Programme

The Industry-Academic Forum on EMC 2026

Day 1 - 29 June

08:30 - 08:40 **Welcome Note - Mohamed Kheir, SDU, Denmark**

Location: Auditorium U101

08:40 - 09:00 **Academic Talk 1 - Christian Schuster, TUHH, Germany**

The SI/PI-Database at TUHH: S-Parameters for ML/AI Applications

The “SI/PI-Database” at Hamburg University of Technology (TUHH) has been providing S-parameters of physics-based printed circuit board (PCB) simulations since 2021. The database started out as a collection of data sets that were originally generated for the design and optimization of signal interconnects and power delivery networks. Meanwhile the database has grown to approx. 90’000 variations of PCB simulations and has been used by both industry and academia to generate applications using methods of machine learning (ML) or more broadly speaking artificial intelligence (AI). To our knowledge, there is no comparable open data source available in the SI/PI domain.
In this presentation we will explain the usage of the database and its latest developments. We will also discuss how we plan to adapt the concept for the European project PATTERN – Enabling AI for EMC.
Location: Auditorium U101

09:00 - 09:20 **Academic Talk 2 - Philippe Besnier, IETR, France**

Controlled Stratification for Determining Extreme Quantiles in Electromagnetic Compatibility Risk Analysis

Electromagnetic compatibility may be considered to be assessed once some specifications are met. These specifications are provided by templates setting limits in terms of emissions or immunity levels. From a modeling point of view, it seems therefore adequate to investigate the extreme quantiles of the oberved quantities to be compared with templates. The controlled stratification technique may be seen as a smart sampling strategy to explore the region of interest of the input space. Given an assumed ground truth model, the controlled stratification method rely on a much simpler model having good correlation properties with the former, according to a specific correlation definition. Such a simple model may be a physical model or a surrogate model. Examples will be provided, highlighting the the effectiveness of this statistical trick.
Location: Auditorium U101

09:20 - 09:40 **Academic Talk 3 - Stefano Grivet-Talocia, Politecnico di Torino, Italy**

Modeling SI/PI and EMC Problems Through Data: Deterministic, Parametric, and Stochastic Perspectives - Part 1

This talk provides an overview of macromodeling and machine learning methods to facilitate design exploration, parametric sweep, and optimization of electronic systems with an emphasis on SI/PI and EMC analyses. The presentation will be divided into two parts. The f irst part will address macromodeling and model order reduction techniques, their evolution and future perspectives, considering recent improvements in parameterization, robustness, scalability, as well as generalizations to nonlinear devices and systems. The second part will discuss the use of machine learning for data-efficient uncertainty quantification, yield analysis, and optimization. In this context, nonparametric kernel regression is shown to be f lexible and more suitable for building surrogate models of computationally expensive electronic systems characterized by a large number of independent design parameters. We will also explore active learning strategies for the iterative acquisition of optimal training datasets.
Location: Auditorium U101

09:40 - 10:00 **Academic Talk 4 - Paolo Manfredi, Politecnico di Torino, Italy**

Modeling SI/PI and EMC Problems Through Data: Deterministic, Parametric, and Stochastic Perspectives - Part 2

This talk provides an overview of macromodeling and machine learning methods to facilitate design exploration, parametric sweep, and optimization of electronic systems with an emphasis on SI/PI and EMC analyses. The presentation will be divided into two parts. The f irst part will address macromodeling and model order reduction techniques, their evolution and future perspectives, considering recent improvements in parameterization, robustness, scalability, as well as generalizations to nonlinear devices and systems. The second part will discuss the use of machine learning for data-efficient uncertainty quantification, yield analysis, and optimization. In this context, nonparametric kernel regression is shown to be f lexible and more suitable for building surrogate models of computationally expensive electronic systems characterized by a large number of independent design parameters. We will also explore active learning strategies for the iterative acquisition of optimal training datasets.
Location: Auditorium U101

10:00 - 10:20 **Academic Talk 5 - Martijn Huynen, Ghent University, Belgium**

Broadband Boundary Integral Equation Modelling for Signal Integrity and EMC Assessment

Rising operating frequencies and increased integration density pose a challenging environment for designers of state-of-the-art components and systems. Physical phenomena such as the skin effect and the proximity effect can severely degrade signal quality. Concurrently, the combination of various technologies for increased performance and flexibility on platforms such as interposers and silicon, makes for a complicated electromagnetic compatibility environment. Hence, the need for powerful modeling tools that tackle Maxwell's equations accurately, are increasingly indispensable for designers.
At quest, we develop boundary integral equation approaches centered on the differential surface admittance operator that enables a broadband, accurate yet fast assessment of lossy, complex interconnects. In this talk, we will show an overview of the capabilities of these methods in the context of electronic packaging design.
Location: Auditorium U101

