GlobalEM
2026

GlobalEM 2026

2026 Global Electromagnetics Symposium



Preliminary Program Guide

June 29 – July 3, 2026
Yonsei University
Seoul, Korea

Organized By
The Korean Institute of Electromagnetic Engineering and Science
SUMMA Foundation

Contents

Welcome Message

On behalf of the Organizing Committee, it is my great pleasure to welcome you to GlobalEM 2026, an international conference dedicated to high-power electromagnetics (HPEM) and electromagnetic security technologies.

GlobalEM has long served as a premier forum where researchers, engineers, and practitioners from around the world come together to exchange ideas, share innovative research, and foster collaboration in this rapidly evolving field.

We are especially pleased to host GlobalEM 2026 in Korea, a country at the forefront of technological innovation in electromagnetics. This conference will provide an excellent opportunity to engage in cutting-edge scientific discussions while also experiencing Korea's dynamic research environment and rich cultural heritage.

As the importance of electromagnetic resilience, high-power systems, and emerging security challenges continues to grow, GlobalEM 2026 aims to serve as a timely platform for addressing these critical issues and exploring future directions.

We have prepared an exciting program featuring keynote and plenary sessions, as well as tutorials and workshops, designed to inspire new ideas and strengthen global collaboration within the community.

I sincerely hope that you will find GlobalEM 2026 both rewarding and memorable, and I look forward to welcoming you in Korea.

General Chair
Prof. Jong-Gwan Yook
Yonsei University

Conference Overview

History of the Conference

GlobalEM is the unified international symposium series dedicated to high-power electromagnetics (HPEM), bringing together researchers, engineers, and practitioners to advance the understanding of HPEM sources, environments, effects, protection, and emerging applications. The series traces its origins to 1978, when the late Carl Baum organized the first Nuclear Electromagnetic Pulse Meeting (NEM) in Albuquerque, New Mexico, supported by the SUMMA Foundation, which he had founded earlier. The inaugural meeting attracted scientists and engineers from the United States and Western Europe and established a strong technical foundation for the community.

As the field matured, the NEM meeting evolved into the High-Power Electromagnetics Meeting (HPEM) and expanded in both scope and participation. In 1994, when the symposium was held in Bordeaux, France, it adopted the name EUROEM. Subsequent meetings held in North America became known as AMEREM, and the symposia have continued to take place every even-numbered year, maintaining a consistent biennial tradition.

In 2015, the growing number of high-quality contributions from Asia led to the establishment of the first ASIAEM Conference in Jeju, Republic of Korea, followed by successful meetings in India and China. In 2022, reflecting the truly global nature of the community, the symposium series was unified under a single name—GlobalEM—after the meeting in Abu Dhabi, UAE. The series continues as GlobalEM 2024 in Austin, Texas, and will remain known as GlobalEM going forward. The next meeting, GlobalEM 2026, will be hosted at Yonsei University in Seoul, Republic of Korea, further strengthening international collaboration and expanding the symposium's global footprint.

Conference Organizer

The Korean Institute of Electromagnetic Engineering and Science
https://www.kiees.or.kr/

SUMMA Foundation
https://ece-research.unm.edu/summa/

International Academic Partners

Nara Institute of Science and Technology
（奈良先端科学技術大学院大学）

Xi'an Jiaotong University
（西安交通大学）

University of New Mexico

Zhejiang University
（浙江大学）

Past Conferences

Year	Conference	Venue	Chairman	Remark
1978	NEM	Albuquerque, New Mexico, USA	Carl E. Baum	1st NEM
1980	NEM	Anaheim, California, USA	Gene E. Morgan	
1982	NEM	Albuquerque, New Mexico, USA	Carl E. Baum	
1984	NEM	Baltimore, Maryland, USA	Louis F. Libello	
1986	NEM	Albuquerque, New Mexico, USA	Rober L. Gardner	
1988	NEM	Menlo Park, California, USA	Werner Graf	
1990	NEM	Albuquerque, New Mexico, USA	Michael G. Harrison	
1992	NEM	Chicago, Illinois, USA	Piergiorgio L.E. Uslenghi	
1994	EUROEM	Bordeaux, France	Dominique J. Serafin	1st EUROEM
1996	AMEREM	Albuquerque, New Mexico, USA	Shyam H. Gurbaxani	1st AMEREM
1998	EUROEM	Tel Aviv, Israe	Joseph Shiloh	
2000	EUROEM	Edinburgh, Scotland, UK	Paul D. Smith and David M. Parkes	
2002	AMEREM	Annapolis, Maryland, USA	Terence J. Wieting	
2004	EUROEM	Magdeburg, Germany	Jurgen Nitsch	
2006	AMEREM	Albuquerque, New Mexico, USA	Donald McLemore	
2008	EUROEM	Lausanne, Switzerland	Farhad Rachidi	
2010	AMEREM	Ottawa, Canada	Lot Shafai	
2012	EUROEM	Toulouse, France	Jean-Philippe Parmantier	
2014	AMEREM	Albuquerque, New Mexico, USA	Edl Schamiloglu	
2015	ASIAEM	Jeju, Republic of KOREA	Yanzhao Xie and C.S. Huh	1st ASIAEM
2016	EUROEM	London, UK	Richard Hoad	
2017	ASIAEM	Bangalore, India	Dave Giri	
2018	AMEREM	Santa Barbara, California, USA	William Radasky	
2019	ASIAEM	Xi'an, China	Yanzhao Xie	
2022	GlobalEM	Abu Dhabi, UAE	Chaouki Kasmi	1st GlobalEM
2024	GlobalEM	Austin, Texas, USA	Janet O'Neil	2nd GlobalEM
2026	GlobalEM	Seoul, Republic of KOREA	Jong Gwan Yook	3rd GlobalEM

Note: Nuclear Electromagnetic Pulse Meeting (NEM)

Conference Committee

General Chair	Jong-Gwan Yook (Yonsei University)
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Publication Chairs	Jung-Hoon Han (Korea Aerospace University) Sun K. Hong (Soongsil University)
Exhibition Chair	Eakhwan Song (Kwangwoon University)
Exhibition Co-Chairs	Jae-Hyun Park (I-Spec) Jeong-Hee Jin (KER) Dong-Ki Yoon (Reflex)
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International Relation Chair	Janet O'Neil (ETS-Lindgren)
Secretary	Han-Chul Shin (RAPA)

Program at a glance

1st Day | June 29 (Mon), 2026

Time	Main Contents					Remark
	Track 1	Track 2	Track 3	Ground Ballom	The Commons	
13:00 - 17:00	등록				Exhibition Preparation	
13:00 - 17:00	Workshop	Workshop	Tutorial			
18:00 - 20:00	Welcome Reception					

2nd Day | June 30 (Tue), 2026

Time	Main Contents					Remark
	Track 1	Track 2	Track 3	Ground Ballom	The Commons	
09:00 - 18:00	Registration					
09:00 - 09:30				Opening Ceremony	Exibition Day #1	
09:30 - 12:00				Invited Talk		
12:00 - 13:30	Lunch					
13:30 - 14:50	TS Tue1-1	TS Tue1-2	AS 1			
14:50 - 15:20	Break & Tea Time					
15:20 - 17:40	TS Tue2-1	TS Tue2-2	AS 2			
14:00 - 17:00					Poster Session #1	

3rd Day | July 1 (Wed), 2026

Time	Main Contents					Remark
	Track 1	Track 2	Track 3	Ground Ballom	The Commons	
09:00 - 18:00	Registration					
08:30 - 10:10	TS Wed1-1	TS Wed1-2	TS Wed1-3		Exibition Day #2	
10:10 - 10:40	Break & Tea Time					
10:40 - 12:00				Plenary Session #1		
12:00 - 13:30	Lunch					
13:30 - 14:50	TS Wed2-1	TS Wed2-2	TS Wed2-3			
14:50 - 15:20	Break & Tea Time					
15:20 - 16:40				Plenary Session #2		
14:00 - 17:00					Poster Session #2	
18:00 - 21:00	Gala Dinner					

