2016 URSI International Symposium on Electromagnetic Theory (EMTS 2016)

Espoo, Finland 14 – 18 August 2016



IEEE Catalog Number: ISBN:

CFP1611I-POD 978-1-5090-2503-9

Copyright © 2016 by the Institute of Electrical and Electronics Engineers, Inc All Rights Reserved

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***This publication is a representation of what appears in the IEEE Digital Libraries. Some format issues inherent in the e-media version may also appear in this print version.

 IEEE Catalog Number:
 CFP1611I-POD

 ISBN (Print-On-Demand):
 978-1-5090-2503-9

 ISBN (Online):
 978-1-5090-2502-2

Additional Copies of This Publication Are Available From:

Curran Associates, Inc 57 Morehouse Lane Red Hook, NY 12571 USA Phone: (845) 758-0400

Fax: (845) 758-2633 E-mail: curran@proceedir

E-mail: curran@proceedings.com Web: www.proceedings.com



2016 URSI International Symposium on Electromagnetic Theory (EMTS)

Plenary Lecture 1

• Generally Covariant Maxwell Theory for Media with a Local Response: Progress since 2000

Friedrich W. Hehl (University of Cologne & University of Missouri-Columbia, Germany), Yakov Itin (Jerusalem College of Technology, Israel), Yuri Obukhov (Russian Academy of Sciences, Russia)1

Inverse Scattering and Imaging I

• Experimental Validation of Radio Frequency Tomography for an Inhomogeneous Medium

Tadahiro Negishi (University of Illinois at Chicago, USA), Yangqing Liu (University of Illinois at Chicago, USA), Vittorio Picco (University of Illinois at Chicago, USA), Danilo Erricolo (University of Illinois at Chicago, USA), Gianluca Gennarelli (IREA-CNR, Italy), Francesco Soldovieri (CNR, Italy), Piergiorgio L.E. Uslenghi (University of Illinois at Chicago, USA)5

• A Combined Approach for Shape Reconstruction from Under-sampled Data

Angela Dell'Aversano (Seconda Università degli Studi di Napoli, Italy), Giovanni Leone (Seconda Università degli Studi di Napoli, Italy), Raffaele Solimene (Second University of Naples, Italy)9

 Experimental Analysis of Dielectric Structures with a Two-Step Electromagnetic Imaging Method

Alessandro Fedeli (University of Genoa, Italy), Matteo Pastorino (University of Genoa, Italy), Andrea Randazzo (University of Genoa, Italy), Samuel Poretti (University of Applied Sciences of Southern Switzerland, Switzerland), Ricardo D. Monleone (University of Applied Sciences of Southern Switzerland, Switzerland), Andrea Salvadè (University of Applied Sciences of Southern Switzerland, Switzerland)13

• Multi-Resolution Approaches for GPR-Data Inversion

Marco Salucci (ELEDIA Research Center, Italy), Lorenza Tenuti (ELEDIA Research Center, University of Trento, Italy), Andrea Randazzo (University of Genoa, Italy), Paolo Rocca (University of Trento, Italy)16

Novel Mathematical Methods in Electromagnetics I

 Nonlinear Guided Electromagnetic Waves in a Layer: Revisiting an Old Problem and New Results

Dmitry Valovik (Penza State University, Russia)19

• Ellipticity of the Electric Field Integral Equation in a Problem of Diffraction by a Partially Shielded Body

Yury Smirnov (Head of Department at Penza State University, Russia), Aleksei Tsupak (Penza State University, Russia), Dmitry Valovik (Penza State University, Russia)23

 Analysis of the TM Plane Wave Scattering from a Dielectric Grating by the Perturbation Method

Akira Komiyama (Osaka Electro-Communication University, Japan)27

• Electromagnetic Time Reversal: What does it Imply?

Tapan Sarkar (Syracuse University, USA), Magdalena Salazar-Palma (Universidad Carlos III de Madrid, Spain)30

Metamaterials and Metasurfaces I

Narrow-Band and Dual-Band Metamaterial Absorbers in the THz Regime

Maria Denise Astorino (University of Rome "La Sapienza", Italy), Fabrizio Frezza (Sapienza University of Rome, Italy), Nicola Tedeschi (Sapienza University of Rome, Italy)34

• Exceptional Points of Degeneracy in Coupled-Mode Periodic Structures

Mohamed A. K. Othman (University of California, Irvine, USA), Farshad Yazdi (University of California, Irvine, USA), Filippo Capolino (University of California, Irvine, USA)38

• Dual Topological Transition in Polaritonic Wire Media and Its Radiative Implications

Mohammad Sajjad Mirmoosa (Aalto University, Finland), Sergei Kosulnikov (ITMO University, Russia), Constantin Simovski (Aalto University, Finland)42

 Analysis of Corrugated Waveguides using a Periodic-Asymptotic Boundary Conditions Approach

Tarek Mealy (Cairo University, Egypt), Islam Eshrah (Cairo University, Egypt)45

High-Frequency and Beam Methods I

• Diverging and Converging Beam Diffraction by Wedges and Cones

Michael Katsav (Tel Aviv University, Israel), Ehud Heyman (Tel Aviv University, Israel), Hendrik Brüns (Christian-Albrechts-Universität zu Kiel, Germany), Ludger Klinkenbusch (Christian-Albrechts-Universitaet zu Kiel, Germany)49

• A Uniform Geometrical Theory of Diffraction for the Scattering from Quasi Periodic Finite Planar Arrays Excited by a Nearby Antenna

Hsi-Tseng Chou (National Taiwan University, Taiwan), Prabbakar Pathak (The Ohio State University, USA)53

 Gaussian Beams for Quasi-Optical-Systems: Modeling Dichroic Surfaces near a Zero of Transmission or Reflection

Alexandre Chabory (ENAC, France), Kevin Elis (CNES, France), Jerome Sokoloff (Université de Toulouse, UPS, INP & CNRS, France)57

• Evolutionary Algorithms Applications for Inverse Scattering using Gaussian Beams

Timor Melamed (Ben-Gurion University of the Negev, Israel), Gadi Lahav (Ben-Gurion University of the Negev, Israel)60

Solutions to Canonical Problems

• Diffraction by an Impedance Cone and Weyl-Van der Pol Phenomenon in Acoustics and Electromagnetism

Mikhail A. Lyalinov (St. Petersburg State University, Russia)63

- High-Frequency Asymptotics for Diffraction by a Strongly Elongated Canonical Object
 - Ivan Andronov (University of St. Petersburg, Russia), Raj Mittra (Pennsylvania State University, USA)67
- Electromagnetic Scattering by an Array of Parallel Metallic Half-Planes Perpendicularly Truncated by a Metal Plane

Piergiorgio L.E. Uslenghi (University of Illinois at Chicago, USA), Vito Daniele (Politecnico di Torino, Italy), Marco Poort (University of Illinois at Chicago, USA)69

• Analysis of Coupled Angular Regions in Spectral Domain

Vito Daniele (Polythechnic of Turin, Italy), Guido Lombardi (Politecnico di Torino & ISMB, Italy), Rodolfo Zich (Politecnico di Torino & ISMB, Italy)73

Backscattering from Electrically Large Low-Absorption Spheres

Andrey Osipov (German Aerospace Center (DLR), Germany)76

• Porcupic Concentrators and Bulbic Cloaks in Planar Configuration

Tommi Rimpiläinen (Aalto University, Finland), Henrik Wallén (Aalto University, Finland), Ari Sihvola (Aalto University, Finland)80

Novel Mathematical Methods in Electromagnetics II

• Plane Wave Propagation in Extreme Magnetoelectric (EME) Medium

Ismo V Lindell (Aalto University, School of Electrical Engineering, Finland), Ari Sihvola (Aalto University, Finland), Alberto Favaro (Imperial College London, United Kingdom)84

General Approach to the Synthesis of Perfectly Refractive Metasurfaces

Viktar Asadchy (Aalto University, Finland), Mohammad Albooyeh (Aalto University, Finland), Svetlana Tcvetkova (Aalto University, Finland), Younes Ra'di (Aalto University, Finland), Sergei Tretyakov (Aalto University, Finland)86

• The Techniques for Modeling the Effects of High-Frequency Wave Field Strong Scintillations on the Transionospheric Paths of Propagation

Nikolay Zernov (University of St. Petersburg, Russia), Vadim Gherm (University of St. Petersburg, Russia)90

• Guaranteed Estimation of Solutions to Transmission Problems for Helmholtz Equation with Uncertain Data From Their Indirect Noisy Observations

Yury Shestopalov (University of Gävle, Sweden), Yury Podlipenko (National Taras Shevchenko University of Kyiv, Ukraine)93

