Uniform Expansion for Oil Well Monitoring \*\*\*\*&&, +

D. Oloumi<sup>1,2,3</sup>, M. I. Pettersson<sup>3</sup>, D. Elliott<sup>1</sup>, P. Mousavi<sup>1,2</sup>  
<sup>1</sup>University of Alberta, Canada; <sup>2</sup>TRlabs, Canada; <sup>3</sup>Blekinge Institute of Technology, Sweden

### 560.8 A Circularly Polarized Dual-Gridded Reflector Prototype with a Meander-Line Circular Polarizer \*\*\*\*&&, -

M.-A. Joyal<sup>1</sup>, M. Riel<sup>2</sup>, Y. Demers<sup>2</sup>, J.-J. Laurin<sup>1</sup>  
<sup>1</sup>Ecole Polytechnique de Montreal, Canada; <sup>2</sup>MDA Corporation, Canada

### 560.9 Aerodynamic Functionalization and Operation of a Radial Dipole Antenna \*\*\*\*B#

A. M. Couch, L. Dennison, K. R. Buchanan, N. Brennan, F. J. Drummond, J. D. Barrera, G. H. Huff, *Texas A&M University, United States*

### 560.10 Isolated Wideband Feeding Network Design with Stable Inter-Port Phase Difference \*\*\*B#

M. H. Rahmani, A. Pirhadi, *Shahid Beheshti University, Iran*

## 561. Multi-Frequency Antennas: Design and Analysis #2

Session Chairs: Greg Huff, Sean Hum

- 561.1 Dual Band Antenna Using the Substrate Integrated Waveguide as an Epsilon Negative Transmission Line** \*\*\*\*&- %  
D. E. Senior, Y. K. Yoon, *University of Florida, United States*
- 561.2 Circularly Polarized Triple Band Patch Antenna for Non-Linear Junction Detector** \*\*\*\*&- '  
K.-S. Min, J.-W. Kim, *Korea Maritime University, South Korea*
- 561.3 Multi-Band CPW- Fed Printed IFA** \*\*\*\*&- )  
D. M. N. Elsheakh, *Electronics Research Institute, Egypt*; A. M. E. Safwat, *Ain Shams University, Egypt*
- 561.4 Non-Uniform Bias Enhancement of a Varactor-Tuned FSS Used with a Low Profile 2.4 GHz Dipole Antenna** \*\*\*\*&- +  
D. Cure, T. Weller, *University of South Florida, United States*; F. A. Miranda, *NASA John H. Glenn Research, United States*
- 561.5 Switchable UWB/Multi-Narrowband Antenna for Cognitive Radio Applications** \*\*\*\*&- -  
E. Erfani, *Urmia University, Iran*; M. Niroo Jazi, T. A. Denidni, *INRS, Canada*
- 561.6 Multiband Ring Microstrip Antennas Fed by an L-Probe in a Single-Layer Substrate** \*\*\*\*& \$%  
H. Wakatsuki, Y. Kimura, M. Haneishi, *Saitama University, Japan*
- 561.7 Multiband Antenna at ISM Band Using Textile Material** \*\*\*\*& '\$'  
M. E. Jalil, M. K. Rahim, N. A. Samsuri, *University Technology Malaysia, Malaysia*
- 561.8 Dual-Frequency Dual-Sense Circular Polarization on Asymmetric Crossed-Dipole Antenna** \*\*\*\*& \$)  
C.-W. Hsu, S.-K. Lin, *Graduate Institute of Communication Engineering, National Taiwan University, Taiwan*; Y.-C. Lin, *Department of Electrical Engineering, National Taiwan University, Taiwan*
- 561.9 Fractal Two-Stage Triangular Monopole Truncated with Central Gaps with a Ground Plane with Quasi-Fractal Concentric Circular Slots** \*\*\*\*& \$+  
R. H. Barroso, H. Perez, D. Marcano, M. A. Diaz, *Simon Bolivar University, Venezuela*
- 561.10 Side Notched Two-Stage Parany Monopole Antenna** \*\*\*\*& \$-  
R. H. Barroso, M. A. Diaz, *Simon Bolivar University, Caracas, Venezuela*

