



# GlobalEM 2024

Global Electromagnetics Conference

AT&T Conference Center • Austin, Texas USA

July 14 through 19, 2024

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# Welcome Message from the GlobalEM 2024 Conference Host

Dear Attendees,

On behalf of ETS-Lindgren, an international manufacturer of components and systems that measure, shield, and control electromagnetic and acoustic energy, we welcome you to the Global Electromagnetics (GlobalEM) Conference 2024 in Austin, Texas! Austin is the capital of the state of Texas and one of the fastest growing large cities in the United States since 2010. Located in Central Texas within the greater Texas Hill Country, it is home to numerous lakes, rivers, and waterways, including Lady Bird Lake and Lake Travis on the Colorado River, Barton Springs, and McKinney Falls. The city adopted “Silicon Hills” as a nickname in the 1990s due to a rapid influx of technology and development companies. Many Fortune 500 companies have headquarters or regional offices in Austin, including 3M, Advanced Micro Devices (AMD), Amazon, Apple, Facebook (Meta), Google, IBM, Intel, NXP Semiconductors, Oracle, Samsung, Tesla, and Texas Instruments. Austin is also known as “The Live Music Capital of the World” due to the city’s numerous live music venues downtown. Regarding education, Austin is the home of the University of Texas at Austin, one of the largest universities in the United States, with over 50,000 students. GlobalEM 2024 takes place at the impressive AT&T Hotel and Conference Center, located adjacent to the University of Texas at Austin.

The GlobalEM Conferences have a rich history and were held for the first time in 1978 as the Nuclear Electromagnetic Pulse Meeting (NEM) in Albuquerque, New Mexico, with the support of an eminent scientist in the electromagnetic field, the late Dr. Carl Baum, and the SUMMA Foundation that he established. NEM was renamed as the High-Power Electromagnetics Meeting or HPEM. When this meeting moved in 1994 to Bordeaux, France, it was renamed EUROEM and subsequently, the meetings in North America were called AMEREM. These meetings have been held every even year since 1978. In 2015, 2017, and 2019, the ASIAEM conferences were initiated in Jeju Island, Republic of Korea; Bengaluru, India; and Xi’An, China, respectively due to the increased number of papers from Asia. In 2022, the meeting moved to Abu Dhabi and was renamed GlobalEM, regardless of the Conference location.

We would like to take this opportunity to thank our dedicated technical program committee, the international scientific committee, our sponsors and exhibitors, as well as the Conference planning committee for their tremendous contributions to the success of GlobalEM 2024.

We hope you enjoy the deliberations at the sessions and opportunities to network with peers and industry experts. Thank you for joining us at GlobalEM 2024!



Janet O'Neil  
Conference Chair  
ETS-Lindgren



Joel Kellogg  
Conference Vice Chair  
ETS-Lindgren

# Welcome from the Technical Program Committee (TPC)

Dear Members of the HPEM Community,

On behalf of the Technical Program Committee (TPC), it is a pleasure to welcome you to GlobalEM 2024 in Austin, Texas, USA. The conference is technically sponsored by SUMMA Foundation and is organized by ETS-Lindgren in Cedar Park, Texas, USA. Janet O'Neil from ETS-Lindgren is the General Conference Chair. We have continued with our new name for our conference (GlobalEM), saying goodbye to our old friends: AMEREM, EUROEM, and ASIAEM. Hopefully the new name will remove any confusion about the constant changing of our conference name each year in the future.

We have planned an exciting technical program. In addition, we have several exhibitors presenting their products and services. HPEM (High-Power Electromagnetics) is an all-encompassing term consisting of lightning, HEMP, IEMI, and electromagnetic testing systems producing high-power EM fields in narrowband, mesoband, and hyperband conditions. This year we solicited papers in 17 topical areas, covering HPEM aspects of interest to researchers throughout the world. Each of the Technical Committees (TCs) has a Chair and a Vice Chair to solicit submissions and to review the papers and organize the sessions. Without the TCs help, it would be difficult to organize this conference.