 Accurate Boundary Extraction and Dielectric Constant Estimation Method for UWB Internal Imaging Radar

Shouhei Kidera (University of Electro-Communications, Japan)96

• Numerical Technique for Wireless Communication System with High Speed Movement

Shafrida Sahrani (Universiti Malaysia Sarawak, Malaysia), Kuroda Michiko (Tokyo University of Technology, Japan)100

Innovative and Diverse Applications of Antennas

• New Antennas for Space Applications

Enrica Martini (University of Siena, Italy), Francesco Caminita (University of Siena, Italy), Marco Faenzi (University of Siena, Italy), Gabriele Minatti (University of Siena, Italy), Stefano Maci (University of Siena, Italy)103

• Fourier Iteration Techniques in Antenna Measurement Applications Using Limited Data

Sembiam R. Rengarajan (California State University, USA), Ronald Pogorzelski (California State University, USA)107

On-body Antennas: Design Considerations and Challenges

Syed Muzahir Abbas (Macquarie University, Australia), Karu Esselle (Macquarie University, Australia), Ladislau Matekovits (Politecnico di Torino, Italy), Muhammad Rizwan (Tampere University of Technology, Finland), Leena Ukkonen (Tampere University of Technology, Finland)109

 Demonstration of mmWave Systems and Networks for the HetNet in 5G Mobile Communication

Makoto Ando (Tokyo Institute of Technology, Japan), Miao Zhang (Xiamen University, P.R. China), Jiro Hirokawa (Tokyo Institute of Technology, Japan), Kei Sakaguchi (Tokyo Institute of Technology & Fraunhofer HHI, Japan), Toru Taniguchi (Japan Radio Co., Ltd., Japan), Makoto Noda (Sony Corporation, Japan), Akira Yamaguchi (KDDI R&D Laboratories Inc., Japan)111

• Pulsed Helical Antenna for High-Power Applications

Dave Giri (PRO-TECH & University of New Mexico, USA)114

• Dual-Frequency Reconfigurable Patch Antenna with Thermal Switches for Temperature Monitoring

Kaiming Dong (Tsinghua University, P.R. China), Fan Yang (Tsinghua University, P.R. China), Shenheng Xu (Tsinghua University, P.R. China), Maokun Li (Tsinghua University, P.R. China)118

Numerical Time Domain Methods

• An Application of ParaExp to Electromagnetic Wave Problems

Melina Merkel (Technische Universität Darmstadt, Germany), Innocent Niyonzima (Technische Universität Darmstadt, Germany), Sebastian Schöps (Technische Universität Darmstadt, Germany)121

Consideration on Implementation of Dispersive Materials into FDTD Dataflow Machine

Hideki Kawaguchi (Muroran Institute of Technology, Japan)125

- High-Quality Discretizations for Microwave Simulations
 - Jukka Räbinä (University of Jyväskylä, Finland), Sanna Mönkölä (University of Jyväskylä, Finland), Tuomo Rossi (University of Jyväskylä, Finland)129
- A Locally Implicit FDTD Scheme with Relaxed Time Step Constraint for Non-Uniform Meshes
 - Stefan Kirsch (Technische Universität Berlin, Germany), Rolf Schuhmann (Technische Universität Berlin, Germany)133
- Time-Domain Simulation of Electromagnetic Fields Based on Frequency-Domain Reduced-Order Models Including Debye Materials

Rolf Baltes (Saarland University, Germany), Ortwin Farle (Saarland University, Germany), Romanus Dyczij-Edlinger (Saarland University, Germany)137

Inverse Scattering and Imaging II

· Alphabet CS for Inverse Scattering

Nicola Anselmi (ELEDIA Research Center, Italy), Lorenzo Poli (ELEDIA Research Center, University of Trento, Italy), Andrea Randazzo (University of Genoa, Italy), Giacomo Oliveri (University of Trento, Italy)141

• Solving the PEC Inverse Scattering Problem with A Linear Model

Shilong Sun (Delft University of Technology, The Netherlands), Bert Jan Kooij (Delft University of Technology, The Netherlands), Alexander Yarovoy (TU Delft, The Netherlands)144

• A Three-Dimensional Microwave Imaging Approach based on a Lp Banach Space Inversion Procedure

Claudio Estatico (University of Genoa, Italy), Matteo Pastorino (University of Genoa, Italy), Andrea Randazzo (University of Genoa, Italy), Emanuele Tavanti (University of Genoa, Italy)148

• Direct Sampling Method for Monostatic Radar Imaging

Huseyin Bektas (Istanbul Technical University, Turkey), Ozgur Ozdemir (Istanbul Technical University, Turkey)152

• Transmission of a Single Rectangular Hole Filled with Uniaxial Anisotropy Material

Hengxin Ruan (Peking University, P.R. China), Lianlin Li (Peking University, P.R. China)155

Novel Mathematical Methods in Electromagnetics III

• Electromagnetic Scattering by a Cylindrically-capped Metallic Wedge Perpendicularly Truncated by a Metal Plane

Piergiorgio L.E. Uslenghi (University of Illinois at Chicago, USA)159

• Theorem for the T1(L,n) Numbers and its Application in the Electromagnetic Theory

Georgi Nikolov Georgiev (University of Veliko Tirnovo "St. St. Cyril and Methodius", Bulgaria), Mariana Nikolova Georgieva-Grosse (Consulting and Researcher in Physics and Computer Sciences, Germany)162

• An Introduction of the Generalized Wiener-Hopf Technique for Coupled Angular and Planar Regions

Vito Daniele (Polythechnic of Turin, Italy), Guido Lombardi (Politecnico di Torino & ISMB, Italy), Rodolfo Zich (Politecnico di Torino & ISMB, Italy)166

• Propagating Beam Frame: A Novel Formulation for Time-Dependent Radiation and Scattering

Ram Tuvi (Tel Aviv University, Israel), Ehud Heyman (Tel Aviv University, Israel), Timor Melamed (Ben-Gurion University of the Negev, Israel)169

• Diffraction of a Creeping Wave by the Edge of a Strongly Elongated Spheroid Truncated by a Plane Perpendicular to its Axis

Frederic Molinet (SARL MOTHESIM, France)173

Plasmonics and Nanoelectromagnetics

• Enhanced non-reciprocity induced by synergy of Dark-Modes and Faraday rotation

Maayan Meir (Tel-Aviv University, Israel), Yarden Mazor (Tel Aviv University, Israel), Ben Zion Steinberg (Tel Aviv University, Israel)177

Graphene-MoS2 Heterostructure Based Surface Plasmon Resonance Biosensor

Sinan Aksimsek (Aalto University, Finland), Zhipei Sun (Aalto University, Finland)180

• Low-Temperature Perspective of Microgap Thermophotovoltaics

Constantin Simovski (Aalto University, Finland), Mohammad Sajjad Mirmoosa (Aalto University, Finland)182

Quantum Superradiant and Subradiant Modes in Plasmonic Nanochannels

Christos Argyropoulos (University of Nebraska-Lincoln, USA), Ying Li (University of Nebraska-Lincoln, USA)185

• Mantle Cloaks for Elliptical Cylinders Excited by an Electric Line Source

Piotr M. Kamiński (Technical University of Denmark, Denmark), Alexander Yakovlev (The University of Mississippi, USA), Samel Arslanagić (Technical University of Denmark, Denmark)189

Present and Future Challenges in Computational Electromagnetics

Fast computational techniques for modeling RFX-mod fusion devices on hybrid CPU-GPU architectures

Domenico Abate (Consorzio RFX, Italy), Bruno Carpentieri (Nottingham Trent University, United Kingdom), Andrea Chiariello (Seconda Università di Napoli, Italy), Giuseppe Marchiori (Consorzio RFX, Italy), Nicolò Marconato (Consorzio RFX, Italy), Stefano Mastrostefano (Università di Cassino e del Lazio Meridionale, Italy), Guglielmo Rubinacci (Università di Napoli Federico II, Italy), Salvatore Ventre (Università di Cassino e del Lazio Meridionale, Italy), Fabio Villone (Università di Cassino e del Lazio Meridionale, Italy)193

• A Novel Beam-Steering Nonlinear Nanoantenna with Surface Plasmon Resonance

Xiaoyan Xiong (The University of Hong Kong, Hong Kong), Lijun Jiang (University of Hong Kong, Hong Kong), Wei E. I. Sha (The University of Hong Kong, Hong Kong), Yat Hei Lo (The University of Hong Kong, Hong Kong), Weng Cho Chew (University of Illinois at Urbana-Champaign, USA)197

• Present and Future Challenges in Preconditioning Integral Equations for Electromagnetics

Francesco Andriulli (Ecole Nationale Superieure des Telecomunications de Bretagne, France)201

 On Error Controlled Computing of the Near Electromagnetic Fields in the Shade Regions of Electrically Large 3D Objects

Mohammad Shafieipour (University of Manitoba, Canada), Jonatan Aronsson (CEMWorks Inc., Canada), Vladimir Okhmatovski (University of Manitoba & University of Manitoba, Canada)203

• Benchmarking to Close the Credibility Gap: A Computational BioEM Benchmark Suite

Jackson Massey (The University of Texas at Austin, USA), Chang Liu (The University of Texas at Austin, USA), Ali Yilmaz (The University of Texas at Austin, USA, USA)207

Electromagnetic Theory I

- Controlling Pulsed EM Scattering of Receiving Antennas: The One-Port Case
 Martin Štumpf (Brno University of Technology, Czech Republic)..... 211
- Magnetoelectric Coupling without Electric and Magnetic Response?