4th Day | July 2 (Thu), 2026

Time	Main Contents					Remark
	Track 1	Track 2	Track 3	Ground Ballom	The Commons	
09:00 - 18:00	Registration					
08:30 - 10:10	TS Thu1-1	TS Thu1-2	TS Thu1-3		Exibition Day #3	
10:10 - 10:40	Break & Tea Time					
10:40 - 12:00				Plenary Session #3		
12:00 - 13:30	Lunch					
13:30 - 14:50	TS Thu2-1	TS Thu2-2	TS Thu2-3			
14:50 - 15:20	Break & Tea Time					
15:20 - 17:40	TS Thu2-1	TS Thu2-2	TS Thu2-3			
14:00 - 17:00					Poster Session #3	

5th Day | July 3 (Fri), 2026

Time	Main Contents					Remark
	Track 1	Track 2	Track 3	Ground Ballom	The Commons	
09:00 - 13:00	Registration					Technical Tour
09:00 - 12:00	Workshop	Tutorial				
12:00 - 13:30	Lunch					
13:30 - 14:00	Closing Ceremony					

Major Programs

- Keynote Speech
- Plenary Session
- Workshop/Tutorial

Keynote Speech

Keynote Speech Program

Date: June 30 (Tue), 2026 **Location: Grand Ballroom, The Commons, Yonsei University**

ID	Presentation Title	Speaker
Key#1	Advancing High Power Microwave Capabilities for an Evolving Threat Environment	David C. Stoudt, Ph.D. (Directed Energy Professional Society)
Key#2	Artificial Intelligence-Accelerated Directed Energy	Edl Schamiloglu, Ph.D. (University of New Mexico)
Key#3	Distributed Analytical Representation and Iterative Technique (DARIT) for the Transient Analysis of Large-Scale Multiconductor Transmission Lines	Yan-zhao XIE (Xi'an Jiaotong University, XJTU)

Keynote Speech #1

Title	Advancing High Power Microwave Capabilities for an Evolving Threat Environment
Speaker	David C. Stoudt, Ph.D.
Affiliation	Directed Energy Professional Society
Position	Executive Director and Fellow

Abstract

The global security environment is being reshaped by the rapid proliferation of unmanned systems, autonomous platforms, and low-cost, high-volume drone swarms. Recent conflicts, including the war in Ukraine, have demonstrated that inexpensive unmanned aerial systems can impose disproportionate operational, psychological, and logistical burdens on modern forces. These threats are evolving faster than traditional defensive architectures can adapt, demanding engagement solutions that are scalable, have deep-magazines, and are effective across diverse operational contexts.

High Power Microwave (HPM) weapons present a compelling response to this challenge. Unlike kinetic interceptors or laser systems—whose effects are visible and intuitive—HPM systems operate through electromagnetic coupling to disrupt, degrade, or permanently damage electronic subsystems. Against unmanned systems that depend on fragile electronics, such effects can be decisive. Yet the invisible, probabilistic nature of HPM interactions has historically limited operational understanding and institutional confidence among warfighters, acquisition leaders, and policymakers.

This keynote will examine the current maturity of HPM technologies and outline the actions required to accelerate their transition from specialized research to fielded capability. It will emphasize the need for operator-relevant metrics that translate complex electromagnetic phenomena into mission-focused outcomes; rigorous and repeatable testing across representative targets and environments; coherent policy and legal frameworks that normalize HPM employment alongside kinetic and other directed-energy systems; and integrated modeling, simulation, and decision-support tools that help warfighters visualize effects and plan engagements with confidence.

Bridging the gap between technical sophistication and operational comprehension is now imperative. By aligning research, testing, policy, and strategic communication, the HPM community can deliver capabilities that are not only technically credible, but trusted, employable, and strategically decisive. This address will issue a call to action for the global EM community to accelerate progress, unify efforts, and ensure that HPM systems mature at a pace commensurate with the threats they are designed to counter.

Biography

Dr. David Stoudt serves as Executive Director and Fellow of the Directed Energy Professional Society (DEPS), where he leads the organization's strategic direction and operations. He previously served as a Senior Executive Advisor and Engineering Fellow for Directed Energy at Booz Allen Hamilton (2016–2025) and as President of DEPS (2018–2024).

Dr. Stoudt completed a distinguished 32-year career in the Department of the Navy, including service as the Navy's first Distinguished Engineer for Directed Energy and Senior Director for Capabilities and Concepts in the Office of the Deputy Under Secretary of the Navy. In these roles, he developed the Navy's vision, strategy, and roadmap for directed-energy weapons and established leading-edge programs, personnel, and facilities at Naval Surface Warfare Center in Dahlgren, Virginia. In 2005, he led the development and operational deployment of high-power microwave counter-IED systems in support of Operation Iraqi Freedom—marking the first successful tactical employment of directed energy weapons.

He holds B.S. (summa cum laude), M.S., and Ph.D. degrees in Electrical Engineering from Old Dominion University.

Keynote Speech #2

Title	Artificial Intelligence-Accelerated Directed Energy
Speaker	Edl Schamiloglu, Ph.D.
Affiliation	University of New Mexico
Position	Professor

Abstract

The field of High-Power Microwaves (HPM) or Directed Energy Microwaves is in its sixth decade following its inception in the late 1960s. During its first 25 years or so the growth of the field was termed the "power derby." This period was characterized by researchers in the US and the Soviet Union pushing the envelope in terms of HPM power generated. The devices researched during this period were primarily oscillators. Then, following the end of the cold war in December 1991, the power derby basically ended as "pulse shortening" became an immediate research priority. During this period, the power levels being generated were so high that the output pulse-lengths could not sustain the powers without a breakdown occurring. At the same time, the fidelity of virtual prototyping (particle-in-cell simulations) had advanced to the extent that virtual prototyping now leads the HPM source design paradigm, replacing the experimentalists. This period also witnessed the increasing internationalization of HPM research with China today playing a leading role. In the early 2020s, interest in HPM research broadened from the L-to-X-band range to go as high as Ka-band. In addition, HPM amplifiers became of great interest. In recent developments, the US Department of Defense (DOD) released its list of top 6 priorities in November 2025. These are Applied Artificial Intelligence (AI), Biomanufacturing, Contested Logistics Technologies, Quantum and Battlefield Information Dominance, Scaled Directed Energy, and Scaled Hypersonics. This presentation will describe the University of New Mexico's efforts pertaining to AI-Accelerated Directed Energy, focusing on Directed Energy Microwaves (HPM).

Biography

Edl Schamiloglu was born and raised in The Bronx, New York City, USA. He received his B.S. and M.S. degrees from Columbia University, New York, NY, and his Ph.D. from Cornell University, Ithaca, NY. He joined the University of New Mexico as an Assistant Professor in 1988, where he is currently Distinguished Professor. He is the Director of the Directed Energy Center at the University of New Mexico (DEC@UNM). He is a Fellow of the IEEE, a Fellow of the American Physical Society, and a SUMMA Foundation Fellow.

Keynote Speech #3

Title	Distributed Analytical Representation and Iterative Technique (DARIT) for the Transient Analysis of Large-Scale Multiconductor Transmission Lines
Speaker	Yan-zhao XIE
Affiliation	Xi'an Jiaotong University (XJTU)
Position	Professor

Abstract

This talk traces the evolution of the Distributed Analytical Representation and Iterative Technique (DARIT)—an analytical framework developed over the past 15 years for the transient analysis of multiconductor transmission line (MTL) systems subjected to electromagnetic disturbances. In modern electronic platforms—from automotive and aerospace systems to very-large-scale integration (VLSI) circuits—MTL bundles often comprise dozens or even hundreds of densely packed interconnects. In such large-scale configurations, assessing the impact of transient electromagnetic interference becomes increasingly challenging, as conventional modeling approaches can become computationally expensive with growing conductor count.

DARIT offers an alternative perspective: by decoupling an N-conductor system into N independent single-line iterative processes, it achieves a significant reduction in computational complexity while preserving physical accuracy. The presentation will guide the audience through key milestones in the framework's development, spanning its original formulation for frequency-domain crosstalk analysis, extension to radiated field coupling problems, successive algorithmic refinements for improved efficiency, and adaptation to time-domain analysis—enabling the handling of nonlinear terminal loads.