We received 57 papers this year, which was lower than usual due to the slow recovery of travel after worldwide COVID travel restrictions and also due to visa issues. Of the submitted papers from 15 countries, the US submitted 24, the UK-6, Netherlands-4, South Korea-4, and UAE-4.

In addition to submitted papers, for the first time we have organized six half day tutorials presented by long term experts in our fields of interest. They will be presented Monday to Thursday in Grand Ballroom E of the AT&T Conference Center. Please see the listing in this program of the tutorials which will be of great interest to new and old members of our community.

As for the technical committee support, the OPENCONF paper review system worked well (operated by the TPC Vice Chair, Dr. Nicolas Mora), and the TC Chairs and Vice Chairs worked with the Chair and Vice Chair of the TPC to complete the review process and to organize the sessions, including session chairs. We are presenting a Best Student Paper Award, an Outstanding Young Scientist Award, new HPEM Fellow awards, and new members selected to receive the Carl E. Baum Memorial Medal. These awards will be presented on Wednesday evening at the end of the Gala dinner.

We hope you will find this to be a rewarding and interesting program. Please do take time to see the sights of Austin, Texas during your visit.

We expect to meet you all in 2025 at a location to be announced soon.



Dr. William Radasky  
GlobalEM 2024, Chair TPC



Dr. Nicolas Mora  
GlobalEM 2024, Vice Chair TPC

# Sponsors and Exhibitors

## Platinum



## Gold



## Silver



## Exhibitors



# Technical Committee

Name	TC	Short Title
Dave Giri	TC1	Sources/Antennas/Facilities
Bill Prather	TC1	Sources/Antennas/Facilities
Jean-Philippe Parmantier	TC2	Coupling/Structures/Cables
Jun Guo	TC2	Coupling/Structures/Cables
Anthony Wraight	TC3	Measurement Techniques
Lihua Shi	TC3	Measurement Techniques
Bill Radasky	TC4	IEMI Threats/Effects/Protection
Richard Hoad	TC4	IEMI Threats/Effects/Protection
Armin Kaelin	TC5	System Level Protection and Testing
Yanzhao Xie	TC5	System Level Protection and Testing
Farhad Rachidi	TC6	Lightning EM Effects/Measurement
Marcos Rubinstein	TC6	Lightning EM Effects/Measurement
Sergey Tkachenko	TC7	Analytic and Numerical Modeling
Shengquan Zheng	TC7	Analytic and Numerical Modeling
Lars-Ole Fichte	TC8	Bioeffects/Medical Applications of EM
Dave Giri	TC8	Bioeffects/Medical Applications of EM
Dave Giri	TC9	Antenna Design/Radiation
Everett Farr	TC9	Antenna Design/Radiation

# Technical Committee

Name	TC	Short Title
Chaouki Kasmi	TC10	Statistical Methods in HPEM
Lars-Ole Fichte	TC10	Statistical Methods in HPEM
Felix Vega	TC12	Explosive Devices - Effects and Protection
Edl Schamiloglu	TC12	Explosive Devices - Effects and Protection
Xiong Wu	TC13	EM Transients in UHV/EHV Transmission Lines and Substations
Bill Radasky	TC13	EM Transients in UHV/EHV Transmission Lines and Substations
Edward Savage	TC14	Influence of Geomagnetic Disturbances on Infrastructures
Edl Schamiloglu	TC15	Meta Materials for High-Power Applications
Zhuoyan Duan	TC15	Meta Materials for High-Power Applications
Jie Guo	TC16	Design of Protective Devices and Test Methods
Tao Liang	TC16	Design of Protective Devices and Test Methods
Bill Radasky	TC17	Evaluation of HEMP/IEMI Impacts on Critical Infrastructures
Yanzhao Xie	TC17	Evaluation of HEMP/IEMI Impacts on Critical Infrastructures
Richard Hoad	TC18	Standards for HPEM Protection
Tae-Heon Jang	TC18	Standards for HPEM Protection

