

XV Iberian Meeting on Computational Electromagnetics EIEC 2023

November 14th-17th 2023, Cádiz, Spain



Microwaves Group

University of Seville



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The XV Iberian Meeting on Computational Electromagnetics will be organized by the Microwaves Group of the University of Seville in the town of Cádiz (Andalucía). EIEC meetings allow the exchange of knowledge between members of Portuguese and Spanish research groups working on computational electromagnetics applications in the various branches of Physics and Electrical Engineering by providing a highly specialized environment. These contacts contribute to forging closer ties in a community whose activity could be diluted in forums with a broader scope, favoring the establishment of partnerships that eventually lead to the development of joint projects.

Traditionally, EIEC tries to promote dialogue and the sharing of ideas among participants outside the program sessions. For this reason, all the editions have been held in small towns and picturesque villages, avoiding the dispersion of the participants and encouraging them to group together in lunches, dinners and social life. In particular, “Hotel Occidental Cádiz” has been chosen as the venue for the XV edition. Although Cádiz is a seaside touristic town and the “Hotel Occidental Cádiz” can be crowded in summer, in Autumn the hotel shows a peaceful atmosphere and it is ideal for intellectual work and scientific brain storming.

The meeting favors the introduction of longer speeches, as opposed to a conference or symposium, allowing the groups to present the research lines they are currently working on and the most relevant results and state of the art in the various topics covered. Also, all presentations are collected in a single oral session so that all participants can attend the presentations of the rest of participants, and the knowledge exchange is maximized. The link to the webpage of the Meeting is: <https://gestioneventos.us.es/eiec2023>.

Welcome to EIEC 2023!

Organizing committee

Local:

- Rafael Rodríguez Boix (US)
- Armando Fernández Prieto (US)
- Miguel Camacho Aguilar (US)

EIEC:

- Álvaro Gómez Gómez (UC)
- Francisco Medina Mena (US)
- Ana Cristina López Cabeceira (UVa)
- António Luis Topa (IST, Instituto de Telecomunicações, Lisboa)
- Juan Manuel Rius Casals (UPC)
- Jesús Rubio (UEX)
- Luis Landesa Porras (UEX)
- Benito Gimeno Martínez (UV)
- Mario Fernández Pantoja (UGr)
- Rafael González Ayestarán (UniOvi)
- Mário G. Silveirinha (IST, Instituto de Telecomunicações, Lisboa)

SCHEDULE

Tuesday November 14th

- 17:00-20:00 – Documentation delivery to conference attendees at *Hotel Occidental Cádiz*.
- 21:00 – Welcome cocktail at *Hotel Occidental Cádiz* (dinner).

Wednesday November 15th

- 09:00-11:00 – Invited talk by Prof. Juan R. Mosig (Professor Emeritus, EPFL, Switzerland) and Session A: “High Frequency Techniques”.
- 11:00-11:45 – Coffee break.
- 11:45-13:45 – Session B: “Reflectarrays and Periodic Structures”.
- 14:00-15:30 – Lunch.
- 15:30-17:30 – Session C: “Numerical Methods and Multiphysics”.
- 17:30-18:15 – Coffee break.
- 18:15-20:15 – Session D: “Integral and Differential Equation Methods in Frequency Domain”.
- 21:15 – Dinner at *Gastropub Islazul (Paseo Marítimo de Cádiz)*.

Thursday November 16th

- 09:00-11:00 – Session E: “Differential Equations in Time and Frequency Domain”.
- 11:00-11:45 – Coffee break.
- 11:45-13:45 – Session F: “Electromagnetic Simulation for Advanced Applications”.
- 14:00-15:30 – Lunch.
- 15:30-17:30 – Session G: “Metasurfaces and Metamaterials”.
- 17:30-18:15 – Coffee break.
- 18:15-20:15 – Session H: “Modeling and Optimization for EM-based Design”.
- 21:15 – Gala dinner at *Restaurante Ventorrillo El Chato (carretera de Cádiz a San Fernando)*.

Friday November 17th

- 09:00-10:00 – EIEC General Assembly.
- 10:30-14:00 – Touristic visit to Cádiz city center: cathedral, town market, *Oratorio de San Felipe Neri* and *Oratorio de la Santa Cueva*.
- 14:30-16:30 – Lunch at *Restaurante El Balandro* (Cádiz city center).
- 16:30 – Farewell.