Mohammad Albooyeh (Aalto University, Finland), Seyedmohammad Hashemi (Shahid Rajaee Teacher Training University, Iran), Viktar Asadchy (Aalto University, Finland), Rasul Alaee (Karlsruhe Institute of Technology, Germany), Mohammad Yazdi (Iran University of Science and Technology, Iran), Mohammad Sajjad Mirmoosa (Aalto University, Finland), Carsten Rockstuhl (Karlsruhe Institute of Technology, Germany), Constantin Simovski (Aalto University, Finland), Sergei Tretyakov (Aalto University, Finland)215

• A multi-resolution 4-D FFT approach to parametric boundary integral equations for helical structures

Sven Nordebo (Linnaeus University, Sweden), Yevhen Ivanenko (Linnaeus University, Sweden), Martin Štumpf (Brno University of Technology, Czech Republic)218

• Nonnegative Energy for Dipolar Continua

Arthur D Yaghjian (Research Consultant, USA)222

• State-space models for stored energy and Q-factors

Mats Gustafsson (Lund University, Sweden)226

• Invariant Dispersion Relation for Anisotropic Media

Yakov Itin (Jerusalem College of Technology, Israel)229

Mathematical Modelling of EM Problems I

• Physical bounds and automatic design of antennas above ground planes

Casimir Ehrenborg (Lund University, Sweden), Mats Gustafsson (Lund University, Sweden)233

- The Effect of Rounding Vertices on the Diffraction from Polygons and Other Scatterers
 - Paul Smith (Macquarie University, Australia), Audrey Markowskei (Macquarie University, Australia)236
- A series representation for the intermediate-field transmittance between apertures

Christophe Craeye (Université Catholique de Louvain, Belgium)240

• Convergence of Fictitious Sources Methods Applied to Three-Dimensional Scattering Problems

Nikolaos L. Tsitsas (Aristotle University of Thessaloniki, Greece), Gerassimos Palaiopanos (National Technical University of Athens, Greece), George Fikioris (National Technical University of Athens, Greece)243

Numerical study of multilayered nonlinear inhomogeneous waveguides in the case of TM polarization

Eugene Smolkin (University of Gävle, Sweden), Yury Shestopalov (University of Gävle, Sweden)247

• Dynamics of Interstellar Dust Particles in Electromagnetic Radiation Fields

Joonas Herranen (University of Helsinki, Finland), Johannes Markkanen (University of Helsinki, Finland), Karri Muinonen (University of Helsinki & Finnish Geospatial Research Institute FGI, Finland)251

Random Media and Rough Surfaces I

• Disorder-induced Light Localisation: from Random to Artificial

Hongwei Yin (National University of Defense Technology, P.R. China), Adenowo Gbadebo (Aston Institute of Photonic Technologies, Aston University, United Kingdom), Elena Turitsyna (Aston Institute of Photonic Technologies, Aston University, United Kingdom)255

• Disorder-induced mutation of quasi-normal modes in 1D open systems

Yury Bliokh (Technion-Israel Institute of Technology, Israel), Valentin Freilikher (Bar-Ilan University, Israel), Franco Nori (Center for Emergent Matter Science (CEMS), RIKEN, Japan)258

In situ search for 3D Anderson localization of ultrasound in resonant emulsions

Benoit Tallon (Université de Bordeaux, France), Thomas Brunet (Université de Bordeaux, France), John Page (University of Manitoba, Canada)262

Particle-like wave packets in complex scattering systems

Benoît Gerardin (Institut Langevin, France), Jerome Laurent (Institut Langevin, France), Philipp Ambichl (Vienna University of Technology, Austria), Claire Prada (Institut Langevin, France), Stefan Rotter (Vienna University of Technology, Austria), Alexandre Aubry (Institut Langevin & ESPCI ParisTech, CNRS, France)265

• Invariant Imbedding Theory of Wave Propagation in Stratified Anisotropic Media

Kihong Kim (Ajou University, Korea)269

• Spatio-temporal imaging of light transport in strongly scattering media

Amaury Badon (Institut Langevin, France), Dayan Li (Institut Langevin, France), Geoffroy Lerosey (Institut Langevin - ESPCI ParisTech and CNRS, France), Albert Boccara (Institut Langevin, France), Mathias Fink (Institut Langevin, France), Alexandre Aubry (Institut Langevin & ESPCI ParisTech, CNRS, France)272

Fast Integral Equation Solvers for Radiation, Scattering, and Field Transformation Problems

- Trigonometric Polynomial Expansion and Multilevel Fast Multipole Algorithm
 Seppo Järvenpää (Aalto University, Finland)276
- Fast Inverse Equivalent Current Solutions with Surface Currents in Complex Space

Thomas F. Eibert (Technische Universität München, Germany), Dario Vojvodic (Technical University of Munich, Germany)280

• Broadband Multilevel Fast Multipole Algorithm For Large-Scale Problems With Nonuniform Discretizations

Ozgur Ergul (Middle East Technical University, Turkey), Bariscan Karaosmanoglu (Middle East Technical University, Turkey), Manouchehr Takrimi (Bilkent University, Turkey), Vakur Erturk (Bilkent University, Turkey)284

 Fast Computation of Modified Green's Function for Generalized Source Integral Equation Solvers

Arkadi Sharshevsky (Tel Aviv University, Israel), Yaniv Brick (The University of Texas at Austin, USA), Amir Boag (Tel Aviv University, Israel)288

Theory of Characteristic Modes based on Potential-Based Integral Equation

Qin Liu (The University of Hong Kong, Hong Kong), Sheng Sun (University of Electronic Science and Technology of China, P.R. China), Qi Dai (University of Illinois at Urbana-Champaign, USA), Weng Cho Chew (University of Illinois at Urbana-Champaign, USA), Lijun Jiang (The University of Hong Kong, Hong Kong)292

• MLFMA, PO and Hybrid MLFMA-PO for Impedance Boundary Condition

Pasi Ylä-Oijala (Aalto University, Finland), Pasi Koivumäki (Aalto University, Finland), Seppo Järvenpää (Aalto University, Finland)296

History of Electromagnetics

- Maxwell's Approach to Deriving the EM Field Equations in Dipolar Continua
 - Arthur D Yaghjian (Research Consultant, USA)300
- Oliver Heaviside, Eccentric Electrician and Master of Maxwell's Theory
 - Ismo V Lindell (Aalto University, School of Electrical Engineering, Finland)304
- On the Metamorphoses of Maxwell's Equations During the Last 150 Years spotlights on the history of classical electrodynamics —

Alberto Favaro (Imperial College London, United Kingdom), Friedrich W. Hehl (University of Cologne & University of Missouri-Columbia, Germany), Jonathan Lux (University of Cologne, Germany)306

Mathematical Modelling of EM Problems II

- Study of Field Misalignment in a Cavity Used for Atomic Clock Applications
 - Anton E. Ivanov (EPFL, Switzerland), Christoph Affolderbach (Université de Neuchâtel, Switzerland), Gaetano Mileti (Université de Neuchâtel, Switzerland), Anja K. Skrivervik (EPFL, Switzerland)308
- Error model for Contour-FFT evaluation of the free-space on-plane Green's function
 - Quentin Gueuning (Université Catholique de Louvain, Belgium), Simon Hubert (Université Catholique de Louvain & ICTEAM Institute, Belgium), Christophe Craeye (Université Catholique de Louvain, Belgium), Claude Oestges (Université Catholique de Louvain, Belgium)312
- Scattering Analysis of Asymmetric Metamaterial Resonators by the Riemann-Hilbert Approach
 - Piotr M. Kamiński (Technical University of Denmark, Denmark), Richard W. Ziolkowski (University of Arizona, USA), Samel Arslanagić (Technical University of Denmark, Denmark)315

Novel RF Systems

- Ultra-wideband Transceiver with High Interference Mitigation for Secure High Data Rate Communication
 - Elias A. Alwan (The Ohio State University & The Electroscience Lab, USA), Dimitrios Siafarikas (The Ohio State University, USA), John L. Volakis (Ohio State University, USA)319