# Venues for Conference Events

## Sunday, July 14, 2024

### Welcome Reception

Location: Interior Courtyard at the AT&T Conference Center  
Time: 6:00 pm to 7:30 pm

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## Monday, July 15, 2024

### Welcome and Technical Sessions

Location: Grand Ballrooms at the AT&T Conference Center  
Time: 9:00 am to 5:30 pm

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## Tuesday, July 16, 2024

### Tutorials and Technical Sessions

Location: Grand Ballrooms at the AT&T Conference Center  
Time: 9:00 am to 5:30 pm

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## Wednesday, July 17, 2024

### Tutorials, Plenary, and Technical Sessions

Location: Grand Ballrooms at the AT&T Conference Center  
Time: 9:00 am to 5:30 pm

### Gala Dinner

Location: Tejas Dining Room at the AT&T Conference Center  
Time: 6:30 pm to 9:30 pm

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## Thursday, July 18, 2024

### Tutorials and Technical Sessions

Location: Grand Ballroom at the AT&T Conference Center  
Time: 9:00 am to 5:30 pm

### Casual BBQ Get-Together Dinner

Location: Details Available at Registration  
Time: 6:30 pm to 9:30 pm

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## Friday, July 19, 2024

### Technical Tour

Location: ETS-Lindgren  
Time: 9:00 am to 2:00 pm



# Program

Monday, July 15, 2024

Time	Grand Ballroom C	Grand Ballroom D	Grand Ballroom E	
8:00 am - 9:00 am	Breakfast			
9:00 am - 10:30 am	Welcome Session 1 - Grand Ballroom C			
10:30 am - 11:00 am	Morning Break			
11:00 am - 12:30 pm	Welcome Session 2 - Grand Ballroom C: Keynote Presentation - "Advances in HPM Technologies", Gun-Sik Park			
12:30 pm - 2:00 pm	Lunch			
2:00 pm - 3:30 pm		TC 16 (32)	"Jaxon SPARTAN™ Shield Monitoring System", David Robley, Jim Youngman, Blake Smith	Tutorial 1: "Tutorial on Some Aspects of Intentional Electromagnetic Interference (IEMI)", D. V. Giri, Pro-Tech, USA
		TC 16 (46)	"Modelling Method to Evaluate Residual Stresses at Power Lines HEMP Protective Devices Output", Guillaume Mejecase, Jean-Pierre Adam	
3:30 pm - 4:00 pm	Afternoon Break			
4:00 pm - 5:30 pm		TC 17 (47)	"HEMP & the New Grid", Tobias Okech	Tutorial 1 (continued): "Tutorial on Some Aspects of Intentional Electromagnetic Interference (IEMI)", D. V. Giri, Pro-Tech, USA
		TC 17 (41)	"Building Resilience of the Electrical Grid to EMP and GMD", Plamen Doynov	
		TC 17 (48)	"Propagation of HEMP Conducted Disturbance Inside a Building Electrical Network", Laurine Curos, Isabelle Lachaud	

# Program

Tuesday, July 16, 2024 (Morning)