TECHNICAL SESSIONS

Wednesday November 15th (first morning session)

09:00-11:00 Invited talk/Session A – High Frequency Techniques

Chairs: Juan Manuel Rius and Rafael R. Boix

09:00-10:00 **INVITED TALK. Stratified media problems with integral equations: a historical perspective from a personal standpoint.**

Juan Ramón Mosig (École Polytechnique Fédérale de Lausanne, Switzerland)

10:00-10:20 **Overview of Ray Tracing Techniques in High Frequency Applications**

David Carbonero, Lorena Lozano, Iván González, Álvaro Somolinos and Felipe Cátedra (Universidad de Alcalá)

10:20-10:40 **Computation of Radiation Patterns and Efficiency of Geodesic Lens Antennas using a Ray-Tracing Model**

Pilar Castillo Tapia (KTH Royal Institute of Technology, Stockholm, Sweden); Francisco Mesa (Universidad de Sevilla); and Óscar Quevedo-Teruel (KTH Royal Institute of Technology, Stockholm, Sweden)

10:40-11:00 **Ray-Tracing Model to Design Dielectric Lenses Combined with Arrays for Satellite Communications**

Núria Flores Espinosa and Pilar Castillo Tapia (KTH Royal Institute of Technology, Stockholm, Sweden); Francisco Mesa (Universidad de Sevilla); María Viganó (Viasat Antenna Systems, Lausanne); and Óscar Quevedo-Teruel (KTH Royal Institute of Technology, Stockholm, Sweden)

TECHNICAL SESSIONS

Wednesday November 15th (second morning session)

11:45-13:45 Session B – Reflectarrays and Periodic Structures

Chairs: Manuel Arrebola and Raúl Rodríguez-Berral

11:45-12:05 **Pre-design Of Reflect/Transmitarrays and Other Devices Using Equivalent Circuits**

Juan Enrique Page (Universidad Politécnica de Madrid)

12:05-12:25 **Advanced Applications using Dual-Frequency and Dual-Polarization Reflectarrays**

José Antonio Encinar and Daniel Martínez-de-Rioja (Universidad Politécnica de Madrid); Eduardo Martínez-de-Rioja (Universidad Rey Juan Carlos); Yolanda Rodríguez-Vaqueiro and Antonio Pino (Universidade de Vigo); Álvaro F. Vaquero and Manuel Arrebola (Universidad de Oviedo); Rafael Florencio (Universidad de Jaén); and Rafael R. Boix (Universidad de Sevilla)

12:25-12:45 **On the Performance of the Eigenstate Equivalent Circuit for Bi-Periodic Scatterers at Oblique Incidence**

Alberto Hernández-Escobar and Elena Abdo-Sánchez (Universidad de Málaga); Jaime Esteban (Universidad Politécnica de Madrid); Teresa M. Martín-Guerrero and Carlos Camacho-Peñalosa (Universidad de Málaga)

12:45-13:05 **Analytical Derivation of Canonical Equivalent Networks for the Cross-Pol Scattering by Thin Metallic FSSs**

Raúl Rodríguez Berral, Francisco Mesa and Francisco Medina (Universidad de Sevilla)

13:05-13:25 **Enhanced formulations of the Spectral-Domain Method of Moments based on the Non-Uniform Fast Fourier Transform and Tailored Green's functions for the Efficient Analysis of Multilayered Periodic Structures**

Juan Córcoles (Universidad Politécnica de Madrid); Miguel Camacho and Rafael R. Boix (Universidad de Sevilla)

13:25-13:45 **Numerically Stable Implementation of Ewald Method for 1D Periodicity**

Sergio Llorente-Romano, Luis E. García-Castillo and Adrián Amor-Martín (Universidad Carlos III de Madrid)

TECHNICAL SESSIONS

Wednesday November 15th (afternoon session)

15:30-17:30 Session C – Numerical Methods and Multiphysics

Chairs: Benito Gimeno and Ángela Coves

15:30-15:50 **Electromagnetic Analysis of Microwave Cavities for Detection of High-Frequency Gravitational Waves**

Pablo Navarro (Universidad Politécnica de Cartagena); Benito Gimeno (Instituto de Física Corpuscular, IFIC, Universidad de Valencia); Juan Monzó and Alejandro Díaz Morcillo (Universidad Politécnica de Cartagena); and Diego Blas (Institut de Física d'Altes Energies, Universitat Autònoma de Barcelona)