• Advanced SARFID: a localization technique for UHF RFID tags

Alice Buffi (University of Pisa, Italy), Paolo Nepa (University of Pisa, Italy)322

• Software Controlled Antennas for Cognitive Radio

Youssef Tawk (The University of New Mexico & Notre Dame University Louaize, USA), Joseph Costantine (American University of Beirut & University of New Mexico, Lebanon), Silvio Barbin (University of São Paulo, Brazil), Christos Christodoulou (The University of New Mexico, USA)326

High-Frequency and Beam Methods II

 Physical Optics versus Gaussian Beam Shooting for Shadow Field Analysis in High Frequency Regime

Christine Letrou (SAMOVAR, Télécom SudParis, CNRS, Université Paris-Saclay, Evry, France, France), Igor Gershenzon (Tel Aviv University, Israel), Yaniv Brick (Institute for Computational Engineering and Sciences, The University of Texas at Austin, Austin, Texas, USA, USA), Amir Boag (Tel Aviv University, Israel)328

- Ray Series for Electromagnetic Waves in Static Heterogeneous Bianisotropic Dielectric Media
 Ludek Klimeš (Charles University in Prague, Czech Republic)331
- Some New Techniques for Evaluating Sommerfeld Integrals for Microstrip Antenna Analysis

Deb Chatterjee (University of Missouri Kansas City, USA), Sadasiva Rao (Naval Research Laboratory, USA), Michael Kluskens (Naval Research Laboratory, USA)335

Electromagnetic Theory II

• Contact-free Measurement of Currents in Two-dimensional Parallel Conductors Using the Green Identity Approach

Fatemeh Ghasemifard (KTH Royal Institute of Technology, Sweden), Martin Norgren (KTH Royal Institute of Technology, Sweden)338

• Comparison of Potential-Based Analysis Methods for Simple and Complex Media

Michael J Havrilla (Air Force Institute of Technology, USA)341

• Transverse Spin and Momentum in Structured Light: Quantum Spin Hall Effect and Transverse Optical Force

Konstantin Bliokh (CEMS, RIKEN & RSPhysE, The Australian National University, Japan)345

• Scattering of lower order modes in a parallel plate waveguide loaded with a slightly deformed layer of conducting strips

Martin Norgren (KTH Royal Institute of Technology, Sweden), Mariana Dalarsson (KTH Royal Institute of Technology, Sweden), Fatemeh Ghasemifard (KTH Royal Institute of Technology, Sweden)349

• Tensor permittivity and permeability reconstruction of a one-sectional diaphragm in a rectangular waveguide

Ekaterina Derevyanchuk (Penza State University, Russia), Yury Smirnov (Head of Department at Penza State University, Russia), Yury Shestopalov (University of Gävle, Sweden)353

Transformation Approach to Electromagnetism I

• Dispersion in spacetime transformation optics

Paul Kinsler (Cockcroft Institute, United Kingdom), Jonathan Gratus (Cockcroft Institute, United Kingdom), Martin McCall (Imperial College London, United Kingdom), Robert Thompson (University of Otago, New Zealand)356

Microwave devices for controlling surface waves

Luigi La Spada (Queen Mary University of London, United Kingdom), Yang Hao (Queen Mary University, United Kingdom)359

· Transformation optics with pseudomagnetic field

Fu Liu (University of Birmingham, United Kingdom), Simon Horsley (University of Exeter, United Kingdom), Jensen Li (University of Birmingham, United Kingdom)361

• New methods for designing invisible and reflectionless materials

Simon Horsley (University of Exeter, United Kingdom), Christopher King (University of Exeter, United Kingdom), Thomas Philbin (University of Exeter, United Kingdom)364

Random Media and Rough Surfaces II

• Beam Summation Theory for Waves in Fluctuating Media. Part I: The Beam-To-Beam Scattering Matrix

Matan Leibovich (Stanford University, USA), Ehud Heyman (Tel Aviv University, Israel)367

• Beam Summation Theory for Waves in Fluctuating Media. Part II: Stochastic Fields

Matan Leibovich (Stanford University, USA), Ehud Heyman (Tel Aviv University, Israel)371

• Edge reflection-driven transition in transmission eigenvalue statistics in random media

Chushun Tian (Institute for Advanced Study, Tsinghua University, P.R. China), Liyi Zhao (Tsinghua University, P.R. China), Xiaojun Cheng (The City University of New York, USA), Yury Bliokh (Technion-Israel Institute of Technology, Israel), Valentin Freilikher (Bar-Ilan University, Israel), Azriel Genack (The City University of New York, USA)375

• Neoclassical field theory for electromagneticly interacting elementary charges

Alexander Figotin (University of California at Irvine, USA), Anatoli Babin (University of California at Irvine, USA)379

Propagation of Waves in Perturbed Periodic Waveguides

Yuri Godin (University of North Carolina at Charlotte, USA)382

Multiple Scattering

• Capabilities of the Discrete Dipole Approximation for Large Particle Systems

Maxim A. Yurkin (Voevodsky Institute of Chemical Kinetics and Combustion SB RAS & Novosibirsk State University, Russia)386

- Discrete Dipole Model of Scattering by Discretely Inhomogeneous Plane Parallel Media
 - Daniel Mackowski (Auburn University, USA), Bahareh Ramezan Pour (Auburn University, USA)390
- T-matrix Simulations of a Collection of Scatterers for Validation of Numerical Electromagnetic Solvers

Torleif Martin (Lund University, Sweden)393

• Validation of Radiative Transfer and Coherent Backscattering for Discrete Random Media

Timo Väisänen (University of Helsinki, Finland), Antti Penttilä (University of Helsinki, Finland), Johannes Markkanen (University of Helsinki, Finland), Karri Muinonen (University of Helsinki & Finnish Geospatial Research Institute FGI, Finland)396

• Multiple Scattering by Dense Random Media: Numerical Solution

Karri Muinonen (University of Helsinki & Finnish Geospatial Research Institute FGI, Finland), Johannes Markkanen (University of Helsinki, Finland), Antti Penttilä (University of Helsinki, Finland), Timo Väisänen (University of Helsinki, Finland), Jouni Peltoniemi (University of Helsinki, Finland)400

Scattering and Diffraction I

 Bistatic Free-Space Measurements of Magneto-Dielectric Materials and Comparison with Numericals Models

Xavier Faget (Aix Marseille Universite, France), Nicolas Mallejac (CEA, France), Amélie Litman (Institut Fresnel UMR CNRS, France)404

• Directive Scattering by a Line Source Coupled to Infinite or Finite Electromagnetic Band-Gap Media

Silvio Ceccuzzi (Roma Tre University, Italy), Vakhtang Jandieri (General and Theoretical Electrical Engineering (ATE), Faculty of Engineering, Germany), Paolo Baccarelli (Sapienza University of Rome, Italy), Cristina Ponti (Roma Tre University, Italy), Giuseppe Schettini ("Roma Tre" University, Italy)407

• The Energy Flow Structure During the Scattering of a Plane Electromagnetic Wave by a Magnetized Plasma Cylinder at Volume Plasmon Resonances

Alexander Ivoninsky (University of Nizhny Novgorod, Russia), Alexander Kudrin (University of Nizhny Novgorod, Russia), Vasiliy Es'kin (University of Nizhny Novgorod, Russia)409

 Structuring Band-pass Dispersion with Cascaded High- and Low-pass Optical Metatronic Metasurfaces

Yue Li (Tsinghua University, P.R. China), Nader Engheta (University of Pennsylvania, USA)413

• Leaky-Mode Characteristics of Silica-Substrate Supported Circular-Cylinder Silver Nanowire

Hsuan-Hao Liu (National Taiwan University, Taiwan), Hsiang-Peng Chen (National Taiwan University, Taiwan), Hung-chun Chang (National Taiwan University, Taiwan)417

• Web-based Application to Obtain the Propagation in Outdoor Environments Importing Data from OpenStreetMaps

Josefa Gómez Pérez (University of Alcala, Spain), Abdelhamid Tayebi (University of Alcala, Spain), Oscar Gutiérrez Blanco (Universidad de Alcalá, Spain), Maria Ángeles Fernandez de Sevilla (UAH, Spain), Francisco Saez de Adana (Universidad de Alcala, Spain)421

Novel Mathematical Methods in Electromagnetics IV

• Induced Torsion Effects in Microwave Structures with Magnetoelectric Fields

Roman Joffe (Ben Gurion University of the Negev, Israel), Eugen Kamenetskii (Ben Gurion University of the Negev, Beer Sheva, Israel), Reuven Shavit (Ben-Gurion University, Israel)424