Time	Grand Ballroom C		Grand Ballroom D		Grand Ballroom E
8:00 am - 9:00 am	Breakfast				
9:00 am - 10:30 am	TC 01-1 (22)	"Collective Cherenkov Radiation Associated with Electron Beams and Amplification", Edl Schamiloglu, Alexander Figotin	TC 18 (25)	"Summary of Recent HPEM Standards Activities of IEC SC 77C", Richard Hoad, Barney Petit, Edl Schamiloglu, William Radasky	Tutorial 2: "Lightning: Basics, Incidence, and Location Techniques", Farhad Rachidi, EPFL, Switzerland and Marcos Rubinstein, Univ. of Applied Sciences and Arts, Switzerland
	TC 01-1 (51)	"Topology Optimization of an X-Band Cavity-Based Slow Wave Structure for Enhanced Bandwidth, Gain, and Efficiency", Moza Mohamed, Jane M. Lehr, Ernesto Neira, A. Elfrgani, Fernando Albarracin, Felix Vega, Chaouki Kasmi	TC 18 (24)	"Update of the IEC HEMP Environment Standard", William Radasky, Edward Savage	
			TC 18 (37)	"Reliability Test for HEMP Protection Filters", Taeheon Jang	
10:30 am - 11:00 am	Morning Break				
11:00 am - 12:30 pm	TC 01-2 (01)	"On the Response of Electrical Cables Excited by the Swiss Impulse Radiating Antenna", Dr. D. V. Giri, Dr. F. M. Tesche, Dr. Carlos Romero	TC 02 (19)	"Electromagnetic Wave Propagation through Cavity Backed Pinholes", Tom van Nunen	Tutorial 2 (continued): "Lightning: Basics, Incidence, and Location Techniques", Farhad Rachidi, EPFL, Switzerland and Marcos Rubinstein, Univ. of Applied Sciences and Arts, Switzerland
	TC 01-2 (56)	"A Compact Spiral Generator for High-Power Electromagnetic Systems", Aaasha AlAli, Gideon Nimo Appiah, Umar Hasmi, Hamad Deiban, Fernando Albarracin, Felix Vega, Chaouki Kasmi	TC 02 (05)	"Transmission-line Transformers Having Irrational Effective Turns Ratios", James McLean	
	TC 01-2 (57)	"Experimental Tests of a 300-kV PFN-Marx Generator for Low Impedance Loads", Umar Hashmi, Aaasha AlAli, Gideon Nimo Appiah, Hamad Deiban, Fernando Albarracin, Felix Vega, Chaouki Kasmi	TC 07 (10)	"Direct Current Mode Stirred - Simulation Results for an Open Coaxial Return Rig", Alexander Schoisl, Markus Rothenhaeusler, Martin Schwarz	

# Program

Tuesday, July 16, 2024 (Afternoon)

Time	Grand Ballroom C		Grand Ballroom D		Grand Ballroom E
12:30 pm - 2:00 pm	Lunch				
2:00 pm - 3:30 pm	TC 01-3 (43)	"The 30m Elliptic Swept CW Antenna at Tinker AFB OK", Jory Cafferky, Garland Anderson, John Semands, William Prather	TC 07-2 (17)	"A Technique for Coherent Distributed Wireless Power Transfer to a Non-Communicative Receiver", Barnabas Petit, Richard Hoad, Cain Stokes	Tutorial 3: "EM Background for EM Coupling Assessment on Complex Systems", Jean-Philippe Parmantier, ONERA/DEMR, University de Toulouse, F-31055, Toulouse, France
	TC 01-3 (26)	"Long Range Wireless Power Transfer - An Application for High Power Electromagnetics", Richard Hoad, Barney Petit	TC 07-2 (18)	"Refining Stochastic Green's Function with Short-Orbit Contributions", Sangrui Luo, Zhen Peng	
	TC 01-3 (50)	"Semiconductor Switches for High Power Applications Research Lines at the University of New Mexico", Nicolas Gonzalez, David Oh Smith, Jane Lehr	TC 07-2 (39)	"High-Frequency Electromagnetic Field Coupling to Infinite Single and Double Helical Wires", Sergey Tkachenko, Felix Middelstaedt, Ralf Vick, Carlos Romero	
3:30 pm - 4:00 pm	Afternoon Break				
4:00 pm - 5:30 pm	TC 01-4 (08)	"Relativistic Magnetron With TE <sub>11</sub> Output Mode Using Upstream Cavity Walls", Frans Nyberg, Pablo Vallejos, Mattias Elfsberg, Alan Aliyali, Tomas Hurtig	TC 08 (16)	"Safety Advantages of Distributed Transmissions", Barnabas Petit, Richard Hoad, Prem Sonigra	Tutorial 3 (continued): "EM Background for EM Coupling Assessment on Complex Systems", Jean-Philippe Parmantier, ONERA/DEMR, University de Toulouse, F-31055, Toulouse, France
	TC 01-4 (15)	"Magnetron operating frequency change due to cathode expansion effect by the electron layer", Dong-Hyun Oh, Jung-Hoon Han	TC 13 (45)	"FDTD Simulation of Voltages Induced on Secondary Circuits in a Substation Owing to Switching Surges", Akiyoshi Tatematsu, Kensuke Teramoto, Daiki Tashiro	
	TC 01-4 (58)	"A 700 Watts Amplifier System For L-Band Applications", Bharathidasan Sugumaran, Oliver Silva, Wajid Khattak, Abdul Baba, Mae Almansoori, Felix Vega, Chaouki Kasmi			

