APEC 2026 Offers A Whirlwind Of Talks On Power Magnetics

by David G. Morrison, Editor, How2Power.com

If you're curious about the impact of AI on power magnetics, developments in magnetics modeling and simulation, techniques for designing magnetic components for specific applications, and new core materials, you will find presentations and often whole sessions on these topics at the upcoming IEEE Applied Power Electronics Conference and Exposition (APEC 2026). This year's gathering of the power electronics industry, which is being held March 22-26 in San Antonio, Texas, continues the practice of devoting extensive attention to developments in power magnetics technology as well as opportunities for professional training. Presenters represent a mix of engineers from academia and industry.

In this article, I present an extensive but not necessarily comprehensive listing of magnetics-related talks in the technical, industry and exhibitor sessions at APEC 2026. But first, I'll kickoff this guide with details on Minjie Chen's plenary talk on the MagNet Challenge followed by abstracts for the magnetics tutorials.

Those interested in the magnetics presentations compiled here, may also appreciate the talks and technology demonstrations planned for the PSMA's pre-APEC Power Magnetics Workshop. For more on this workshop, see the reference.

Plenary Session

MagNet Challenge: The Serendipity When Power Magnetics Meets AI

Speaker: Minjie Chen, Associate Professor, Princeton University, USA

Abstract: Magnetics play important roles in almost all power electronics systems. The multidimensional and interconnected complexities of material physics, geometric structure, operating conditions, and circuit functionality make magnetic components a major bottleneck in high-performance design. Data-driven methods and artificial intelligence (AI) techniques have demonstrated strong capabilities in modeling complex physical systems. Large-scale, high-quality, well-labeled data sources are the foundations of modern AI. A collaborative environment enables the community to break traditional knowledge barriers and unlock forward-looking breakthroughs.

This presentation will explore the historical evolution and emerging intersections between power magnetics and artificial intelligence, and introduce the MagNet Challenge as an international collaborative research platform that bridges materials and design, data and algorithms, academia and industry, and the past and future of power electronics.

Speaker bio: Minjie Chen is an associate professor of electrical and computer engineering at Princeton University, where he leads the Princeton Power Electronics Research Group. He is currently on sabbatical from Princeton as a visiting professor at TSMC and Nvidia Research. He received his Ph.D. in EECS from MIT and his B.S. in Electrical Engineering from Tsinghua University. He is a recipient of the IEEE PELS Richard M. Bass Outstanding Young Engineer Award, a Princeton SEAS Junior Faculty Award, the NSF CAREER Award, the MIT Dimitris N. Chorafas Ph.D. Thesis Award, and more than 15 prize papers from top IEEE journals and conferences.

He is a PELS Distinguished Lecturer, a co-Editor-in-Chief of IEEE Transactions on Power Electronics, and was listed multiple times on the Princeton Engineering Commendation List for Outstanding Teaching. He is currently chairing IEEE PELS Technical Committee 10: Design Methods and AI Tools, and has been leading the IEEE PELS International Challenge in Design Methods for Power Electronics – the MagNet Challenge – since 2023.

Professional Education Seminars (Tutorials)

S05 - 3D: FEM Simulation For Magnetic Component Design: From Paradigm And Methods, To Pitfalls And Future Applications

Presenter: Juris Vencels, TRAFOLO Engineering

Seminar Description: Magnetic component design increasingly relies on 3D Finite Element Method (FEM) simulations, yet many engineers approach FEM as a "black box" that either gives them numbers or gives them headaches. This seminar demystifies the process. Aimed at magnetic design engineers ranging from no prior FEM experience to intermediate level.

We start with the core paradigm: understanding what FEM actually computes, how advanced numerical methods can improve it, and why mesh quality, material data, and modeling choices shape results far more than the choice of tool. From there, we move on to numerical limitations, common pitfalls, and best practices. A "Simulation Wizard" framework will be introduced—a structured guide for selecting the right models based on design intent, accuracy needs, and available data. Participants will then see simulation results benchmarked against validation studies, followed by a discussion of discrepancies and how to interpret them constructively.

The seminar concludes with a pragmatic discussion on when FEM is worth the effort (and when it's not), and a forward-looking look at emerging applications such as integrated magnetics for power supply on chip (PwrSoC) technologies. Attendees will leave with sharper intuition, practical workflows, and a healthier respect for what FEM can and cannot deliver.

S10: Python For Power Electronics: From Zero To AI

Presenter: Alfonso Martínez, Würth Elektronik

Seminar Description: Software tools are indispensable in development of modern power supplies, from simple calculations, like the estimation of core losses with the Steinmetz equation, to advanced simulation tools, like thermal simulations in Finite Elements software, including magnetic design automation or circuit simulation in LTspice.

Many of these calculations can be implemented on Excel spreadsheets, which are widely used for the early design stages of many custom power components. While being quite flexible and its learning curve quite low, these spreadsheets often fail at more complex tasks, like advanced modeling.