• Condition for Phase Shifter Operation of the Circular Waveguide, Containing an Azimuthally Magnetized Ferrite Cylinder and a Dielectric Toroid

Mariana Nikolova Georgieva-Grosse (Consulting and Researcher in Physics and Computer Sciences, Germany), Georgi Nikolov Georgiev (University of Veliko Tirnovo "St. St. Cyril and Methodius", Bulgaria)428

• Increasing Effective Angular Resolution of Measuring Systems Based on Antenna Arrays

Boris Lagovsky (Moscow State Institute of Radio Engineering and Automation, Russia), Alexander Samokhin (Moscow Technological University, Russia), Yury Shestopalov (University of Gävle, Sweden)432

• Unifying Electromagnetic and Communication Theories: A Proposal for a New Research Program

Said Mikki (University of New Haven, USA), Yahia Antar (Royal Military College of Canada, Canada)435

• Evolution of the Quadratic Functions of the Time-domain Waveguide Fields

Oleg Tretyakov (Gebze Technical University, Turkey), Fatih Erden (Turkish Naval Academy, Turkey)439

• Pulse Responses of Plane Gratings in Dispersion Media

Ryosuke Ozaki (Nihon University, Japan), Tsuneki Yamasaki (Nihon University, Japan)443

Electromagnetics for Radio Frequency Identification Systems I

• Implementation and Performance Evaluation of Graphene-based Passive UHF RFID Textile Tags

Mitra Akbari (Tampere University of Technology, Finland), Lauri Tapio Sydänheimo (Tampere University of Technology, Finland), Yahya Rahmat-Samii (University of California Los Angeles (UCLA) & UCLA, USA), Johanna Virkki (Tampere University of Technology, Finland), Leena Ukkonen (Tampere University of Technology, Finland)447

• RFIDrone: Preliminary Experiments and Electromagnetic Models

Michela Longhi (University of Rome "Tor Vergata", Italy), Guido Casati (University of Rome "Tor Vergata", Italy), Daniele Latini (University of Rome "Tor Vergata", Italy), Francesco Carbone (GEO-K, Italy), Fabio Del Frate (Università degli Studi di Roma, Italy), Gaetano Marrocco (University of Rome "Tor Vergata", Italy)450

• Robustness of Wearable UHF-Band Ungrounded Antennas to Human-Body Proximity

Francesco Tucconi (Università di Cagliari, Italy), Giovanni Andrea Casula (Università di Cagliari, Italy), Giorgio Montisci (University of Cagliari, Italy), Giuseppe Mazzarella (University of Cagliari, Italy)454

• Permittivity characterization based on Radar Cross measurements

Etienne Perret (Grenoble INP - LCIS, France)457

 Encoding/Decoding Strategies for Frequency Domain Chipless RFIDs Employing Periodic Surfaces

Filippo Costa (University of Pisa, Italy), Simone Genovesi (University of Pisa, Italy), Agostino Monorchio (University of Pisa, Italy), Giuliano Manara (University of Pisa, Italy)461

• Near-field Coupling in UHF-RFID Printer-Encoders

Andrea Michel (University of Pisa, Italy), Alice Buffi (University of Pisa, Italy), Giuliano Manara (University of Pisa, Italy)464

Integral Equation Methods

• Volume Potential-Integral-Equation Formulation for Electromagnetic Scattering by Dielectric Objects

Johannes Markkanen (University of Helsinki, Finland)468

• Balanced tangential testing for the nonconforming discretization of the Electric-Field Integral Equation on open PeC surfaces

Eduard Ubeda (Universitat Politècnica de Catalunya (UPC), Spain), Ivan Sekulic (Universitat Politècnica de Catalunya (UPC), Spain), Juan M. Rius (Universitat Politècnica de Catalunya, Spain)472

• A Full Wave Conductor Modeling Using Augmented Electric Field Integral Equation

Tian Xia (University of Illinois, Urbana-Champaign, USA), Hui Gan (University of Illinois, Urbana-Champaign, USA), Michael Wei (University of Illinois, Urbana-Champaign, USA), Qin Liu (The University of Hong Kong, Hong Kong), Lijun Jiang (University of Hong Kong, Hong Kong), Weng Chew (The University of Hong Kong, Hong Kong), Henning Braunisch (Intel Corporation, USA), Aygun Kemal (Intel Corporation, USA), Zhiguo Qian (Intel Corporation, USA), Alaeddin Aydiner (Intel Corporation, USA)476

• Fast Integral Equation Method for Metasurface Antennas

Francesco Caminita (University of Siena, Italy), Enrica Martini (University of Siena, Italy), Gabriele Minatti (University of Siena, Italy), Stefano Maci (University of Siena, Italy)480

• Novel Single-Source Integral Equation in Electromagnetics

Vladimir Okhmatovski (University of Manitoba & University of Manitoba, Canada), Anton Menshov (University of Texas at Austin, USA), Farhad Lori Sheikh Hosseini (University of Manitoba, Canada), Shucheng Zheng (University of Manitoba, Canada)484

• Performance of Iterative Solvers in the Discrete Dipole Approximation

Maxim A. Yurkin (Voevodsky Institute of Chemical Kinetics and Combustion SB RAS & Novosibirsk State University, Russia)488

Education in Electromagnetics

• Teaching experiment in Aalto University: progressive inquiry, reverse engineering, and company collaboration in a hands-on antenna course

Jari Holopainen (Aalto University School of Electrical Engineering, Finland), Dimitrios C Tzarouchis (Aalto University, Finland)492

• Algebraic Electromagnetism

Eike Scholz (Technical University of Munich, Germany), Sebastian Lange (Bundeswehr Research Institute for Protective Technologies and NBC Protection, Germany), Thomas F. Eibert (Technische Universität München, Germany)496

• Electromagnetism and Cross-disciplinary Problems

Lauri Kettunen (Tampere University of Technology, Finland), Tuomas Kovanen (Tampere University of Technology, Finland), Timo Tarhasaari (Tampere University of Technology, Finland)500

• Identifying trends of an International Master's level Electromagnetic Course: Assessment of an in Class Conceptual Survey and Homework Assignments

Dimitrios C Tzarouchis (Aalto University, Finland), Ari Sihvola (Aalto University, Finland)502

Novel Mathematical Methods in Electromagnetics V

Breach of Electromagnetic Symmetries in Particle Arrays

Yarden Mazor (Tel Aviv University, Israel), Ben Zion Steinberg (Tel Aviv University, Israel)506

• Fredholm Integral Equations: Scattering on Dielectric Structures

Alexander Samokhin (Moscow Technological University, Russia), A Samokhina (Moscow Technological University, Russia)509

• On Multi-Dimensional Systems; Properties of their Transfer Functions

Lars Jonsson (KTH Royal Institute of Technology, Sweden), Mats Gustafsson (Lund University, Sweden)512

• A Numerically Stable Algorithm for Eccentrically Metamaterial Covered Circular Cylinders

Fatih Dikmen (Gebze Technical University, Turkey), Emrah Sever (Gebze Technical University, Turkey), Yury A. Tuchkin (Gebze Institute of Technology, Turkey), Cumali Sabah (Middle East Technical University - Northern Cyprus Campus, Turkey)515

Wearable Antennas and Body-Centric Communications I

• Conductive Textiles for Wearable Electronics

Asimina Kiourti (The Ohio State University, USA), John L. Volakis (Ohio State University, USA)518

• Enhancing the Design of Textile Antennas with a Polynomial Chaos-based Stochastic Framework

Marco Rossi (Ghent University, Belgium), Sam Agneessens (Ghent University, Belgium), Dries Vande Ginste (Ghent University, Belgium), Hendrik Rogier (Ghent University, Belgium)520

• Design Considerations for Wearable Antennas

Anja K. Skrivervik (EPFL, Switzerland), Marko Bosiljevac (University of Zagreb, Croatia), Jovanche Trajkovikj (EPFL, Switzerland), Benjamin Fuchs (University of Rennes 1 - IETR, France), Zvonimir Sipus (University of Zagreb, Croatia)524

Dual Band Implantable Antenna for Biomedical Applications

Siddik Basaran (Akdeniz University, Turkey), Merve Usluer (Akdeniz University, Turkey)528

Interaction of Electromagnetic Fields with Biological Tissues I

• Dipole forward simulation guides transcranial electric stimulation of the hand knob area

Alexander Hunold (Technische Universität Ilmenau, Germany), Klaus Schellhorn (Neurocare Group GmbH, Germany), Jens Haueisen (Technical University Ilmenau, Germany)530

• Challenges in Modeling Nerve-Electrode Interactions of Neuronal Implants

Revathi Appali (Universität Rostock, Germany), Kiran Sriperumbudur (UIniversity of Rostock, Germany), Ursula van Rienen (Universität Rostock, Germany)534