# Program

Wednesday, July 17, 2024

Time	Grand Ballroom C		Grand Ballroom D		Grand Ballroom E
8:00 am - 9:00 am	Breakfast				
9:00 am - 10:30 am	Plenary 1 - Grand Ballroom C: "CenterPoint Energy's RDSM Program: Strengthening Grid Resilience with Adaptable Deployment Strategies", Eric Easton, Ryan Marietta "Revisiting the Design Ideas Behind the Mitigation of Conducted HEMP and IEMI", Sergio N. Longoria				
10:30 am - 11:00 am	Morning Break				
11:00 am - 12:30 pm	Plenary 2 - Grand Ballroom C: "Santis Lightning Research Facility: Recent Developments and Findings", Farhad Rachidi, Marcos Rubinstein "The Most Ambitious Radio Astronomy Endeavor of the 21st Century? EMC in a Large-scale Project", Howard Reader				
12:30 pm - 2:00 pm	Lunch				
2:00 pm - 3:30 pm	TC 09 (12)	"Simple Mathematical Models of Reflector IRAs with 2-Arm and 4-Arm Feeds", Everett Farr	TC 10-1 (06)	"High Level Electromagnetic Susceptibility: A Practical Answer Using Machine Learning", Mario Echeverri Bautista, Peter Zwamborn	Tutorial 4: "Principles and Application of Protection Devices for HPEM Purposes", Armin W. Kaelin, EMProtec AG, Switzerland
			TC 10-1 (33)	"Development of Bayesian Component Failure Models in E1 HEMP Grid Analysis", Niladri Das, Ross Guttromson, Tommie A. Catanach	
			TC 10-1 (14)	"Fusion of Parameterized and Physics-oriented Statistical Surrogate Models for EM Coupling on Wires in Complex Enclosures", Shen Lin, Zhen Peng	
3:30 pm - 4:00 pm	Afternoon Break				
4:00 pm - 5:30 pm	TC 12 (59)	"Enhanced Landmine Discrimination from GPR Data using AI-based Algorithms", Alejandro Rangel, Fabian Ruiz, Cesar Pedraza, Felix Vega, Lucuiano Prado, Mae Mansoori, Sultan Ghazal, Asilah Almesmari, Oggine Lapuz, Chaouki Kasmi	TC 10-2 (44)	"Experimentally Testing the Time Domain Random Coupling Model within a Complex Scattering System", Isabella Giovannelli, Steven Anlage, Thomas Antonsen	Tutorial 4 (continued): "Principles and Application of Protection Devices for HPEM Purposes", Armin W. Kaelin, EMProtec AG, Switzerland
	TC 12 (34)	"High-Resolution Time Reversal MUSIC for Enhanced Landmine Localization", Hamidreza Karami, Marcos Rubinstein, Farhad Rachidi, Carlos Romero, André Koch			