## 562. Radar Imaging and Non-Intrusive Monitoring

Session Chairs: Jeffrey Nanzer, Lorenzo Lo Monte

- 562.1 Three-Dimensional Imaging of Targets Behind Multilayered Walls** \*\*\*\* & %  
W. Zhang<sup>1</sup>, A. Hoorfar<sup>2</sup>, Q. H. Liu<sup>1</sup>  
<sup>1</sup>Duke University, USA; <sup>2</sup>Villanova University, USA
- 562.2 Simulation of a Polarimetric Radar Imaging System Using Realistic Antenna Patterns** \*\*\*\* & %  
T. Dogaru, C. Le, US Army Research Laboratory, United States
- 562.3 Ground Surface Scattering and Clutter Suppression in Ground-Penetrating Radar Applications** \*\*\*\* & %  
D. H. Liao, U.S. Army Research Laboratory, United States
- 562.4 Compressed Sensing Through a Pipe** \*\*\*\* & %  
N. J. Whitelonis, H. Ling, The University of Texas at Austin, United States
- 562.5 In-Situ Surface Wave Launchers for Power Line Fault Detection** \*\*\*B#  
N. Alam, R. Bhuiyan, R. Dougal, M. Ali, University of South Carolina, United States
- 562.6 Numerical and Experimental Study on Statistical Stability of Ultrawideband Time-Reversal Imaging** \*\*\*\* & %  
A. E. Fouda, F. L. Teixeira, The Ohio State University, United States
- 562.7 Selective Ultrawideband Time-Reversal MUSIC Using a Time-Domain Gating Technique** \*\*\*\* & %  
H. Choi, Y. Ogawa, T. Nishimura, T. Ohgane, Hokkaido University, Japan
- 562.8 Range-Azimuth Tracking of Humans Using a Microstrip Leaky Wave Antenna** \*\*\*\* & %  
S.-T. Yang, H. Ling, The University of Texas at Austin, United States
- 562.9 Array-Based UWB FMCW Through-the-Wall Radar** \*\*\*\* & %  
N. Maaref, P. Millot, Onera, France
- 562.10 Sub-THz Through-Wall and Low Contrast Targets Passive Imaging** \*\*\*B#  
A. Vertiy<sup>1</sup>, S. Ozbek<sup>2</sup>, A. Paviyuchenko<sup>1</sup>  
<sup>1</sup>TUBITAK-MAM, Material Institute, Turkey; <sup>2</sup>TUBITAK-MAM, Turkey
- 562.11 Time-Reversal Imaging of Underground Targets Using Lateral Waves** \*\*\*\* & %  
S. M. Moghadasi, M. Dehmollaijan, University of Tehran, Iran

### 563. Electromagnetic Theory

Session Chairs: Guido Lombardi, Weng Cho Chew

- 563.1 The Reactive Energy of Transient EM Fields** & &  
G. Kaiser, *Center for Signals and Waves, United States*
- 563.2 Antenna Reciprocity and the Theory of Electromagnetic Time Reversal** & ' %  
W. M. Dyab, T. K. Sarkar, *Syracuse University, United States*; M. Salazar-Palma, *Universidad Carlos III de Madrid, Spain*
- 563.3 Derivation of the Fundamental Evolution Equations of Electromagnetic Radiation in the near-Field Zone** B#  
S. M. Mikki, Y. M. M. Antar, *Royal Military College of Canada, Canada*
- 563.4 Wave Operators and Green's Functions on Random Graphs** & ' '  
C. Xing, V. Jandhyala, *University of Washington, United States*
- 563.5 Fluid-Dynamic Formulation of Maxwell's Equations** & ' )  
C. A. Gonano, R. E. Zich, *POLITECNICO DI MILANO, Italy*
- 563.6 The Casimir Force for Arbitrary Three-Dimensional Objects with Low Frequency Methods** & ' +  
P. R. Atkins<sup>1,2</sup>, Q. I. Dai<sup>2</sup>, W. E. I. Sha<sup>2</sup>, W. C. Chew<sup>1,2</sup>  
<sup>1</sup>*University of Illinois at Urbana-Champaign, United States*; <sup>2</sup>*University of Hong Kong, Hong Kong*
- 563.7 Evaluation of Certain Integrals Using Stochastic Formulation of the Lossy Wave Equation** & ' -  
R. Janaswamy, *University of Massachusetts, United States*
- 563.8 Theory of Near Field for Antennas Embedded in Complex Environments** B#  
S. M. Mikki, Y. M. M. Antar, *Royal Military College of Canada, Canada*
- 563.9 Relational Analysis of the Fundamental Operational Modes of General Electromagnetic Systems: The Antenna Current Greens Function Formalism as a** B#  
**Paradigm**  
S. M. Mikki, Y. M. M. Antar, *Royal Military College of Canada, Canada*
- 563.10 Pulse Transmission into a Lorentz Half-Space** B#  
N. Cartwright, *SUNY New Paltz, United States*
- 563.11 More Unusual Properties of the Microwave Vortex** & ' (%  
S. D. Stearns, *Northrop Grumman Corporation, United States*

## 564. Propagation effects

Session Chairs: Robert Marshall, Katherine Horgan

- 564.1 The Influence of Lateral Boundary Conditions on Numerical Weather Prediction Modeling of Radio Refractivity Fields During a Sea Breeze** "B#  
R. E. Marshall, K. Horgan, I. Renta, *NSWCDC, United States*
- 564.2 Measuring the Complex Permittivity of Grain by the Free-Space Technique with a Thru-Reflect-Match Calibration Procedure** "B#  
J. Roelvink, S. Trabelsi, *United States Department of Agriculture, United States*
- 564.3 Extensions to the Quasi-Static Expressions for the Line Parameters of Co-Planar Waveguide with Relatively Thick Conductors** "B#  
J. Roelvink, S. Trabelsi, *United States Department of Agriculture, United States*
- 564.4 High Fidelity Peer-to-Peer UWB Propagation Measurements in High Multipath Environments Using the PulsON 400 UWB Transceiver** "B#  
A. M. Petroff, B. Dewberry, *Time Domain, United States*
- 564.5 Empirical Adjustment of the Selected Propagation Models for Application in the Peculiar Environment of the Container Terminal** "B#  
S. J. Ambroziak, *Gdansk University of Technology, Poland*
- 564.6 Over Water Radar Propagation Prediction from Mesoscale Meteorological Models Blended with Surface Layer Models** "B#  
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