• Improved Result for the Refractive Index of Human Hemoglobin Solutions by Kramers-Kronig Relations

Jonas Gienger (Physikalisch-Technische Bundesanstalt (PTB) Berlin, Germany), Hermann Groß (Physikalisch-Technische Bundesanstalt (PTB) Berlin, Germany), Jörg Neukammer (Physikalisch-Technische Bundesanstalt, Germany)538

• Evaluation Method for In-situ Electric Field of Different TMS Coils in Human Brain

Akimasa Hirata (Nagoya Institute of Technology, Japan), Masahiro Iwahashi (Nagoya Institute of Technology, Japan), Ilkka Laakso (Aalto University, Finland)542

Forward Scattering and Propagation I

 Rigorous Analysis of Light Scattering by a Grating of Nanocylinders Coupled to a Dielectric Substrate

Vakhtang Jandieri (General and Theoretical Electrical Engineering (ATE), Faculty of Engineering, Germany), Kiyotoshi Yasumoto (Fukuoka Institute of Technology & Kyushu University, Japan), Daniel Erni (University of Duisburg-Essen, Germany)545

• Accurate Formulation of Electromagnetic Scattering from Dielectric Slab Including Periodic Circular Cylinder Array with a Heterogeneous Cylinder

Koki Watanabe (Fukuoka Institute of Technology, Japan)549

• Long-Wave Approximation for the Effective Dielectric Tensor of Periodic Materials

Yuri Godin (University of North Carolina at Charlotte, USA), Boris Vainberg (University of North Carolina at Charlotte, USA)553

Novel Mathematical Methods in Electromagnetics VI

• Wiener-Hopf Analysis of the Diffraction by a Thin Material Strip

Takashi Nagasaka (Chuo University, Japan), Kazuya Kobayashi (Chuo University, Japan)557

• A Well-Conditioned, Hermitian, Positive Definite, Combined Field Integral Equation for Simply and Multiply Connected Geometries

Simon B Adrian (Technische Universität München & Institut Mines-Télécom / Télécom Bretagne, Germany), Francesco Andriulli (Ecole Nationale Superieure des Telecomunications de Bretagne, France), Thomas F. Eibert (Technische Universität München, Germany)561

• A Floquet Wave Theory for Curvilinear Locally Periodic Boundary Conditions

Gabriele Minatti (University of Siena, Italy), Francesco Caminita (University of Siena, Italy), Enrica Martini (University of Siena, Italy), Stefano Maci (University of Siena, Italy)565

Electromagnetics for Radio Frequency Identification Systems II

- EM Analysis of Smart Shelf RFID Antenna with Reconfigurable Interrogation Zone
 - Andrey S Andrenko (SYSU-CMU Shunde International Joint Research Institute, P.R. China)569
- Object Attitude Estimation Using Passive RFID Tag Arrays
 - Guillermo Alvarez Narciandi (University of Oviedo, Spain), Jaime Laviada (Universidad de Oviedo, Spain), Fernando Las-Heras (Universidad de Oviedo, Spain)572
- RFID Tags for In-Situ Tire Monitoring

Navtej Saini (Ohio State University, USA), Shuai Shao (Ricoh Innovation Corporation, USA), Asimina Kiourti (The Ohio State University, USA), Robert Burkholder (Ohio State University, USA), John L. Volakis (Ohio State University, USA)575

Interaction of Electromagnetic Fields with Biological Tissues II

- Sub-Voxel Refinement Method for Tissue Boundary Conductivities in Volume Conductor Models
 - Marko Mikkonen (Aalto University, Finland), Ilkka Laakso (Aalto University, Finland)579
- A Physical Model of Blood Platelets Shape and its Effect on Light Scattering
 - Alexander Moskalensky (Novosibirsk State University & Voevodsky Institute of Chemical Kinetics and Combustion SB RAS, Russia), Alyona Litvinenko (Novosibirsk State University, Russia), Vyacheslav Nekrasov (Voevodsky Institute of Chemical Kinetics and Combustion SB RAS, Russia), Maxim A. Yurkin (Voevodsky Institute of Chemical Kinetics and Combustion SB RAS & Novosibirsk State University, Russia)583
- A Novel Wide-Band Reflection-Based System for Measuring Abdominal Fat in Humans
 - Siamak Sarjoghian (Queen Mary University of London, United Kingdom), Xiaodong Chen (Queen Mary University of London, United Kingdom), Yasir Alfadhl (Queen Mary University of London, United Kingdom)586

Forward Scattering and Propagation II

• Reflection, transmission and absorption coefficients of a dusty plasma slab

Guiping Li (University of Electronic Science and Technology of China, P.R. China), Jun Xu (University of Electronic Science and Technology of China, P.R. China), Maoyan Wang (University of Electronic Science and Technology of China, P.R. China), Sanqiang Tong (University of Electronic Science and Technology of China, P.R. China), Hailong Li (University of Electronic Science and Technology of China, P.R. China)590

• Broadband Power Transfer Through a Metallic Wire Medium Slab

Sergei Kosulnikov (ITMO University, Russia), Dmytro Vovchuk (Yuriy Fedkovych Chernivtsi National University, Ukraine), Igor S Nefedov (Aalto University, Finland), Sergei Tretyakov (Aalto University, Finland), Constantin Simovski (Aalto University, Finland)594

• Recent Advancements in the Forward Scattering with the Cylindrical Wave Approach

Cristina Ponti (Roma Tre University, Italy), Massimo Santarsiero (Roma Tre University, Italy), Giuseppe Schettini ("Roma Tre" University, Italy)598

• Waveform Design for Dispersive SAR

Natalie Cartwright (SUNY New Paltz, USA), Kaitlyn Muller (Colorado State University, USA)600

Transformation Approach to Electromagnetism II

• The Limits and Extension of Transformation Optics

Martin McCall (Imperial College London, United Kingdom)603

• Broadband Metasurface for Surface Wave Lenses

Rhiannon C Mitchell-Thomas (University of Exeter, United Kingdom), Ian Hooper (University of Exeter, United Kingdom), John Sambles (University of Exeter, United Kingdom), Alastair Hibbins (University of Exeter, United Kingdom), Oscar Quevedo-Teruel (KTH Royal Institute of Technology, Sweden)605

• Open cloak designed with transformation optics

Bin Zheng (Zhejiang University, P.R. China), Hamza Ahmad Madni (Zhejiang University, P.R. China), Hongsheng Chen (Zhejiang University, P.R. China)607

• Flat Transformation Optics

Mario Mencagli, Jr. (University of Siena, Italy), Enrica Martini (University of Siena, Italy), Stefano Maci (University of Siena, Italy)609

Metamaterials and metasurfaces II

• Simulations and Measurements of Large Phase Progression in Multi-layered Metamaterials

Amir I Zaghloul (US Army Research Laboratory & Virginia Tech, USA), Steven Weiss (US Army Research Lab, USA), Anthony Anthony (US Army Research Laboratory, USA)611

• Selected features of metamaterials with near-zero parameters

Iñigo Liberal (University of Pennsylvania, USA), Nader Engheta (University of Pennsylvania, USA)614

• A Polarization-Independent Single Band Switchable Metamaterial Absorber

Saptarshi Ghosh (Indian Institute of Technology Kanpur, India), Kumar Vaibhav Srivastava (Indian Institute of Technology, Kanpur, India)618

• Electromagnetic wave propagation in metamaterials: a visual guide to Fresnel-Kummer surfaces and their singular points

Alberto Favaro (Imperial College London, United Kingdom)622

• Numerical Investigation of DB Metamaterial and Retrieval of its Effective Parameters

Muhammad Khalid ("La Sapienza" University of Rome, Italy), Nicola Tedeschi (Sapienza University of Rome, Italy), Fabrizio Frezza (Sapienza University of Rome, Italy)625

Integral Equation and Finite Element Methods

• Singular Integral Equations in the Wave Scattering Problems

Tamara Galishnikova (Lomonosov Moscow State University, Russia), Anatoly Ilinskiy (Lomonosov Moscow State University, Russia)629

• Characteristic Mode-Surface Integral Equation Analysis of Plasmonic Nanoparticles

Pasi Ylä-Oijala (Aalto University, Finland), Elias Raninen (Aalto University, Finland), Dimitrios C Tzarouchis (Aalto University, Finland), Ari Sihvola (Aalto University, Finland)632

• Unequally-spaced fast Laplace transform for Green's function evaluation

Quentin Gueuning (Université Catholique de Louvain, Belgium), Christophe Craeye (Université Catholique de Louvain, Belgium), Claude Oestges (Université Catholique de Louvain, Belgium)636