The talk will particularly highlight a recent advancement: DARIT-auto, which automates high-order analytical derivations for more iteration steps, addressing challenges in algebraic complexity that previously limited the framework's applicability. Looking ahead, we will discuss ongoing efforts toward macromodel extraction and the integration of DARIT-based solvers into commercial EDA tools, with the goal of facilitating industry-ready EMC verification solutions.

Biography

Yan-zhao Xie is a Professor with the School of Electrical Engineering, Xi'an Jiaotong University, China. Since 2016, he has served as the Director of the National Center for International Research on Transient Electromagnetics and Applications (TEA). In 2010, he was elected to EMP Fellow for his contributions to EMP interaction, modeling, and measurement. He further received the Carl Baum Memorial Medal in 2019. He served as the General Chair of the ASIAEM in 2015 (Jeju Island, Korea) and again in 2019 (Xi'an, China), as well as the General Chair of the IEEE Global Electromagnetic Compatibility Conference (GEMCCon) in 2020 (Xi'an, China). His research interests include electromagnetic compatibility, electromagnetic transients in power systems, high-power electromagnetics, and time-reversal techniques, etc.

Plenary Session

Plenary Session Program

ID	Presentation Title	Speaker
PS #1	Advances in Infrastructure Protection: Cost-Effective Resilience in the Age of Electromagnetic Conflict	Dr. Carlos Romero (Armasuisse, Switzerland)
PS #2	Risk Based Electromagnetic Protection	Dr. Martin Schaarschmidt (WIS, Germany)
PS #3	HPEM in Controlled Fusion Facilities	Prof. Cui Meng (Zhejiang University)
PS #4	Research on laser plasma based electromagnetic pulse generation using intense femtosecond laser pulses	Dr. HyungTaek Kim (GIST, RoK)
PS #5	EMC as a Foundation of Hardware Security: Toward Electromagnetic Security by Design	Prof. Yuichi Hayashi (NAIST, Japan)
PS #6	TBD	Dr. Felix Vega (TII DERC, UAE)

Plenary Speech #1

Title	Advances in Infrastructure Protection: Cost-Effective Resilience in the Age of Electromagnetic Conflict
Speaker	Dr. Carlos Romero
Affiliation	armasuisse Science and Technology (Swiss Federal Office for Defence Procurement), Switzerland
Position	Senior Scientific Project Manager; Head, WTK – NEMP Laboratory, Spiez

Abstract

Modern societies depend on tightly coupled electrical and digital infrastructures. Recent conflicts, most visibly the war in Ukraine, have shown how rapidly electromagnetic (EM) effects can translate into operational impact: jamming and spoofing of GNSS, disruption of communications, vulnerability of UAV/UGV ecosystems, and cascading consequences when power and timing are stressed. At the same time, classical "more metal everywhere" hardening is increasingly limited by cost, maintenance burden, and the pace of system upgrades.
These plenary addresses infrastructure protection as a system problem: how to achieve resilient function under a diverse threat ensemble (HEMP/NEMP, HPEM, IEMI, lightning, and high-density RF environments) while controlling lifecycle cost. The talk connects validated EM theory to engineering decisions at scale, electrical grids and substations, platform and facility interfaces, cable/harness networks, and critical services, emphasizing: (i) system coupling-path dominance and interface failure modes, (ii) electromagnetic topology and decomposition into measurable/processable subproblems, (iii) systems of systems hardening designed for maintainability, (iv) probabilistic resilience (not single-scenario pass/fail), and (v) verification strategies that combine measurement, reduced-order models, and uncertainty bounds.
keywords: electromagnetic topology; coupling networks; topology; electric infrastructure; resilience; uncertainty quantification; surrogate modelling;

Biography

Dr. Carlos Romero is an electromagnetics engineer and Senior Scientific Project Manager at armasuisse Science and Technology, where he heads the WTK – NEMP Laboratory in Spiez and TC Chair. His work focuses on system-level resilience against strong EM environments (HEMP/NEMP, HPEM, IEMI and related conducted/radiated effects), combining measurement, modeling and verification methods for platforms, facilities and critical infrastructure.
Carlos in an electrical engineer, working for his PhD in the lightning and EMC research laboratory of Prof. Farhad Rachidi at EPFL, contributing to the Säntis lightning research facility and its long-term database of directly measured lightning currents and associated electromagnetic fields, building modern statistical foundations that support protection engineering.
After EPFL, he moved to industry and worked on high-voltage pulsed-power systems and wideband E/H-field instrumentation for HPEM/NEMP testing. Since 2018, he is with armasuisse (Swiss Army) has led and supported national and international activities in EM protection, test capability and standardization. He is an IEEE EMC Society Senior Member and a Summa Foundation HPEM Fellow. Outside engineering, he is an avid reader who enjoys poetry, from Hafez and Walt Whitman to Japanese haiku.

Plenary Speech #2

Title	Risk Based Electromagnetic Protection
Speaker	Dr. Martin Schaarschmidt
Affiliation	Bundeswehr Research Institute for Protective Technologies and CBRN Protection
Position	Head of Electromagnetic Effects and HPEM

Abstract

Traditional rule-based electromagnetic protection frameworks aim to ensure system functionality by defining predictable electromagnetic environments, particularly effective for threats like nuclear electromagnetic pulse (NEMP), where field characteristics over large areas are relatively uniform.
However, this approach faces significant limitations when addressing non-nuclear high-power microwave (HPM) threats, which are highly variable and depend on complex, scenario-specific parameters—including adversary capabilities, operational contexts, and tactical objectives. These uncertainties challenge the efficacy of rigid, one-size-fits-all standards, necessitating a paradigm shift toward adaptive, risk-informed methodologies.
Recent advancements in civilian applications have demonstrated the viability of risk-based electromagnetic protection as a robust alternative. By integrating probabilistic modeling, threat assessment, and system-specific vulnerability analyses, it enables tailored mitigation strategies that balance operational requirements with risk tolerance. This approach acknowledges the dynamic nature of (intentional) electromagnetic interference threats, accounting for variables such as emission sources, propagation paths, and system susceptibility.
Building on this foundation, we present recent efforts of the military sector to adopt similar principles to develop coherent standards that guide project managers in ensuring safe equipment operation. These frameworks emphasize scenario-driven risk evaluation, incorporating both quantitative metrics (e.g., waveforms, exposure distances) and qualitative factors (e.g., mission criticality, adversary capabilities). Such standards aim to harmonize protection requirements with evolving operational demands, fostering resilience against emerging threats while avoiding over-engineering.
We will explore the theoretical underpinnings of risk-based protection, its practical implementation in civilian and military contexts, and the ongoing efforts to standardize risk-informed electromagnetic protection. By bridging the gap between traditional rule-based approaches and modern risk management, it offers a flexible, future-ready solution to safeguard critical systems in an increasingly complex electromagnetic threat landscape.

Biography

Martin Schaarschmidt received the Diploma degree in physics from Technical University Berlin, Berlin, Germany, in 2003, and the Ph.D. degree in quantum field theory of semiconductors in 2006. Since 2006, he has been with the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) and joined the Microwave simulation group of the Bundeswehr Research Institute for Protective Technologies and CBRN-Protection (WIS), Munster, Germany, in 2008. From 2012 to 2013, he headed the Balanced Nuclear Protection and Hardening group and, from 2013 to 2016, the Scientific Computing group. Since 2016, he is the Head of the Electromagnetics Effects and HPEM branch, WIS. His research interests include qualification and protection of military equipment against high-power electromagnetics (HPEM), protection against intentional electromagnetic interference, risk management for complex systems, fast pulsed power sources, and fast transient high field pulse measurement.