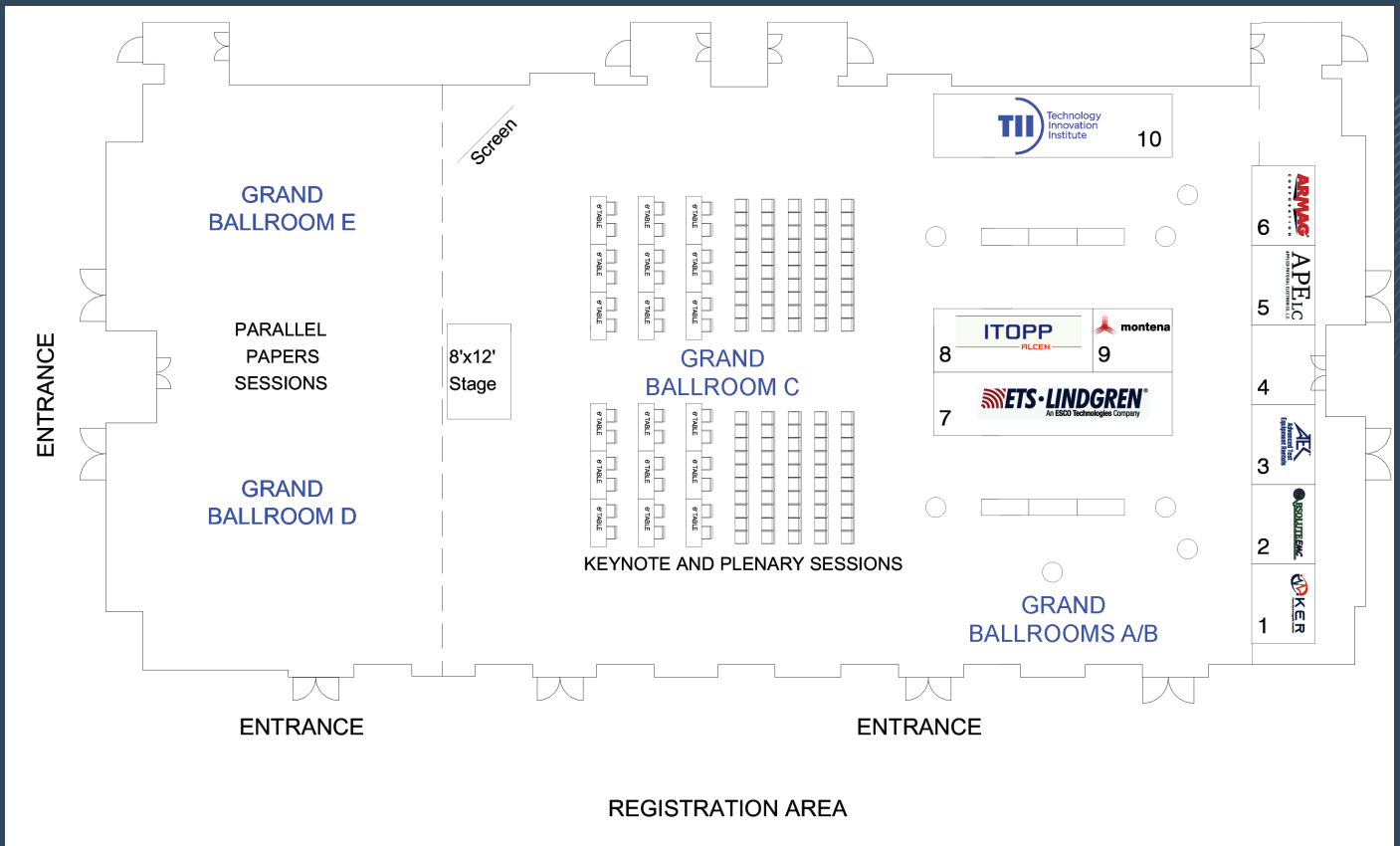
Time	Grand Ballroom C		Grand Ballroom D		Grand Ballroom E
8:00 am - 9:00 am	Breakfast				
9:00 am - 10:30 am	TC 05-1 (23)	"Protection of High Voltage Power Grids from the High Altitude Electromagnetic Pulse (HEMP)", William Radasky, Edward Savage	TC 04-1 (40)	"Characterization of the Wave Propagation Generated by an Indoor EMP Simulator", Ali Yaqoob, David Martinez, Hamad AlYahyaee, Islem Yahi, Felix Vega, Chaouki Kasmi	Tutorial 5: "Status and Development of New Sources for Producing HPEM Fields", Edl Schamiloglu, Distinguished Professor of Electrical and Computer Engineering, University of New Mexico, Albuquerque, New Mexico
	TC 05-1 (20)	"Design of a HEMP Protection Power Filter To Meet MIL-STD-188-125-1A", Sergio Longoria	TC 04-1 (55)	"Evolution of CenterPoint Energy's Resilient Digital Substation Module (RDSM): Enhancing Reliability and Efficiency through Design Innovations", Ryan Marietta, Eric Easton	
	TC 05-1 (49)	"Adding EMP Hardening to EMC Filters", Bektas Colak, Jane M. Lehr	TC 04-1 (35)	"Immunity of LNAs to Bursts of RF Pulses", Andrea Anzellotti, Roeland Kooij, Peter Zwamborn	
10:30 am - 11:00 am	Morning Break				
11:00 am - 12:30 pm	TC 05-2 (21)	"Design of a 10 kbps and 128 kbps Data Filter with HEMP Protection", Sergio Longoria			Tutorial 5 (continued): "Status and Development of New Sources for Producing HPEM Fields", Edl Schamiloglu, Distinguished Professor of Electrical and Computer Engineering, University of New Mexico, Albuquerque, New Mexico
	TC 05-2 (42)	"Protection of LV and MV Electrical Grids with Solid-State Transformers", Plamen Doynov			
12:30 pm - 2:00 pm	Lunch				