• Theory of a Loop Antenna Located on the Surface of a Dielectric Column in a Magnetoplasma

Alexander Kudrin (University of Nizhny Novgorod, Russia), Tatyana M. Zaboronkova (Technical University of Nizhny Novgorod, Russia), Anna Zaitseva (University of Nizhny Novgorod, Russia), Lyudmila Popova (University of Nizhny Novgorod, Russia)639

• Influence of standing waves on the solution of the inverse problem of reconstructing parameters of a dielectric inclusion in a waveguide

Elena Sheina (Lomonosov Moscow State University, Russia), Yury Shestopalov (University of Gävle, Sweden), Alexander Smirnov (Lomonosov Moscow State University, Russia)643

Scattering and Diffraction II

• Light Scattering into Two Fixed Angles vs. Angle-Resolved Measurements for Characterization of Single Submicron Particles

Anastasiya Konokhova (Institute of Chemical Kinetics and Combustion, Russia), Maxim A. Yurkin (Voevodsky Institute of Chemical Kinetics and Combustion SB RAS & Novosibirsk State University, Russia), Valeri Maltsev (Voevodsky Institute of Chemical Kinetics and Combustion SB RAS, Russia)647

 Recent Developments on the Iterative Physical Optics for the Analysis of Electrically Large Scatterers

Luca Pandolfo (IDS Ingegneria Dei Sistemi S. p. A, Italy), Patrizio De Vita (IDS Ingegneria Dei Sistemi, Italy), Mauro Bandinelli (IDS Ingegneria Dei Sistemi S. p. A, Italy), Giorgio Carluccio (Delft University of Technology, The Netherlands), Matteo Albani (University of Siena, Italy)650

• On Sum Rules for Scattering in Circular Polarization

Daniel Sjöberg (Lund University, Sweden)654

• Transition Function for Describing Metasurface Dispersion

Mario Mencagli, Jr. (University of Siena, Italy), Enrica Martini (University of Siena, Italy), Stefano Maci (University of Siena, Italy)657

• Diffraction by Thick and Loaded Slit -E-polarization Case-

Hiroshi Shirai (Chuo University, Japan), Masayuki Shimizu (Chuo University, Japan), Ryoichi Sato (Niigata University, Japan)659

• Tailoring Dielectric Resonator Geometries for Directional Scattering, Huygens' Metasurfaces, and High Quality-Factor Fano Resonances

Salvatore Campione (Sandia National Laboratories, USA), Lorena Basilio (Sandia National Laboratories, USA), Larry Warne (Sandia National Laboratories, USA), William Langston

(Sandia National Laboratories, USA), Ting Luk (Sandia National Laboratories, USA), Joel Wendt (Sandia National Laboratories, USA), Sheng Liu (Sandia National Laboratories, USA), Igal Brener (Sandia National Laboratories, USA), Michael Sinclair (Sandia National Laboratories, USA)662

Chaos and Complexity in Electromagnetics I

· Random Matrix Theory of Resonances: an Overview

Yan Fyodorov (King's College London, United Kingdom)666

• Exact Results for Chaotic Scattering and Applications to Microwave Experiments

Thomas Guhr (University of Duisburg-Essen, Germany)670

• Universality and Short-Wavelength Approximations for Chaotic Wave Scattering

Martin Sieber (University of Bristol, United Kingdom)674

 A Phase-Space Approach for Propagating Field-Field Correlation Functions Near Stochastic Sources

Gabriele Gradoni (University of Nottingham, United Kingdom), Stephen Creagh (University of Nottingham, United Kingdom), Gregor Tanner (University of Nottingham, United Kingdom)678

• Transfer operator approach for cavities with apertures

Gabriele Gradoni (University of Nottingham, United Kingdom), Stephen Creagh (University of Nottingham, United Kingdom), Gregor Tanner (University of Nottingham, United Kingdom)682

 Semiclassical Modeling of Individual and Arrayed Nanoantennas in the Quantum Plasmonic Regime

Pai-Yen Chen (Wayne State University, USA)686

Antennas and Wireless Communication Systems

• Effect of Shape Deformation of a Patch Antenna on Its Characteristic Modes

Mikko Honkala (Aalto University School of Electrical Engineering, Finland), Anu Lehtovuori (Aalto University & School of Electrical Engineering, Finland), Elias Raninen (Aalto University, Finland), Pasi Ylä-Oijala (Aalto University, Finland)690

• Density tapering for antenna arrays based on a coordinate transform

Christophe Craeye (Université Catholique de Louvain, Belgium), Douglas Buisson (University of Cambridge, United Kingdom), Nima Razavi Ghods (University of Cambridge, United Kingdom), Ha Bui Van (Université Catholique de Louvain & ICTEAM, Belgium)694

• Linear Antenna Synthesis with Maximum Directivity using Improved Fruit Fly Optimization Algorithm

Nattaset Mhudtongon (King Mongkut's Institute of Technology Ladkrabang, Thailand), Chuwong Phongcharoenpanich (King Mongkut's Institute of Technology Ladkrabang, Thailand), Koki Watanabe (Fukuoka Institute of Technology, Japan)698

• Propagation in Cellular Networks

Mohammad Abdallah (Syracuse University, USA), Tapan Sarkar (Syracuse University, USA), Magdalena Salazar-Palma (Universidad Carlos III de Madrid, Spain)702

• Time Domain Reciprocity and the Transfer Response of Coupled Antennas

Amir Shlivinski (Ben-Gurion University of the Negev, Israel)706

Near-Field Focused Radiation by Two Edge-Coupled Microstrip Antenna Arrays

Hsi-Tseng Chou (National Taiwan University, Taiwan), Paolo Nepa (University of Pisa, Italy)709

Poster Session

 Power Effect of Polar Summer Mesosphere Dusty Plasma on Space Microwave Energy Transmission

Hailong Li (University of Electronic Science and Technology of China, P.R. China), Jun Xu (University of Electronic Science and Technology of China, P.R. China), Maoyan Wang (University of Electronic Science and Technology of China, P.R. China)713

• Electromagnetic Characterization of a Metasurface-enabled Frequency Reconfigurable Antenna

Jiaran Qi (Harbin Institute of Technology, P.R. China), Zifu Zhang (Harbin Institute of Technology, P.R. China)715

• Antenna Array De-Embedding and Reciprocity Constraint

Gregory Samelsohn (Shamoon College of Engineering, Israel)718

• Radiation Pattern of Rectangular Patch Antenna with Curved Surface

Hirokazu Kobayashi (Osaka Institute of Technology, Japan)721

• Electromagnetic mode profile shaping in waveguides

Taylor Boyd (Cockcroft Institute, United Kingdom), Paul Kinsler (Cockcroft Institute, United Kingdom), Jonathan Gratus (Cockcroft Institute, United Kingdom), Rosa Letizia (Lancaster University, United Kingdom)725

• Compact Microstrip Feedings with an Elevated Ground Plane for Thick Folded SIW

Lei Wang (Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland), Qi Wu (Beihang University, P.R. China), Juan R Mosig (Ecole Polytechnique Federale de Lausanne, Switzerland)728

• A Novel UWB antenna for Vehicle-to-Infrastructure Automotive Applications

Vittorio Franchina (University of Pisa, Italy), Andrea Michel (University of Pisa, Italy), Paolo Nepa (University of Pisa, Italy), Michele Gallo (Calearo Antenne SpA & Politecnico di Bari, Italy), Ilenia Moro (Calearo Antenne Spa, Italy), Daniel Zamberlan (Calearo Antenne S.p.A., Italy)730

• Electromagnetic Field Theory as System Theory

Eike Scholz (Technical University of Munich, Germany), Sebastian Lange (Bundeswehr Research Institute for Protective Technologies and NBC Protection, Germany), Thomas F. Eibert (Technische Universität München, Germany)733

- On the Issue of Simulating Very Large Endfire Arrays with Complex Antenna Geometries
 Jakob Helander (Lund University, Sweden), Daniel Sjöberg (Lund University, Sweden), Doruk Tayli (Lund University, Sweden)737
- Development of a Rain Attenuation Model for Terrestrial Links Using a Physically-Based Approach

Riccardo Ghiani (Università di Cagliari, Italy), Lorenzo Luini (Politecnico di Milano, Italy), Alessandro Fanti (University of Cagliari, Italy)741

A preliminary work on the discrimination of magnetic properties by means of TDR data
 Raffaele Persico (IBAM-CNR, Italy), Fabio Mangini (Sapienza University of Rome, Italy)745

• Tunable Leaky-Wave Antennas with RF MEMS

Tae Young Kim (TU München, Germany), Raimund Klapfenberger (TU München, Germany), Larissa Vietzorreck (Technische Universitaet Muenchen, Germany)748