Plenary Speech #3

Title	HPEM in Controlled Fusion Facilities
Speaker	Cui Meng
Affiliation	Zhejiang University
Position	Professor

Abstract

High-power electromagnetic pulse (HPEM) environments present significant electromagnetic interference challenges to the safe and stable operation of controlled fusion facilities. This paper provides an overview of the complex HPEM environments and effects in both magnetic confinement fusion (MCF) and laser inertial confinement fusion (ICF) facilities. In MCF devices such as tokamaks, plasma and coil currents generate strong stray magnetic fields, while high-voltage switching operations in systems like Marx generators contribute to the electromagnetic environment. The primary focus is on ICF facilities, where intense laser-target interactions generate super thermal electrons that escape the target chamber and excite broadband electromagnetic pulses (Electron-EMP) in the interior of the target chamber. Furthermore, the intense X-rays produced during fusion burn interact with facility structures, inducing various classes of electromagnetic pulses. When X-rays irradiate cables directly, they generate Cable-SGEMP. When X-rays interact with the target chamber cavity, they produce three distinct effects: External-SGEMP and Cavity-SGEMP from interactions with the outer and inner cavity surfaces respectively, and Source Region EMP (SREMP) in the target chamber room due to X-rays penetrating the chamber wall. Switching operations in the energy storage area further contribute to the overall electromagnetic environment. Understanding these complex and interrelated HPEM generation mechanisms is essential for developing effective electromagnetic shielding and protection strategies for next-generation fusion reactors.

Biography

Cui Meng, Qiushi Distinguished Professor and Doctoral Supervisor at Zhejiang University, Director of the "Research Center for Electromagnetic Risk Assessment" at Zhejiang University, HPEM Fellow, Technical Expert of IEC-SC77C, Associate Editor of IEEE Transactions on Nuclear Science (IEEE-TNS), Council Member of the Radiation Physics Branch of the Chinese Nuclear Society, Expert Committee Member of the Special Power Supply Branch of the China Power Supply Society, Expert Committee Member of the Electromagnetic Technology Branch of the China Ordnance Society, and Expert Committee Member of the Complex Radiation Field Branch of the China Ordnance Society. Main research interests include the mechanism and effects of electromagnetic pulse environments excited by transient ionizing radiation, and research on quantitative assessment techniques for high-power electromagnetic environment effects.

Plenary Speech #4

Title	EMC as a Foundation of Hardware Security: Toward Electromagnetic Security by Design
Speaker	Yuichi Hayashi
Affiliation	Nara Institute of Science and Technology (NAIST)
Position	Professor

Abstract

Information security is implemented across multiple layers, from applications and protocols to networks. However, the ultimate root of trust resides in hardware; once this physical foundation is compromised, upper-layer protections can no longer guarantee security. This structural dependency closely parallels a fundamental principle of electromagnetic compatibility (EMC): reliable system operation requires electromagnetic integrity at the hardware level. In this sense, information security and EMC share a common philosophy—security by design and EMC by design—both requiring that physical-layer considerations be incorporated from the earliest stages of system architecture.

This plenary lecture focuses on electromagnetic security (EMSEC), a critical security challenge at the intersection of hardware security and electromagnetic compatibility. Electromagnetic-mediated threats are first organized into a three-part taxonomy consisting of Direct Emission (DE), Carrier-Coupled Emission (CCE), and Actively Induced Emission (AE), and their underlying mechanisms are discussed. Hardware-level security has been addressed through a variety of approaches spanning software, algorithms, cryptographic protocols, and hardware design. However, many existing countermeasures remain dependent on specific algorithms, implementations, or protocols. In contrast, mitigation based on established EMC technologies directly addresses electromagnetic phenomena at the physical layer and therefore provides strong versatility independent of higher-layer algorithms or protocols.

The lecture further highlights that conventional EMC techniques—including EMI suppression, shielding, and EMC-based protection—can function not only as tools for compliance and reliability but also as effective countermeasures against malicious physical attacks on hardware. In addition to information leakage through compromising emanations, the talk addresses the emerging threat of combined electromagnetic attacks, in which compromising emanations interact with intentional electromagnetic interference (IEMI) to create new vulnerabilities. By bridging EMC and information security, this plenary lecture proposes a new role for the EMC community in enabling resilient and secure next-generation electronic systems.

Biography

Yuichi Hayashi is a Professor at Nara Institute of Science and Technology. His research focuses on electromagnetic compatibility and hardware security, particularly electromagnetic information leakage and physical-layer security. He is the Chair of the EM Information Leakage Subcommittee in the IEEE EMC Society Technical Committee 5 and serves as a member of the IEEE EMC Society Board of Governors. He has received numerous awards and honors, including the IEEE International Symposium on Electromagnetic Compatibility Best Symposium Paper Award, the IEEE Electromagnetic Compatibility Society Technical Achievement Award, the EMC Japan/APEMC Okinawa Excellent Paper Award, the Richard B. Schulz Best Transactions on EMC Paper Award, and the EMC Europe Best Paper Award.

Plenary Speech #5

Title	**Research on laser plasma based electromagnetic pulse generation using intense femtosecond laser pulses**
Speaker	Hyung Taek Kim
Affiliation	Advanced Photonics Research Institute / Gwangju Institute of Science and Technology
Position	Head Research Scientist Director of Research Center for Plasma Applications with Ultra-intense Lasers (PAUL center)

Abstract

Electromagnetic pulses (EMP) generated in ultra-intense laser–plasma experiments are widely recognized as a major source of interference in experimental diagnostics and electronic systems. These emissions can disrupt data acquisition, introduce significant noise in detectors, and occasionally cause failures in nearby electronic equipment. As a result, previous efforts have primarily focused on technical mitigation strategies such as electromagnetic shielding, grounding optimization, and detector protection. However, comparatively limited attention has been given has been given to the fundamental characteristics of EMP generation and the broader electromagnetic phenomena associated with laser–plasma interactions.

This presentation discusses the formation of plasma in ambient air induced by ultra-intense laser pulses and the resulting laser filamentation and generation of radiations. By examining the interaction between laser-produced plasma with air media or solid targets, we investigate the mechanisms responsible for plasma filamentation, x-ray generation, and electromagnetic pulse emission. In this presentation, we also propose that, beyond mitigating unwanted EMP effects, laser-generated plasma in air could provide opportunities for controlling electromagnetic phenomena. In particular, laser-induced plasma structures could potentially enable applications such as electromagnetic wave guiding and lightning guiding, suggesting various possibilities for future research and technological development involving laser–plasma interactions in air.
This research was supported by the Challengeable Future Defense Technology Research and Development Program through the Agency For Defense Development(ADD) funded by the Defense Acquisition Program Administration(DAPA) in 2026(No.915107201)

Biography

Hyung Taek Kim is the Head Research Scientist at the Advanced Photonics Research Institute (APRI) of the Gwangju Institute of Science and Technology (GIST) and the Director of the Research Center for Plasma Applications with Ultra-intense Lasers (PAUL Center). He also serves as the Laser Plasma Group Leader at the Center for Relativistic Laser Science (CoReLS), Institute for Basic Science (IBS). Dr. Kim is one of the leading experimental physicists in Korea working in the field of ultra-intense laser–plasma interactions. His research focuses on laser wakefield acceleration, laser-driven electron acceleration, and the generation of ultrashort radiation sources such as X-rays and gamma rays using high-power lasers. At CoReLS, IBS, he currently leads laser–plasma acceleration experiments utilizing a multi-petawatt laser system. Recently, he has also been actively pursuing research on applying ultra-intense laser–plasma technologies to electromagnetic pulse (EMP) generation and related applications for the neutralization of electronic devices.