10:20 - 10:50 **Coffee Break and Poster Session**

10:50 - 11:10 **Academic Talk 6 - Cheng Yang, TUHH, Germany**

Adaptive On-the-Fly Near-Field Scanning via Gaussian Process Regression and Bayesian Optimization

Advancements in wireless communication, quantum computing, and electric vehicles are introducing significant challenges for electrical and microwave engineering, particularly in addressing electromagnetic compatibility (EMC). Near-field measurement, as a cost-effective and practical solution, is therefore widely applied for pre-compliance testing, especially when full wave modeling and simulation become infeasible. This talk presents an adaptive near-field acquisition framework based on iterative, on-the-fly (OTF) scanning guided by Gaussian process regression and Bayesian optimization. The proposed approach enables high-speed, high-resolution near-field measurements for large-scale EMC applications. Experimental demonstrations using both
industrial-grade and educational robotic platforms across a range of devices illustrate how fast, intelligent near-field measurements can now be completed within minutes. The methodology is further extended to support cost-effective indoor and outdoor EMC and antenna measurements at GHz frequencies.
Location: Auditorium U101

11:10 - 11:30 **Academic Talk 7 - Domenico Spina, Vrije Universiteit Brussel, Belgium**

Physic-informed machine learning techniques for EMC problems

In recent years, machine learning has become an essential tool for the design andanalysis of complex RF and microwave systems. This presentation highlights recent advances in machine learning–based methodologies, developed by considering the characteristics of the system under study and how its physical properties are represented in the training data (physic-informed approach). Both neural network–based techniques and data-efficient methods, particularly those relying on Gaussian processes, will be discussed. Their key characteristics will be outlined, along with their application to challenging electromagnetic compatibility (EMC) problems.
Location: Auditorium U101

11:30 - 11:50 **Academic Talk 8 - Xinglong Wu, Politecnico di Milano, Italy**

Modeling Cable Harnesses for EMC in Automotive and Industrial Applications

Abstract: Wire harnesses are essential components in automotive and industrial systems and often play a critical role from the EMC viewpoint, as cables can efficiently couple and capture electromagnetic noise. This talk will present several cable modeling techniques for EMC analysis, including a digital-twin-based modelling methodology, a simple radiation prediction approach, and a fast susceptibility evaluation method for bulk current injection (BCI). These techniques offer simple, accurate and easy-to-be-implemented prediction tools for EMC assessment.
Location: Auditorium U101

11:50 - 12:10 **Academic Talk 9 - Pooya Davari, Aalborg University**

Supra-EMC: Supraharmonics ElectroMagnetic Compatibility strategies in power electronic based power grid

Supra-EMC is a 4.5-year research and innovation project starting from 2023 sponsored by Innovation Fund Denmark. The project vision is to bridge the gap between power grid compatibility and Power Electronics ElectromagneticCompatibility (EMC) to develop and demonstrate EMC tools and device for Power Electronics applications. To exploit new energy and cost-effective solutions for sustainable business opportunities and develop new EMC tools and devices for commercialization and new job creation. Supra-EMC project specifically focuses on 2kHz – 150 kHz known as supraharmonics as the new frequency range for EMC standardization.
Location: Auditorium U101

12:10 - 12:30 **Academic Talk 10 - Mohamed Kheir, SDU, Denmark**

Reinventing Electromagnetic Simulation with Physics-Informed AI

Electromagnetic simulation is essential for modern electronic design, yet it remains constrained by mesh-based solvers that are computationally expensive and difficult to scale. In this keynote, we present a meshless simulation framework based on Physics-Informed Neural Networks (PINNs) enhanced with Kolmogorov–Arnold Networks (KANs).
By embedding Maxwell's equations directly into the learning process, the approach enables fast, physically consistent field prediction without meshing. A modular strategy further allows complex PCB structures to be decomposed, trained locally, and efficiently recombined.
Validated against commercial solvers, the method achieves strong accuracy while reducing simulation time by a factor of 3 . This work highlights a shift toward AI-driven electromagnetic simulation, enabling faster design cycles and opening new possibilities for predictive EMC engineering.
Location: Auditorium U101