15:50-16:10 **Analog Electrodynamics Model for the Analysis of Curved Universe**

Enderson Falcón-Gómez (Universidad Carlos III de Madrid); Vittorio de Falco (Istituto Nazionale di Fisica Nucleare, Napoli, Italy); Kerlos Atia Abdalmalak (Aswan University, Egypt); Adrián Amor-Martín (Universidad Carlos III de Madrid); Valentín de la Rubia (Universidad Politécnica de Madrid); Isabel Carnoto Amat (Universidad Carlos III de Madrid); Gabriel Santamaría Botello (University of Colorado, Boulder, USA); and Luis Enrique García Muñoz (Universidad Carlos III de Madrid)

16:10-16:30 **Rigorous Calculation of the Electromagnetic Fields in a Rectangular Waveguide with Small Corrugations for Reduction of Multipactor Effect**

Sarah M. Kira Bonte, Ángela Coves, Ángel A. San Blas and Manuel Sancho (Universidad Miguel Hernández de Elche); and Stephan Marini (Universidad de Alicante)

16:30-16:50 **Study of the Multipactor Effect in an RF Electron Gun Photoinjector**

Daniel González-Iglesias, Daniel Esperante, Benito Gimeno, C. Blanch, N. Fúster-Martínez, Pablo Martínez-Reviriego, Pablo Martín-Luna and J. Fúster (Instituto de Física Corpuscular, IFIC, Universidad de Valencia); and D. Alesini (Laboratori Nazionale di Frascati, Rome, Italy)

16:50-17:10 **Power-diffusive Model for Beam Loading Effects in Linear Accelerators**

Javier Olivares-Herrador (Instituto de Física Corpuscular, IFIC, Univ. de Valencia); A. Latina (CERN, Geneva, Switzerland); N. Martínez Fúster, Benito Gimeno and Daniel Esperante (Instituto de Física Corpuscular, IFIC, Universidad de Valencia)

17:10-17:30 **A Linearized Hydrodynamic Model for Plasmonic Acceleration in Carbon Nanotubes**

Pablo Martín-Luna (Instituto de Física Corpuscular, IFIC, Universidad de Valencia); Alexandre Bonatto (Federal University of Porto Alegre, Brazil); Benito Gimeno and Daniel Esperante (Instituto de Física Corpuscular, IFIC, Universidad de Valencia); and Javier Resta-López (Instituto de Ciencia de los Materiales, Univ. de Valencia)

TECHNICAL SESSIONS

Wednesday November 15th (evening session)

18:15-20:15 Session D – Integral and Differential Equation Methods in Frequency Domain

Chairs: Luis Landesa and Jesús Rubio

18:15-18:35 **Simple Randomized Strategies for Low-Rank Matrix Compression**
Héctor López-Menchón, Robert Molina, Alexander Heldring, Eduard Úbeda and Juan Manuel Rius (Universitat Politècnica de Catalunya)

18:35-18:55 **MoM Solution of Curvilinear Surfaces with Origami Basis Functions**
Luis Landesa (Universidad de Extremadura); Jorge A. Tobón Vázquez and Francesca Vipiana (Politecnico di Toriano)

18:55-19:15 **An Efficient Methodology for the Analysis of Antennas Composed of a Large Subdomain with Symmetry of Revolution**
Jesús Rubio (Universidad de Extremadura); José M. Gil (Universidad Politécnica de Madrid); R. Gómez Alcalá (Universidad de Extremadura); Miguel A. Gómez de Aza (Universidad Politécnica de Madrid); Yolanda Campos-Roca and Juan F. Izquierdo (Universidad de Extremadura); Jesús García (Universidad Politécnica de Madrid); Alfonso Gómez García (Universidad de Extremadura); and Pedro Robustillo (AIRBUS, Germany)

19:15-19:35 **Allowing for Mirror Symmetry in the Method of Moments Analysis of the Scattering by Cylinders of Arbitrary Cross Section**
Francisco J. Hidalgo, Rafael R. Boix and Miguel Camacho (Universidad de Sevilla); and Juan Córcoles (Universidad Autónoma de Madrid)

19:35-19:55 **On the use of the Method of Manufactured Solutions for the Domain Decomposition Method**
Adrián Amor-Martín and Luis E. García-Castillo (Universidad Carlos III de Madrid)