Workshop & Tutorial

WS/TU Program

WS/TU ID	Time	WS/TU Title	Organizer
WG#1	June 29 (Mon)	EMP, HEMP, and IEMI Threats—Theory, Mitigation, and Standards	Janet O'Neil (ETS-Lindgren, USA) Yuichi Hayashi (NAIST, Japan)
WG#2	July 3 (Fri)	High Power Microwave Sources	EunMi Choi (UNIST, Republic of KOREA)
WG#3	July 3 (Fri)	Sensing-based Physical Artificial Intelligence	Jun Han (KAIST, Republic of KOREA)
TU#1	June 29 (Mon)	Resilience and Protection of Critical Infrastructure from HPEM Environments	Richard Hoad (QinetiQ, UK)
TU#2	June 29 (Mon)	Overview of HPEM Sources, Antennas and Applications across Various Frequency Bands	Dave Giri (Pro-Tech, USA)

WS#1 EMP, HEMP, and IEMI Threats—Theory, Mitigation, and Standards

WS/TU ID	WS#1
Title	EMP, HEMP, and IEMI Threats—Theory, Mitigation, and Standards
Session Organizer	Janet O'Neil / ETS-Lindgren Yuichi Hayashi / NAIST
Session Description	This workshop addresses the growing risks posed by Intentional Electromagnetic Interference (IEMI) and High-Altitude Electromagnetic Pulse (HEMP) to modern electronic systems and critical infrastructure. As the availability of disruptive sources increases and systems become more vulnerable, even partial failures can severely impact public life. The session begins with "Theory Behind EMP/HEMP/IEMI: Causes, Effects, History, and Standards," offering foundational insights into electromagnetic pulse phenomena. "Lightning, HEMP and General Pulse Mitigation Strategies" explores practical countermeasures, followed by "Protection Implementation with Filters, Filter Testing and Grounding," which presents hands-on techniques for shielding sensitive electronics. "Intentional Electromagnetic Interference as a Physical Layer Security Threat to Electronic Systems" highlights how externally injected electromagnetic disturbances can threaten information security and discusses practical countermeasures, while "HEMP Measurement Techniques IEC 61000-4-24" introduces standardized approaches for evaluating system resilience. Participants will gain a comprehensive understanding of both traditional and modern protection strategies, including resilience engineering and functional safety. The workshop concludes with an update on evolving industry standards, equipping attendees with actionable knowledge to safeguard infrastructure against electromagnetic threats. Speakers and their corresponding affiliations are active technical contributors to the industry standards committees, including IEC SC77C, as well as members of IEEE EMC Society TC-5 on High Power Electromagnetics.

Presenter #1

Identification	WS #1-1
Title	Theory Behind EMP/HEMP/IEMI: Causes, Effects, and History
Speaker	Garth D'Abreu
Affiliation	ETS-Lindgren
Position	Director, Automotive Solutions

Abstract

The currents and voltages induced in electronic circuits by EMP and other high-energy natural or man-made sources can have catastrophic effects on vulnerable equipment, and these risks have been recognized for several decades. In this presentation, we will take a high-level look at several of these high-energy sources and introduce the mitigation and protection methods available for both conducted and radiated threats. The design of protection systems is critical for any application, and mistakes or gaps in understanding the threat, the system architecture, or the selection of components can easily compromise overall effectiveness.

Biography

Garth D'Abreu is the Director of Automotive Solutions at ETS-Lindgren, based at the company's corporate headquarters in Cedar Park, Texas. He has primary responsibility for design and development within the Systems Engineering group, specializing in turnkey solutions for Automotive EMC, Wireless, and OTA test integration.

He serves as ETS-Lindgren's subject matter expert for the research and development of reverberation chambers and GTEM cells, and he also supports the RF filters, EMP applications, and wireless device test systems teams. His extensive experience aligns well with the diverse measurement techniques and chamber design considerations required for modern Automotive EMC, antenna measurement, and wireless system testing.

Mr. D'Abreu is a Senior Member and past Distinguished Lecturer of the IEEE EMC Society, and an active participant in standards development through the U.S. ISO and CISPR D automotive EMC committees, as well as the ANSI C63.25 committee. He has more than 35 years of experience in the RF industry.

He holds a BSc in Electronics & Communications Engineering from North London University, UK.

Presenter #2

Identification	WS #1-2
Title	EMP Hardened Infrastructure: Considerations for Shield Effectiveness and Shielding Components
Speaker	Sanjay Singh
Affiliation	ETS-Lindgren
Position	Managing Director, ETS Lindgren India

Abstract

Building on the previous topic, "Theory Behind EMP/HEMP/IEMI: Causes, Effects, History, and Standards," this presentation will focus on the fundamental considerations for Shielding Effectiveness and the key shielding components involved in developing EMP-hardened infrastructure. It will also briefly compare the requirements of an EMP-hardened facility with those of an EMC test chamber. Drawing on my experience across multiple EMP projects—and the challenges encountered along the way—I aim to keep the discussion engaging and address questions from attendees with practical, real-world insights.

Biography

Sanjay Singh is the Managing Director of ETS-Lindgren Engineering India Pvt. Ltd., a role he has held since February 2014. He joined the organization after completing 20 years of distinguished service in the Indian Navy, where he held technical leadership positions overseeing Electronics, Sensors, Power Generation and Distribution, Fire Control Systems, Radars, and Communications.

With more than three decades of experience, he has led teams across operations and maintenance, project management, sales and marketing, equipment induction, risk mitigation, testing, procurement, and contract management.

His current areas of focus include MIL-STD and commercial test chambers, EMP hardening of critical infrastructure, and instrumentation for EMI/EMC compliance testing across Electronics, Automotive, Medical Devices, OTA Wireless, and Antenna testing domains.

He is an alumnus of the Indian Institute of Technology Delhi (M.Tech), Jamnalal Bajaj Institute of Management Studies (Executive MBA), and the National Defence Academy.

Presenter #3

Identification	WS #1-3
Title	Lightning, HEMP and General Pulse Mitigation Strategies
Speaker	Tobias Okech
Affiliation	MPE Limited
Position	Senior Engineer

Abstract

This presentation reviews generalized mitigation strategies for lightning and high-altitude electromagnetic pulse (HEMP) environments for control lines. A theoretical framework is developed and applied to practical approaches ranging from clamping devices to multi-stage filters. A three-layer mitigation concept is proposed, and the efficacy and limitations of the approach are discussed.

Biography

Tobias Okech is a Senior Engineer at MPE Limited, based in Liverpool, United Kingdom. He earned his BSc in Physics and his MSc in Radiometrics Modeling and Instrumentation from the University of Liverpool in 2008 and 2010, respectively.

Tobias began his career in software engineering and data science before transitioning into instrumentation, working at a mass spectrometry company on magnetic-sector ICP-MS systems. His expertise in electronics, amplifiers, and detector modeling enabled him to advance into development engineering and project management, where he contributed a steady stream of technical improvements across several product lines, including RF and EMP power, signal, and data-line filters.

His current research interests include the use of specialized software for digital IIR and FIR filter design to deepen his understanding of the theoretical foundations of filter technology.

Presenter #4

Identification	WS #1-4
Title	Intentional Electromagnetic Interference as a Physical Layer Security Threat to Electronic Systems
Speaker	Yuichi Hayashi
Affiliation	Nara Institute of Science and Technology (NAIST)
Position	Professor

Abstract

Intentional Electromagnetic Interference (IEMI) is a critical physical-layer attack vector that threatens information security. This tutorial explores how injected electromagnetic fields compromise system integrity and confidentiality without physical access. We detail how targeted IEMI causes data-dependent faults to bypass security, corrupts communication buses for command injection, and enables information leakage. Through experimental case studies, we prove the real-world viability of these threats. Finally, we analyze adversarial models and present hardware and system-level countermeasures. Ultimately, this tutorial aims to bridge the EMC and hardware security communities and to outline directions for robust defenses for next-generation cyber-physical systems.

Biography

Yuichi Hayashi is a Professor at Nara Institute of Science and Technology. His research interests include electromagnetic compatibility and hardware security. He is the Chair of the EM Information Leakage Subcommittee in IEEE EMC Society Technical Committee 5 and serves as a member of the IEEE EMC Society Board of Governors. He has received numerous awards and honors, including the IEEE International Symposium on Electromagnetic Compatibility Best Symposium Paper Award (2013), the IEEE Electromagnetic Compatibility Society Technical Achievement Award (2021), and the Richard B. Schulz Best Transactions on EMC Paper Award (2024).

Presenter #5

Identification	WS #1-5
Title	HEMP Measurement Techniques IEC 61000-4-24
Speaker	TaeHeon Jang
Affiliation	I-Spec
Position	Convenor, IEC SC77C MT 61000-4-24 Executive Director, I-Spec Co., Ltd.