12:30 - 13:30 **Lunch & Networking**

13:30 - 13:50 **Industry Talk 1 - Thomas Kjaer Nowak, Danfoss, Denmark**

This session provides a brief introduction to the Electrohydraulic Solutions sub-department within Danfoss Power Solutions. Following this overview, the presentation shifts toward the electromagnetic compatibility (EMC) landscape influencing current development activities. Agricultural machinery is subject to EMC requirements comparable to those in the automotive industry and therefore faces many of the same challenges. The talk highlights several of the practical EMC and EMC-related issues encountered in the department's daily work, offering insight into the complexities of ensuring robust performance in modern off-highway applications.
Location: Auditorium U101

13:50 - 14:10 **Industry Talk 2 - Stefan Hoffmann, Fraunhofer IZM, Germany**

Practical EMI Troubleshooting of Power Electronic Devices – A Methodical Approach

In device development, the focus is often on achieving full functionality. EMC aspects are only considered at a late stage of development, which frequently leads to complications, additional design iterations and higher costs.
The presentation uses various practical examples to demonstrate how EMC problems can be solved efficiently with a methodical approach, supported by the use of simulation tools. It covers the systematic identification and analysis of interference sources, coupling paths and interference sinks. Concrete measures for conducted and radiated emission mitigation are presented, such as the targeted use of filter components, optimized layout and shielding concepts. Throughout this process, simulation tools play a key role in evaluating measures, validating solutions and reducing the number of necessary iterations.
Location: Auditorium U101

14:10 - 14:30 **Industry Talk 3 - Bernhard Wunsch, ABB, Switzerland**

EMC Modeling of Radiated Emissions in Industrial Power Converters

A major challenge in the development of future power converters and systems is compliance with EMC norms and the avoidance of internal EMI. At ABB Corporate Research we extended our EMC simulation platform to include the prediction of radiated emissions of power converters enabling simulation-based EMC design for future prototypes. First applications of the tools include various power converters and a simplified setup. For motor drive systems radiation is often dominated by total currents on the power cables which are typically caused by a mode conversion due to shielding imperfections. Full-wave simulations as well as derived effective models consistently explain emission peaks and resonances enabling the assess-ment of input and output filtering concepts as well as shielding measures.
Location: Auditorium U101

14:30 - 14:50 **Industry Talk 4 - Dominik Schröder, Fraunhofer ENAS, Germany**

How Near-Field Scanning can support EMC Simulations

This talk presents a robot-guided near-field scanning methodology for identifying and analyzing EMC issues by combining it with full-wave simulations. The key lies in phase-resolved measurements. Based on the surface equivalence principle, equivalent near-field source of electronic systems can be created. This “digital EMC twin” can be used for different scenarios. From near-field interaction with other devices, over evaluating the radiation into its intended environment, up to extrapolations to the far-field.
Location: Auditorium U101

14:50 - 15:10 **Industry Talk 5 - Christian Wolf, GRUNDFOS, Denmark**

Current EMC Challenges at Grundfos

1. Lack of attention to an EMC-friendly mechanical design in the early design phase causes problems later when the projects are nearing completion where it is often a problem to keep electromagnetic emissions below the given limits due to a fixed mechanical design.
2. Differences in the measured radiated noise from measurement laboratory to measurement laboratory due to the lack of a uniform termination requirement for cables leading out of the measurement area. This is a shortcoming in the standards. We see differences of up to 20 dB for the same measurement setup in different measurement laboratories due to this shortcoming.

Location: Auditorium U101

15:10 - 15:40 **Coffee Break and Poster Session**

15:40 - 16:00 **Industry Talk 6 - Henrik Nygård Henriksen, FORCE Technology, Denmark**

Overview of Force Technology and highlighting our contribution to EMC validation in Scandinavia

Location: Auditorium U101

16:00 - 16:20 **Industry Talk 7 - Arne Schröder, Hitachi Energy, Switzerland**

Application of Parameterized Macromodels in Power Electronic Converter Design: An Example of Successful Industry–Academia Collaboration

Data driven models play a crucial role in the development and design of power electronic converters. Modeling electromagnetic compatibility (EMC) phenomena and designing effective EMC solutions often require the use of models that depend on multiple variables, such as frequency, temperature, bias current, or geometry. A key challenge in the identification of parameterized circuit-based models is ensuring passivity and stability over the entire parameter space. In this presentation, we discuss a recently developed macromodeling technique that overcomes these challenges, along with its application to the generation of equivalent circuits for magnetic components characterized in terms of broadband experimental measurements. The talk illustrates how academic research can effectively address and support the demands of industrial applications.
Location: Auditorium U101