19:55-20:15 **Efficient Implementation of Different Integral Equation Formulations for the Analysis of 3D Rectangular Waveguide Microwave Circuits**
Antonio Manuel Huéscar de la Cruz (Universidad Politécnica de Cartagena); Celia Gómez Molina (Erzia Technologies, Santander); Fernando D. Quesada Pereira and Alejandro Álvarez-Melcón (Universidad Politécnica de Cartagena); and Vicente Boria Eibert (Universitat Politècnica de València)

TECHNICAL SESSIONS

Thursday November 16th (first morning session)

09:00-11:00 Session E – Differential Equation Methods in Time and Frequency Domain

Chairs: Valentín de la Rubia and Luis M. Díaz Angulo

09:00-09:20 **Open SEMBA/DGTD: an Open-Source Maxwell's Equations Solver based on Discontinuous Galerkin Time Domain Method**

Alejandro Muñoz Manterola, Luis M. Díaz Angulo and Farah Amador (Universidad de Granada)

09:20-09:40 **Overview of the Implementation, Results and Late-Time Instabilities in the Orthogonalized Integral-based Sub-Gridding Algorithm in FDTD**

Antonio M. Valverde, Miguel Ruiz-Cabello, Alberto G. Bravo, Amelia Rubio Bretones and Salvador González García (Universidad de Granada)

09:40-10:00 **Fast Direct Solvers for Surface Partial Differential Equations and its Applications to Scattering Problems**

Felipe Vico, Miguel Ferrando-Bataller, Eva Antonino-Daviu and Marta Cabedo-Fabres (Universidad Politécnica de Valencia)

10:00-10:20 **FDTD Voxells-in-Cell Method in Computational Electromagnetics**

Kenan Tekbas (Amasya University, Amasya, Turkey); Jean-Pierre Bérenguer (The University of Manchester, Manchester, U. K.); Luis Díaz-Angulo, Miguel Ruiz-Cabello and Salvador González García (Universidad de Granada)

10:20-10:40 **Simulation of Common Mode Ferrite Chokes using FDTD and HFSS**

Alberto Gascón Bravo, Alejandro Muñoz Manterola, Luis Díaz Angulo and Kenan Tekbas (Universidad de Granada); Roberto Moreno (IKERLAN Technology Research Centre, Arrasate/Mondragón); Manuel Añón Cancela (INTA, Madrid); and Salvador González García (Universidad de Granada)

10:40-11:00 **Exploring Stability and Accuracy of Implicit, Explicit and Exact Time-Integrators for Maxwell's Equations**

Farah Amador Mazariegos, Alejandro Muñoz Manterola, Luis Díaz Angulo, Kenan Tekbas, Alberto Gascón Bravo and Salvador González García (Universidad de Granada)

TECHNICAL SESSIONS

Thursday November 16th (second morning session)

11:45-13:45 Session F – Electromagnetic Simulation for Advanced Applications

Chairs: Francisco Medina and Juan Pablo Martínez

11:45-12:05 **A New Lossless Reciprocal Quasi-Isolating Device: Application to Radiofrequency Heating**

Jesús M^a Rebollar, José Ramón Montejo-Garai and Jorge A. Ruiz-Cruz (Universidad Politécnica de Madrid)

12:05-12:25 **Numerical Modelling of Domestic Induction Heating System Based on Finite Element Analysis**

Juan Pablo Martínez Jiménez, Ignacio Lope Moratilla, Claudio Carretero Chamarro and Jesús Acero Acero (Universidad de Zaragoza)

12:25-12:45 **Transmission Study between In-Body and On-Body Antennas in the ISM 2.45 GHz Frequency Band**

André Ribeiro, Carlos Mendes and Pedro Pinho (Universidade de Aveiro)

12:45-13:05 **Modelling of Induction Heating Systems by Using Non-Linear IBC from B-H Curve Approached by Straight Segments**

José Ortega, Óscar Lahuerta, Claudio Carretero, Juan Pablo Martínez and Jesús Acero (Universidad de Zaragoza)

13:05-13:25 **Compensation Coil Design for Transcranial Magnetic Stimulation**

José A. Vílchez Membrilla, Ángel Quirós Olazábal and José M. Guerrero Rodríguez (Universidad de Cádiz); Mario Fernández Pantoja (Universidad de Granada); and Clemente Cobos Sánchez (Universidad de Cádiz)

13:25-13:45 **Dielectric Assist Accelerating (DAA) Structures for Compact Linear Accelerators of Low Energy Particles in Hadrontherapy Treatments**