Abstract

This presentation provides a comprehensive overview of the measurement techniques defined in IEC 61000-4-24 for evaluating the performance of HEMP protection devices and combination filters. The standard outlines test facilities, procedures, and performance criteria essential for ensuring system resilience against early-time, intermediate-time, and conducted electromagnetic pulse threats.

The presentation explains test methods for protective components such as GDTs, MOVs, and two-port SPDs, emphasizing the use of controlled fixtures, proper impedance matching, and accurate measurement of residual current and voltage. A major focus is the Pulsed Current Injection (PCI) method used to assess HEMP combination filters, including verification of test levels, characterization of double-exponential waveforms, and procedures for capturing peak values, rise time, and root action.

The session also introduces measurement techniques for RF antenna-port protectors, addressing front-door coupling mechanisms and frequency-dependent test waveforms such as double-exponential pulses and damped sinusoids. Key performance criteria, residual limits, and post-test functional checks are discussed to support consistent and repeatable evaluations.

Finally, the presentation highlights future directions for IEC 61000-4-24 and IEC 61000-5-5, including expanding the scope to broader conducted disturbances, establishing standardized test methods for RF limiters, and addressing the growing need for post-installation and in-service verification of HEMP filters. Participants will gain a practical and technically grounded understanding of how to apply IEC 61000-4-24 in both laboratory and field environments to ensure robust electromagnetic protection.

Biography

TaeHeon Jang is the Convenor of IEC TC77C MT 61000-4-24, leading the international revision of the HEMP combination-filter test standard. He has made long-standing technical contributions to IEC SC77C, particularly in developing and advancing test methods for HEMP protection devices. In recognition of his leadership, he received the IEC 1906 Award for his contributions to SC77C projects and his technical leadership in HEMP combination-filter test methods. He currently serves as Executive Director at I-Spec Co., Ltd., continuing to support global standardization efforts in high-power electromagnetics and EMC.

WS#2 High Power Microwave Sources

WS/TU ID	WS#2
Title	High Power Microwave Sources
Session Organizer	EunMi Choi / UNIST
Session Description	This session focuses on recent progress in HPM source development, system integration, and experimental validation, with an emphasis on bridging classical device physics with modern computational work. Topics include high power microwave oscillators and amplifiers such as BWOs, MILO, TWT, and gyrotrons, pulsed power, beam-wave interaction, and measurement techniques. HPM research for in-house code development will be also covered.

Presenter #1

Identification	Workshop#3-1
Title	HPM Sources: Gyrotrons, Theory and Experiments and Applications
Speaker	EunMi Choi
Affiliation	UNIST
Position	Professor

Abstract

This presentation provides a technical overview of gyrotrons within the High-Power Microwave (HPM) regime. Based on the Electron Cyclotron Resonance Maser (ECRM) principle, gyrotrons generate high-power radiation in the millimeter-wave and terahertz (THz) spectra by utilizing the relativistic azimuthal grouping of electrons. These devices bridge the operational gap between conventional vacuum electronics and optical sources.
The discussion details the physical mechanisms of wave-particle interactions, specifically addressing mode selection and stability in overmoded resonant cavities. Furthermore, the talk examines applications in magnetic confinement fusion (ECH/ECCD), high-resolution spectroscopy (DNP-NMR), and long-range radar systems.

Biography

EunMi Choi is a professor in department of electrical engineering at Ulsan National Institute of Science and Technology (UNIST). She is currently leads the THz Vacuum Electronics and Applied Electromagnetics (TEE) laboratory as a principle investigator since 2010. Her main contribution in the field includes high power vacuum electronics development (gyrotrons, TWTs, etc) and its application for nuclear fusion plasma heating and current drive, remote detection of radioactive materials experimentally, and energy recirculating microfabricated vacuum electronics amplifier source development. Her current research interests span from development of electron beam based high power millimeter and THz sources, ultra-compact THz sources at 300 GHz and beyond by means of micro-fabrication techniques, orbital angular momentum (OAM) beams generation for communication system and exotic electromagnetic waves generation, to their possible applications in novel technique in remote detection of radioactive materials, and plasma interaction with exotic electromagnetic waves.

Presenter #2

Identification	Workshop#3-2
Title	HPM Sources: BWO, MILO, Pulsed Power, etc
Speaker	Sun-Hong Min
Affiliation	AICT (Advanced Institutes of Convergence Technology)
Position	

Abstract

High-power microwave (HPM) sources based on relativistic electron beams remain essential platforms for generating gigawatt-level microwave radiation in pulsed regimes. This workshop will provide a focused tutorial on the physics, design, and experimental validation of HPM oscillators driven by intense electron beams, with particular emphasis on backward wave oscillators (BWOs), magnetically insulated line oscillators (MILOs), and associated pulsed power technologies. The session will begin with a concise review of beam–wave interaction physics in slow-wave structures, including dispersion engineering, synchronism conditions, and nonlinear saturation mechanisms in relativistic regimes. Special attention will be given to beam instabilities that influence mode competition, efficiency, and spectral stability. Practical design considerations for BWO and MILO systems will be discussed, covering slow-wave structure optimization, impedance matching, magnetic insulation, and output coupling strategies.

A dedicated segment will address pulsed power drivers for HPM sources, including pulse forming networks, Marx generators, and high-voltage switching technologies. The interplay between pulse shaping, beam quality, and microwave generation efficiency will be analyzed from both theoretical and experimental perspectives. Measurement techniques for gigawatt-class microwave characterization—such as calibrated antenna diagnostics, attenuation chains, and time-resolved spectral analysis—will also be introduced.

By bridging classical vacuum electronic device theory with modern numerical modeling and experimental validation, this tutorial aims to provide participants with a systematic understanding of HPM source development. The session is designed for researchers and engineers working on advanced electromagnetic systems who seek both foundational insight and practical guidance for next-generation HPM platforms.

Biography

Sun-Hong Min received the Ph.D. degrees in physics from the Department of Physics and Astronomy, Seoul National University (SNU), Seoul, 2013. He has studied high-power microwaves (HPM), mm-waves and THz vacuum electronics device (VED), pulse power machine, and radiation physics, over the past 20 years. His main fields for VEDs are BWO, MILO, klystron, magnetron, and cyclotron. He used to work as a Postdoctoral Researcher with the Center for THz-Bio Application System, Seoul National University, Seoul, from 2013 to 2015. He worked as a Senior Researcher with Korea Institute of Radiological and Medical Science (KIRAMS) from 2015 to 2023. He currently works as a Principal Researcher with Center for Applied Electromagnetic Research, Advanced Institutes of Convergence Technology (AICT), Suwon-si, Gyeonggi-do 16229, Republic of Korea since 2023.

Presenter #3

Identification	Workshop#3-3
Title	HPM Sources Code Development
Speaker	Dong-Yeop Na
Affiliation	POSTECH
Position	Professor

Abstract

This session presents the fundamentals of an electromagnetic particle-in-cell algorithm coupled with a finite-element time-domain field solver on irregular meshes. The method is based on differential geometry and discrete exterior calculus, ensuring consistent discretization of Maxwell's equations, exact charge conservation, and structure preservation.

Biography

Dr. Dong-Yeop Na is an Assistant Professor in the Department of Electrical Engineering at Pohang University of Science and Technology (POSTECH), where he has led the Applied Computational Electromagnetics (ACEM) Laboratory since August 2022. His research centers on computational classical and quantum electrodynamics. In particular, his current interests include discrete exterior calculus–based particle-in-cell algorithms for high-power microwave device modeling; secondary electron emission and multiscale interactions between circuits and high-energy plasma systems; ultra-wideband, numerically stable FEM solvers based on the A-Phi potential and generalized Lorenz gauge; numerical frameworks for open and dissipative quantum-optical systems; LEO-to-ground propagation modeling based on 3D atmospheric refractivity reconstruction from numerical weather prediction data; and optimization of metasurface-based asymmetric IR-transparent passive radiative cooling systems.