16:20 - 16:40 **Industry Talk 8 - Kai Numssen, IU International University of Applied Sciences & m4 wireless GmbH, Germany**

Metamaterial Technology for Wireless Communication Systems

Recent advancements in radio-frequency (RF) technology benefit significantly from novel capabilities that become accessible with metamaterial concepts. Metamaterials are artificial, engineered structures that enable properties not found in nature. Thus, they open up possibilities for new designs of RF components with unprecedented performance. In addition, metamaterials inspire novel types of devices in wireless communication systems, such as so-called reconfigurable intelligent surfaces (RIS), which are considered as a key technology for 6G, the next generation of mobile communication networks.
The talk will first briefly explain the fundamentals of metamaterials and how they can be applied to RF technology. Subsequently, examples of metamaterial based RF components in coaxial and microstrip technology will be presented and it will be demonstrated how wavelength-dependent devices like antennas can be miniaturized applying metamaterial concepts. Finally, it will be shown how surprising properties of metasurfaces, i.e. two-dimensional metamaterials, lead to the development of RIS and how RIS will contribute to overcome challenges of the next generation of mobile communication systems.
Location: Auditorium U101

16:40 - 17:00 **Industry Talk 9 - Samuel Hildebrandt, Lumiloop GmbH, Germany**

How to Laser-Power Everything, and How to Start a Business Based on That

LUMILOOP’s patented Power-over-Fiber (PoF) technology enables reliable sensors everywhere: High voltage, high current, electric or magnetic fields are the comfort zone of PoF!
In this presentation, you will get a brief overview of basics and applications of a PoF system. Practical aspects are discussed for two fields of application:
(1) Measurement technology. In Electromagnetic Compatability (EMC), PoF guarantees consis-tent measurement without influencing field distribution. The combination of RF signals up to 40 GHz, electric-field strength over 1.000 V/m, and fiber technology with the necessity to extreme miniaturization creates an unique set of requirements.
(2) Condition monitoring systems. The combination of harsh environmental conditions (opera-ting temperature -40 .. 85 °C, vibration, presence of various fluids), sensitive sensors and the long lifetime required for a permanent installation on infrastructure results in many challenges.
The talk will also cover parts of LUMILOOP’s founding story, including lessons leaned on how to start a business in EMC.
Location: Auditorium U101

17:00 - 17:20 **Industry Talk 10 - Morten Sørensen, Dr., FORCE Technology**

3D Full-Wave Simulations in an Industrial Context

3D full-wave electromagnetic simulations play an important role in industrial EMC practice, complementing traditional SPICE-based approaches. Key challenges include simulation uncertainty, unknown material properties, and the impact of modeling simplifications on accuracy. Through selected case studies, simulations demonstrate their value in product development, visualization of electromagnetic phenomena, and identification of radiated emission mechanisms. Their effective use supports improved design robustness and enables earlier detection and mitigation of EMC issues in complex electronic systems.
Location: Auditorium U101

18:00 - 21:00 **EMC Forum Dinner**

Day 2 - 30 June

08:30 - 09:30 **EMC Forum Committee Meeting**

Location: Red Box

09:30 - 11:30 **EMC Knowledge Café**

Interactive EMC Roundtable: Challenges & Future Directions
This interactive session brings together participants in moderated small-group discussions to explore key challenges and opportunities in EMC, building on the topics presented during Day 1.

Participants will engage in focused roundtable discussions on selected themes, including:

- AI in EMC: potential, limitations, and industrial adoption
- EMC in early design phases and system-level challenges
- Simulation vs. measurement: closing the gap
- EMC challenges in complex industrial systems

Each group will exchange experiences, identify key challenges, and discuss possible solutions. The session will conclude with a short wrap-up where key insights from each table are shared with all participants. The goal is to foster meaningful exchange between academia and industry and to generate actionable ideas for future collaboration.
Location: Red Box

11:30 - 11:45 **Coffee Break**

11:45 - 12:15 **Helpful Tips on MSCA Doctoral Network Call - Dr. Doris Bell, Chief Advisor, SDU TEK Innovation**

Location: Auditorium U101

12:15 - 13:15 **Lunch & Networking**

13:15 - 13:30 **Closing Remarks - Mohamed Kheir, SDU, Denmark**

Location: Auditorium U101

13:30 - 13:45 **Group Photo**

13:45 - 14:15 **EMC Lab Tour - Group 1**

14:15 - 14:30 **Coffee Break**

14:30 - 15:00 **EMC Lab Tour - Group 2**