Pablo Martínez-Reviriego, Daniel Esperante and Benito Gimeno (Instituto de Física Corpuscular, IFIC, Universidad de Valencia); Alexej Grudiev (CERN, Geneva, Switzerland); César Blanch, Nuría Fúster-Martínez, Daniel González-Iglesias, Pablo Martín-Luna, Eduardo Martínez, Abraham Menéndez, Marçà Boronat and Juan Fúster (Instituto de Física Corpuscular, IFIC, Universidad de Valencia)

TECHNICAL SESSIONS

Thursday November 16th (afternoon session)

15:30-17:30 Session G – Metasurfaces and Metamaterials

Chairs: Miguel Beruete and Óscar Quevedo-Teruel

15:30-15:50 **Gradient and Modulated Metasurfaces for Millimeter Wave Arrays and Beam-Formers**

David González-Ovejero, Christos Bilitos, Jérôme Taillieu and Marceau Bouchez (Université de Rennes, CNRS, IETR, Rennes, France)

15:50-16:10 **Expanding Possibilities in Wireless Communications: Full-Space Metasurfaces at Millimeter-Waves**

Miguel Beruete (Universidad Pública de Navarra, Pamplona)

16:10-16:30 **Analytical Circuits to Model 3D Metagratings**

Antonio Álex-Amor (Universidad San Pablo-CEU, Madrid); Salvador Moreno-Rodríguez, Pablo Padilla, Juan F. Valenzuela-Valdés and Carlos Molero (Universidad de Granada)

16:30-16:50 **On the Improvement of Bandwidth Response of Periodic Single and Differential Microstrip Lines with Defected Ground Structures by using Glide Symmetry**

Armando Fernández-Prieto (Universidad de Sevilla); B. A. Mouris (KTH Royal Institute of Technology, Stockholm, Sweden); Victoria dos Santos (Teledyne Innovaciones Microelectrónicas, Sevilla); José Luis Medrán and Jesús Martel (Universidad de Sevilla); R. Thoaben (KTH Royal Institute of Technology, Stockholm, Sweden); Rafael R. Boix, Francisco Medina and Francisco Mesa (Universidad de Sevilla); and Óscar Quevedo-Teruel (KTH Royal Institute of Technology, Stockholm, Sweden)

16:50-17:10 **Design and Characterization of a Line-Wave Waveguide**

Ismael Barba, Ana Grande and Ana C. López-Cabeceira (Universidad de Valladolid)

17:10-17:30 **Floquet Circuits Applied to Time-Varying Metallic Metasurfaces**

Salvador Moreno-Rodríguez (Universidad de Granada); Antonio Álex-Amor (Universidad San Pablo-CEU, Madrid); Pablo Padilla, Juan F. Valenzuela-Valdés and Carlos Molero (Universidad de Granada)

TECHNICAL SESSIONS

Thursday November 16th (evening session)

18:15-20:15 Session H – Modelling and Optimization for EM-based Design

Chairs: Rafael González Ayestarán and Pablo Padilla

18:15-18:35 **Modeling of Radar Pulse Compression Using Matched Filters**

Rui P. Sustelo and António L.Topa (Instituto de Telecomunicações, Instituto Superior Técnico, Lisboa)

18:35-18:55 **Enhanced Conjugate-Phase Method for NF-Focusing Using Arrays and RIS**

Rafael G. Ayestarán, Alvaro Pendás and Jesús A. López-Fernández (Universidad de Oviedo)

18:55-19:15 **Electromagnetically Generated Coupling Matrix in Coupled-Resonator Microwave Circuits**

Valentín de la Rubia (Universidad Politécnica de Madrid)

19:15-19:35 **Half-Mode Groove Gap Waveguide for Filter and Diplexer Design**

Stephan Marini (Universidad de Alicante); Miguel Ferrando-Rocher (Universitat Politècnica de València); Aitor Morales-Hernández and Encarnación Gimeno-Nieves (Universidad de Alicante); and Ángela Coves-Soler (Universidad Miguel Hernández de Elche)

19:35-19:55 **Optimized Varactor Parasitic Modelling in the Millimeter-Wave Band**

Mario Pérez-Escribano (Universidad de Málaga); Ángel Palomares Caballero (IETR, Rennes, France); Pablo Padilla and Juan F. Valenzuela-Valdés (Universidad de Granada)

19:55-20:15 **Spatially Fed Array Optimization with Adaptive Templates**

Álvaro F. Vaquero, Marcos R. Pino, Manuel Arrebola and Fernando Las-Heras (Universidad de Oviedo)