WS#3 Sensing-based Physical Artificial Intelligence

WS/TU ID	WS#3
Title	Sensing-based Physical Artificial Intelligence
Session Organizer	Jun Han / KAIST
Session Description	The proposed workshop, Sensing-based Physical Intelligence, targets the emerging convergence of electromagnetic sensing, acoustic sensing, optical/vision sensing, and AI-driven perception for cyber-physical intelligence. The objective is to explore how diverse sensing modalities—ranging from RF signals (mmWave radar, Wi-Fi CSI, RF imaging), to acoustic and vibration sensing, to optical and vision-based systems—can jointly enable machines to perceive, reason about, and interact with the physical world in real time. The session will cover sensing fundamentals, multimodal signal processing, machine learning pipelines for physical inference, system integration, and security and privacy implications of pervasive sensing. This workshop is original in framing sensing not as isolated sensing technologies but as a unified foundation for Physical Intelligence: the ability of machines to understand environments, human behavior, and hidden physical states through heterogeneous physical signals. The proposal is timely given rapid advances in edge AI, low-power sensing hardware, multimodal foundation models, and growing demand for robust perception in privacy-sensitive, low-visibility, or infrastructure-constrained environments. The impact on the EMC community is significant. It expands EMC from compatibility and interference mitigation toward enabling reliable, trustworthy multimodal sensing systems operating in complex electromagnetic environments. Beyond EMC, the session fosters cross-disciplinary collaboration spanning AI, robotics, security, human-computer interaction, and smart infrastructure, accelerating applications in public safety, healthcare, smart spaces, and next-generation human–machine interaction.

Presenter #1

Identification	WS#3-1
Title	(1) Weapon Detection in Public Sapces via Metasurface-based mmWave Imaging
Speaker	Sihun Yang
Affiliation	KAIST
Position	Ph.D. Student

Abstract

The increasing incidence of armed violence, such as stabbings and active shootings, in crowded public spaces highlights an urgent need for widely deployable weapon detection systems. Detecting concealed weapons requires precise imaging, rather than simple metal detection, to distinguish weapons from everyday metallic items. However, existing imaging systems, such as airport body scanners, rely on costly hardware and require cooperative subjects to pause during the scanning process. Consequently, these systems are confined to controlled checkpoints with explicit queuing, hindering large-scale deployment.

In this talk, I will present a low-cost, walk-through weapon detection system utilizing a commodity mmWave radar paired with a passive metasurface. The core idea of our system is to employ a transmissive metasurface that spatially encodes the reflection map of the scene, enabling the reconstruction of the target image from limited mmWave measurements without requiring costly hardware or mechanical scanning. To translate these measurements into high-fidelity images, we incorporate a physics-informed diffusion model to generate target images consistent with the reflected mmWave signals, allowing the system to infer the concealed object's shape and type.

Preliminary simulation results suggest our system achieves a spatial resolution of up to several wavelengths, even for moving targets. Finally, this talk will detail remaining challenges, concluding with a discussion of future work for deployment in public spaces.

Biography

Sihun Yang is a Ph.D. student in Computer Science at KAIST, advised by Prof. Jun Han. His research interest lies at the intersection of wireless sensing and mobile/sensing systems. His work focuses on developing physics-informed sensing systems that extend commodity wireless platforms into robust machine perception, enabling pervasive sensing intelligence.

Presenter #2

Identification	WS#3-2
Title	(2) Acoustic-based Activity Recognition
Speaker	Gyuyeon Kim
Affiliation	KAIST
Position	Ph.D. Student

Abstract

Monitoring everyday events in the home can help computational systems provide timely assistance without requiring constant user effort. However, existing solutions involve important trade-offs. Cameras introduce privacy concerns, and wearables depend on consistent use and regular charging. Tag-based approaches are often more practical, but many require periodic battery replacement, depend on non-ubiquitous transceivers, or need multiple receivers per room because of limited sensing range.

In this talk, I will present AcousTag, a batteryless, 3D-printed tag that can be sensed by widely deployed smart speakers such as Amazon Echo Dots to detect interactions with hinged or sliding objects from a distance. AcousTag includes two main technical contributions: (1) a batteryless tag design that harvests motion energy to produce unique, identifiable acoustic reflections, and (2) a receiver-side software system that retrofits commodity smart speakers to detect these reflections in real time, enabling room-scale sensing and differentiation of multiple object interactions.

We evaluate AcousTag through real-world deployments across two homes, where it achieves an average activation accuracy of over 94%. We also show that tags can be detected at distances up to 11 m, while remaining robust during multi-speaker operation and simultaneous tag activations.

Biography

Gyuyeon Kim is a Ph.D. student in Computer Science at KAIST, advised by Prof. Jun Han. His research interest lies in cyber-physical systems, sensing intelligence, and mobile/IoT systems. His work focuses on building practical sensing systems that use commodity hardware and physics-informed methods to solve real-world problems. He has received an ACM HotMobile Best Poster Award.

Presenter #3

Identification	WS#3-3
Title	(3) Vision-based Counterfeit Food Product Detection
Speaker	Jonghyuk Yun
Affiliation	KAIST
Position	Ph.D. student

Abstract

The prevalence of counterfeit infant formulas poses serious threats to infant health and safety, a concern highlighted by the notorious Melamine Milk Scandal that affected hundreds of thousands of children. The primary challenge in detecting counterfeit formulas lies in their sophisticated adulteration and substitution techniques. Such detection is feasible only in laboratory settings, making it nearly impossible for average consumers to test the formula before feeding their infants. In this talk, I will present PowDew, a novel and practical system that enables counterfeit infant formula detection using only a commodity smartphone. PowDew operates by capturing and analyzing the interaction of a water droplet with the powdered formula, focusing on the droplet motion, namely its spreading and penetration. Our key insight is that the droplet motions are governed by powder-specific properties such as wettability and porosity. PowDew analyzes the subtle differences in droplet motions and infers the formula's authenticity. To demonstrate PowDew's effectiveness, we implement PowDew and conduct comprehensive real-world experiments under varying conditions with different brands of powdered infant formula and adulterants. Our extensive real-world evaluation, comprising 12,000 minutes of video recordings across various brands of authentic and altered infant formulas under different conditions, demonstrates that PowDew achieves a detection accuracy of up to 96.1%.

Biography

Jonghyuk Yun is a Ph.D. student at the Sensing Intelligence and Cyber-Physical Security (CyPhy) Lab at KAIST, advised by Prof. Jun Han. His research focuses on the novel use of sensors in mobile environments to address challenges in public safety. In particular, he is interested in developing solutions for public safety by augmenting physics-based models and integrating diverse sensing modalities, with an emphasis on commodity mobile devices and real-world deployment. He has received multiple awards at top-tier mobile and sensing venues, including the Best Paper Award at ACM MobiSys, as well as the Best Poster Award at ACM SenSys and ACM HotMobile.

TU#1 Resilience and Protection of Critical Infrastructure from HPEM Environments

WS/TU ID	TU#1
Title	Resilience and Protection of Critical Infrastructure from HPEM Environments
Session Organizer	Richard Hoad / QinetiQ Ltd.
Session Description	This tutorial will introduce or reappraise the audience with the need for and the potential solutions for HPEM resilience and protection of critical infrastructure assets. We will provide an overview of relevant transient HPEM 'threat' environments including High altitude Electromagnetic Pulse (HEMP) and Intentional Electromagnetic Interference (IEMI) environments. We will describe what critical infrastructure is and how it has particular challenges, which could make it vulnerable to HPEM environments. Finally, we will discuss some practical protection solutions and introduce the concept of moving towards a resilience based, rather than protection-dominated, approach to HPEM threat mitigation. We will reference published information such as the standards of International Electrotechnical Commission (IEC) 77C and, in particular, the newly published IEC standard 61000-5-6. We will also reference other relevant authoritative documents and provide a bibliography for further reading.

Presenter #1

Identification	TU#1-1
Title	Resilience and Protection of Critical Infrastructure from HPEM Environments
Speaker	Richard Hoad
Affiliation	QinetiQ Ltd.
Position	Chief Engineer

Abstract

This tutorial will introduce or reappraise the audience with the need for and the potential solutions for HPEM resilience and protection of critical infrastructure assets. We will provide an overview of relevant transient HPEM 'threat' environments including High altitude Electromagnetic Pulse (HEMP) and Intentional Electromagnetic Interference (IEMI) environments. We will describe what critical infrastructure is and how it has particular challenges, which could make it vulnerable to HPEM environments. Finally, we will discuss some practical protection solutions and introduce the concept of moving towards a resilience based, rather than protection-dominated, approach to HPEM threat mitigation.
We will reference published information such as the standards of International Electrotechnical Commission (IEC) 77C and, in particular, the newly published IEC standard 61000-5-6. We will also reference other relevant authoritative documents and provide a bibliography for further reading.