2:00 pm - 3:30 pm	TC 03-1 (31)	"Vector Transfer Functions for Extrapolating System Currents", Jonathan Morrow-Jones, Heather Jiles, Michael Bak, William Linzey			Tutorial 6: "Resilience and Protection of Critical Infrastructure from HPEM Environments", Richard Hoad, QinetiQ Ltd, Farnborough, Hampshire, United Kingdom
	TC 03-1 (09)	"Direct Current Mode Stirred – A New Approach For The Correction Factor", Markus Rothenhaeusler, Martin Schwarz, Alexander Schoisl			
3:30 pm - 4:00 pm	Afternoon Break				
4:00 pm - 5:30 pm	TC 03-2 (29)	"Controlling the Coupling of Plane Wave to Microstrip Mounted on the TEM/GTEM Wall in Radiated Immunity Testing", Adrian Sutinja, Scott Haydon			Tutorial 6 (continued): "Resilience and Protection of Critical Infrastructure from HPEM Environments", Richard Hoad, QinetiQ Ltd, Farnborough, Hampshire, United Kingdom
	TC 03-2 (36)	"Towards Low-Cost Single-Port Imaging of Reflective Targets with a Resonant Metasurface", Elias Le Boudec, Farhad Rachidi, Felix Vega, Hamidreza Karami, Marcos Rubinstein			

# Poster Sessions

Wednesday, July 17, 2024

Time		Grand Ballrooms A/B (Exhibits Area)
8:00 am - 5:30 pm <i>Posters will be displayed all day.</i> <i>Authors will be present during the breaks and lunch.</i>	(07)	"Estimating Radiation from Pulsed Power Sources", Roeland Kooij, Mario Echeverri Bautista, Peter Zwamborn
	(13)	"Effect of Composite Absorbers Placed on Aperture Side within Enclosure on Shielding Effectiveness", Jong Hwa Kwon, Chang Hee Hyoung, Jung Hwan Hwang, Hyun Ho Park
	(17)	"Experiments with 6-Cavity S-Band (A6) Relativistic Magnetron", Andrey Andreev, Edl Schamiloglu
	(28)	"Simulations of 8-Cavity X-Band Relativistic Magnetron", Andrey Andreev, Edl Schamiloglu

# Technical Program and Exhibitor Locations







[ets-lindgren.com](https://ets-lindgren.com)