• Multiple Scattering by Dense Random Media: Volume-Element Extinction

Karri Muinonen (University of Helsinki & Finnish Geospatial Research Institute FGI, Finland), Johannes Markkanen (University of Helsinki, Finland), Anne Virkki (Arecibo Observatory & University of Helsinki, Puerto Rico), Antti Penttilä (University of Helsinki, Finland), Daniel Mackowski (Auburn University, USA)751

• On zero-reflection and zero-transmission of a stratified lossy medium

Fabio Mangini (Sapienza University of Rome, Italy), Fabrizio Frezza (Sapienza University of Rome, Italy)755

• Amplitude and Slope Diffraction Coefficients for S-UTD-CH Model

Mehmet Baris Tabakcioglu (Bursa Technical University, Turkey)759

• Plane-wave Reflection from the Interface of a Novel Uniaxial Medium with Extreme Parameters

Muhammad Khalid ("La Sapienza" University of Rome, Italy), Nicola Tedeschi (Sapienza University of Rome, Italy), Fabrizio Frezza (Sapienza University of Rome, Italy)763

• Plasmonic Modes on Rounded Hexahedral and Octahedral Nano-Antennas

Dimitrios C Tzarouchis (Aalto University, Finland), Pasi Ylä-Oijala (Aalto University, Finland), Ari Sihvola (Aalto University, Finland)767

• A Dual-Band Conformal Metamaterial Absorber for Curved Surface

Neha Hakla (Indian Institute of Technology Kanpur, India), Saptarshi Ghosh (Indian Institute of Technology Kanpur, India), Kumar Vaibhav Srivastava (Indian Institute of Technology, Kanpur, India), Anuj Shukla (Defence Laboratory, Jodhpur, India)771

• Degrees of Freedom of the Field and Maximum Directivity

Enrica Martini (University of Siena, Italy), Per-Simon Kildal (Chalmers University of Technology, Sweden), Stefano Maci (University of Siena, Italy)775

• Transmission-Line Modeling of Shielding Effectiveness of Multiple Shielded Cables with Arbitrary Terminations

Salvatore Campione (Sandia National Laboratories, USA), Lorena Basilio (Sandia National Laboratories, USA), Larry Warne (Sandia National Laboratories, USA), William Langston (Sandia National Laboratories, USA)777

• An Approach to Estimation of Solutions to Inverse Problems of Electromagnetics

Yury Shestopalov (University of Gävle, Sweden)780

Forward Scattering and Propagation III

• Analytical investigations of ground modifications assisting the detection of a buried object

Constantinos A Valagiannopoulos (Nazarbayev University, Kazakhstan), Nikolaos L. Tsitsas (Aristotle University of Thessaloniki, Greece), Ari Sihvola (Aalto University, Finland)783

• A first numerical assessment of the reliability of finite element simulators for time-harmonic electromagnetic problems involving rotating axisymmetric objects

Massimo Brignone (University of Genoa, Italy), Praveen Kalarickel Ramakrishnan (University of Genoa, Italy), Mirco Raffetto (University of Genoa, Italy)787

• Frequency and Time Domain UTD Vertex Diffraction: a Heuristic solution and a step toward the exact one

Matteo Albani (University of Siena, Italy), Giorgio Carluccio (Delft University of Technology, The Netherlands)791

Chaos and Complexity in Electromagnetics II

• Uncertainty Quantification of Propagation in Evaporation Ducting

Mattias Enstedt (Swedish Defense Research Agency, Sweden), Niklas Wellander (Swedish Defence Research Agency, Sweden)794

• Inhomogeneous Wave Penetration in Lossy Media

Paolo Baccarelli (Sapienza University of Rome, Italy), Fabrizio Frezza (Sapienza University of Rome, Italy), Patrizio Simeoni (Sapienza University of Rome, Italy), Nicola Tedeschi (Sapienza University of Rome, Italy)797

• Comparison of Ray Traced Based Models with Physical Optic Model

Mehmet Baris Tabakcioglu (Bursa Technical University, Turkey)800

Electromagnetic Bandgap and Guiding Structures

• Effective Parameter Calculation of 3D Bianisotropic Scatterer Arrays through Extracted Polarizabilities

Theodosios Karamanos (Aristotle University of Thessaloniki, Greece), Nikolaos V. Kantartzis (Aristotle University of Thessaloniki, Greece)804

• Left handedness and asymmetric excitation in linear arrays of isotropic electric-magnetic particles

Yarden Mazor (Tel Aviv University, Israel), Ben Zion Steinberg (Tel Aviv University, Israel)808

 Analysis of Waveguide Discontinuities with Lateral and Transverse Perfect Magnetic Wall Boundary Conditions

Lucas Polo-López (Universidad Autonoma de Madrid & Escuela Politecnica Superior, Spain), Jorge A Ruiz-Cruz (Universidad Autonoma de Madrid & Escuela Politecnica Superior, Spain), Jose Ramon Montejo-Garai (Universidad Politecnica de Madrid, Spain), Jesus Maria Rebollar (Universidad Politecnica de Madrid, Spain)811

Inverse Scattering and Imaging III

- Hard Thresholding Based Compressed Sensing Approach for Thermoacoustic Tomography
 - Ulas Taskin (Istanbul Technical University, Turkey), Emre Yalcin (Istanbul Technical University, Turkey), Ozgur Ozdemir (Istanbul Technical University, Turkey)815
- Real GPR Signal Processing for Target Recognition with Circular Array Antennas
 - Xuan Wang (Delft University of Technology, The Netherlands), Shilong Sun (Delft University of Technology, The Netherlands), Jianping Wang (Delft University of Technology, The Netherlands), Alexander Yarovoy (TU Delft, The Netherlands), Boriszlav Neducza (Geology & Geophysics (Geo2X), Switzerland), Guido Manacorda (Ingegneria Dei Sistemi S.p.A. (IDS), Italy)818
- Back-Projected Cortical Potential Imaging for Monitoring and Stimulation Tools
 - Dror Haor (Ben-Gurion University, ElmindA, Israel), Reuven Shavit (Ben-Gurion University, Israel), Amir Geva (BGU ElmindA, Israel)822

Direct and Inverse problems in the mathematical theory of electromagnetics

- Boundary shape reconstructions in a coaxial waveguide using Bessel functions
 - Mariana Dalarsson (KTH Royal Institute of Technology, Sweden), Martin Norgren (KTH Royal Institute of Technology, Sweden)826
- Estimation of Complex Valued Permeability of Cable Armour Steel
 - Yevhen Ivanenko (Linnaeus University, Sweden), Sven Nordebo (Linnaeus University, Sweden)830
- On the Spectrum and Preconditioning of Electromagnetic Volume Integral Equations

Johannes Markkanen (University of Helsinki, Finland), Pasi Ylä-Oijala (Aalto University, Finland), Seppo Järvenpää (Aalto University, Finland)834

• Generation of inhomogeneous electromagnetic waves by a lossy prism

Nicola Tedeschi (Sapienza University of Rome, Italy), Fabrizio Frezza (Sapienza University of Rome, Italy), Vincenzo Pascale (Sapienza University of Rome, Italy), Fabio Pelorossi (Sapienza University of Rome, Italy)838

Wearable Antennas and Body-Centric Communications II

• A Foldable Textile Patch for Modular Snap-On-Button-Based Wearable Antennas

Shengjian Jammy Chen (The University of Adelaide, Australia), Damith C. Ranasinghe (The University of Adelaide, Australia), Christophe Fumeaux (The University of Adelaide & School of Electrical and Electronic Engineering, Australia)842

 Flexible Millimetre-Wave Frequency Reconfigurable Antenna for Wearable Applications in 5G Networks

Syeda Fizzah Jilani (Queen Mary University of London, United Kingdom), Berit Greinke (Queen Mary University of London, United Kingdom), Yang Hao (Queen Mary University, United Kingdom), Akram Alomainy (Queen Mary University of London, United Kingdom)846

• A Theoretical Analysis to Reduce the Human Body Effect on Wearable PIFAs Performance

Giovanni Andrea Casula (Università di Cagliari, Italy), Giorgio Montisci (University of Cagliari, Italy), Giuseppe Mazzarella (University of Cagliari, Italy), Andrea Michel (University of Pisa, Italy), Paolo Nepa (University of Pisa, Italy)849

• Minimum of Two-Port Voltage and Power Gain under Varying Terminations: Semi-Analytical Method and Application to Biotelemetry Systems

Toni Björninen (Tampere University of Technology & BioMediTech, Finland), Elham Moradi (Tampere University of Technology, Finland), Muhammad Waqas Khan (Tampere University of Technology, Finland), Leena Ukkonen (Tampere University of Technology, Finland)853