Biography

Richard is Chief Engineer for Directed Energy Weapons and Resilience (DEWR) at QinetiQ UK Ltd. Richard provides strategic oversight and leadership of QinetiQ's DEWR Technical capability; where a capability is defined as people/skills, facilities & tools, Technology and partnerships.
He has undertaken many years of research studying emerging disruptive threats to military and Critical Infrastructure assets, particularly for high impact low likelihood events. He has helped operators of mission critical and essential services understand their risk to novel Electromagnetic threats and has developed tools, techniques and products which support improved resilience of military systems and the Critical Infrastructure.
Richard is the author of over 90 peer reviewed technical and journal papers on the topics above and is co-author of a book titled 'HPEM effects on electronic systems'. He is a Fellow of the Institute of Engineering and Technology (IET), registered with the Engineering Council UK (ECUK) as a Chartered Engineer (C.Eng.) a HPEM Fellow of the SUMMA foundation; a QinetiQ Senior Fellow; and a Member of the Register of Security Engineers and Specialists. In 2022 Richard received the prestigious Carl Baum Medal.

TU#2 Overview of HPEM Sources, Antennas and Applications across Various Frequency Bands

WS/TU ID	TU#2
Title	Overview of HPEM Sources, Antennas and Applications across Various Frequency Bands
Session Organizer	D. V. Giri, Ph.D., Pro-Tech, Wellesley, MA 02481, USA and University of New Mexico
Session Description	One way to classify HPEM Environments is based on the bandwidth. This classification has resulted in 4 bands. It is noted that, of all the HPEM environments, natural lightning signal is the only environment occurring in nature. The rest are all created by mankind. In this tutorial, we will describe examples of many existing HPEM sources across all bands along with appropriate radiating systems for each of these sources. One of the bands, called the hyperband has at least 2 decades of frequencies (ex: 40 MHz to 4000 MHz) and has both civilian and military applications which will also be presented.

Present #1

Identification	TU#3-1
Title	Classification of HPEM Environments: Narrowband Sources and Antennas
Speaker	Dr. D. V. Giri
Affiliation	Pro-Tech, Wellesley, MA 02481, USA and University of New Mexico
Position	Scientist

Abstract

We introduce the 4-band classification of HPEM signals and then launch into a description of Narrowband High-Power Microwave systems along with appropriate antennas. It is noted that GW level sources are possible in the L Band and several 100s of MW of pulsed microwaves can be produced with adverse effects on electronic systems, Typical sources are relativistic Magnetrons, Vircators and Reltrons. Operating principles of such sources will be described along with appropriate radiating systems. Methods to calculate near, intermediate and far fields will be presented. Many examples of such facilities and their capabilities will be described.

Biography

Dr. Giri has over 50 years of work experience in the general field of electromagnetic theory and its applications in NEMP (Nuclear Electromagnetic Pulse), HPM (High-Power Microwaves), Lightning, and UWB (Ultra-Wideband). A complete description of his academic training and work experience may be seen at his website: www.dvgiri.com
He obtained the B.Sc., Mysore University, India, (1964), B.E., M.E., Indian Institute of Science, (1967) (1969), M.S., Ph.D., Harvard University, (1973) (1975),
Certificate, Harvard Introduction to Business Program, (1981).
Since 1984, he is a self-employed consultant doing business as Pro-Tech, performing R&D work for U.S. Government and Industry.
He is also an Adjunct Professor in the Dept. of ECE, University of New Mexico, Albuquerque, NM.
Dr. Giri has taught graduate and undergraduate courses in the Dept. of EECS, University of California, Berkeley campus.

LIFE FELLOW of IEEE,
Inducted into IEEE EMC Society Hall of Fame 2022
Member of Commission B, URSI
International Chairman of Commission E, URSI.
Was an Associate Editor for the IEEE Transactions on EMC
URSI and SUMMA Foundation FELLOW
IEEE EMC Society Distinguished Lecturer (2020-2021)
First Recipient of Carl Baum Medal (2017)
International Chair, Commission E, URSI (2014-2017)
IEEE John Kraus Antenna Awardee (2006)
Adjunct Professor, Dept. of ECE, University of New Mexico

Books
1) High-Power Microwave Systems and Effects published by Taylor and Francis in 1994.
2) High-Power Electromagnetic Radiators: Nonlethal Weapons and Other Applications published by Harvard University Press in 2004.
3) High-Power Electromagnetic Effects on Electronics was published by Artech in 2020.

Present #2

Identification	TU#3-2
Title	Moderate Band HPEM Sources and Antennas
Speaker	D. V. Giri, Ph.D.
Affiliation	Pro-Tech, Wellesley, MA 02481, USA and University of New Mexico
Position	Scientist

Abstract

Moderate band of frequencies are defined by a percentage bandwidth (pbw) in the range of 1 to 100%. Damped sinusoidal sources meet this requirement. In this presentation, we will describe ways of generating damped sinusoidal waveforms and energize helical antennas.
Many such systems have been developed with center frequencies ranging from 100 MHz to 1 GHz. The radiated waveforms grow for a few cycles and then decay in a few cycles of sinusoids. Helical antennas have been integrated with such sources, producing a circularly polarized electromagnetic field at a distance. Antenna Analyses and experimental verification will also be presented.

Present #3

Identification	TU#3-3
Title	Ultra-Moderate and Hyper band HPEM Sources, Antennas and some Illustrated Applications.
Speaker	D. V. Giri, Ph.D.,
Affiliation	Pro-Tech, Wellesley, MA 02481, USA and University of New Mexico
Position	Scientist

Abstract

The maximum percentage bandwidth (pbw) of any electromagnetic signal is 200 %. Ultra-moderate band is defined by a pbw in the range of 100% to 163.64%. Hyperband occupies a percentage bandwidth in the range of 163.65 to 200%. In practice, we have achieved a pbw of nearly 192% out of a theoretical max of 200%. High-power sources in these two bands will be described. We will focus on hyperband sources and antennas in this presentation. After a description of design principles, we will address measurements and diagnostics. Pulsed antennas are a developing area of research, wherein very common terms such as gain and beamwidth are yet to be defined. The input pulse and the radiated transient fields have a very wide spectrum of frequencies and common antenna terms are defined for a single frequency of operation. One other important feature of these special antennas results in non-dispersive performance. We will also describe some military and civilian applications for such hyperband antennas.

Important Dates & Registration Information

Conference Key Dates

Paper Submission Deadline: March 10, 2026
Notification of Acceptance: April 7, 2026
Final Manuscript Submission Deadline: April 21, 2026
Conference Dates: June 29 (Mon) – July 3 (Fri), 2026

Registration

Registration for GlobalEM 2026 is available through the official conference website. Participants are strongly encouraged to register early to benefit from reduced fees and to ensure smooth participation.
Early Registration: Mar. 7 – Apr. 21, 2026
Advance Registration: Apr. 22 – Jun. 14, 2026
On-site Registration: Jun. 29 – Jul. 3, 2026
Register at: https://globalem2026.org/registration-guideline/

Author Requirement

At least one author of each accepted paper must register by April 21, 2026
Papers without a registered presenter will not be included in the conference proceedings.

Final Manuscript

Authors must submit the final manuscript in a one-page, two-column format.
The official conference paper template is available on the conference website:
https://globalem2026.org/paper-template/
All submissions must strictly follow the provided template.

Participation & Presentation

Registered participants will have access to technical sessions, workshops, tutorials, and conference events (depending on registration category)
Each accepted paper must be presented by a registered author
Each registered presenter may present up to two papers

GlobalEM
2026

GlobalEM 2026

2026 Global Electromagnetics Symposium

June 29 – July 3, 2026
Yonsei University, Seoul, Korea