This seminar proposes Python as a tool for Power Engineer, which expands the limit of things that can be modeled, and works a glue between different tools already used, providing the possibility of high automation.

S18: Optimal Design Of Inductive Power Components Based On Accurate Loss And Thermal Models

Presenter: Jonas Muehlethaler, MSc, PhD, MBA

Seminar Description: This presentation focuses on the optimal design of inductive components through accurate modeling of magnetic, winding, and thermal losses. It begins by analyzing challenges posed by non-sinusoidal and dc-biased waveforms and demonstrates advanced modeling techniques to address them. A reluctance-based magnetic circuit model is introduced, enabling precise inductance, saturation, and stray-field calculations, even for complex air gap geometries.

For core losses, a hybrid method combining loss maps with the improved Generalized Steinmetz Equation (i2GSE) is presented, capturing effects of waveform shape, dc bias, and relaxation phenomena across a wide frequency and flux density range. Winding loss modeling addresses skin and proximity effects in various conductor types, including solid, foil, and Litz wires, with analytical and FEM-based approaches.

Thermal modeling then links electrical losses to component temperature rise, forming the basis for multi-objective optimization where tradeoffs between efficiency, volume, and cost are considered. Throughout the talk, real-world examples and experimental validations illustrate the effectiveness of these models, culminating in guidelines for achieving compact, efficient magnetic components in modern power electronics. To enhance the learning experience, interactive elements such as live calculations, waveform analysis, and design trade-off simulations will be integrated, encouraging active participation and practical understanding.

Industry Sessions

IS09 - Simulation And Modelling Of Power Electronics

Industry Session Chairs: Harry Soin, AEI and Richard Chung, ST Microelectronics
Student Session Assistant: Jiyoon Choi, Nagoya University

IS09.4: Validating 3D FEM Simulations with Measurements—The Case Of Gapped Core And Multi-turn/Litz Wires

Industry Session Presenter: Juris Vencels, TRAFOLO Engineering
Co-Author: Mareks Krisjanis, Ventspils University of Applied Sciences and Marks Kuncevics, TRAFOLO

Abstract: This presentation explores the implementation and validation of homogenization techniques for modeling litz and stranded windings in 3D FEM simulations using the open-source solver ElmerFEM. The focus is on a practical question faced by magnetics engineers: how close can simulations get to real high-frequency measurements, and what are the pitfalls along the way?

We compare simulation results with comprehensive frequency-sweep measurements on custom prototypes using litz and multi-turn windings, applying corrections to measurement data to account for parasitic capacitances. Across these studies, we underline both the strengths and the limitations of the homogenization approach: while it offers an efficient way to capture losses without meshing every strand, factors such as non-uniform strand distribution, twisting, and circulating currents remain outside its scope.

The overall theme is pragmatism—FEM simulations are powerful, but reconciling them with real-world data requires awareness of their limits, careful correction of measurements, and a willingness to accept that models are approximations, not magic. Attendees will walk away with concrete insights into when homogenization can be trusted, when it cannot, and how to combine measurements and simulations for reliable design decisions in high-frequency magnetics.

IS09.6: Reduced-Order Magnetics Modeling: Accelerating Power Electronics Design With FEA Insights

Industry Session Presenter: Nikos Dimitrakopoulos, Altair Engineering

Abstract: This talk presents a methodology to bridge the gap between analytical magnetics models and high-fidelity finite element analysis (FEA) for power electronics applications. Traditional analytical models are fast but often inaccurate, and FEA models are accurate but slow and complex. The session will show how reduced-order models of e-motors and passive magnetics, created using FEA insights, can be integrated into system-level simulations to accelerate design while bridging speed with accuracy for saturation, copper losses (including proximity effects), and core losses. The goal is to offer engineers a more practical and scalable alternative to traditional analytical methods and full FEA workflows, ultimately improving design experience while achieving a maximized simulation fidelity to time ratio.

IS11: Overcoming Technical And Manufacturing Challenges To Meet Market Demands

Industry Session Chairs: George A. Slama and Matt Wilkowski, Würth Elektronik, Ed Herbert, PSMA Independent Inventor

Student Session Assistant: Joonhyung Kim, Dankook University

IS11.1: Design And Validation Of A Medium-Voltage Dual Active Bridge Transformer: Fixing Multiple Design Challenges

Industry Session Presenter: Nicola Rosano, Standex

Co-Authors: Srdjan Lukic, North Carolina State University and Chris Riccardella, Standex

IS11.3: The Hidden Challenges Of Design Transformers For Dual Active Bridge Systems

Industry Session Presenter(s): Marcin Kącki, Hitachi Energy, Miroslav Vasic, Universidad Politecnica de Madrid

IS11.4: Low-Power And High-Power Transformer Solutions To Support The Power Delivery Network For AI In Data Centers

Industry Session Presenter: Claudio Canete-Cabeza, Würth Elektronik Midcom

IS11.4: Low-Power and High-Power Transformer Solutions to Support the Power Delivery Network for AI in Data Centers

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IS11.5: Challenge In Implementing Automation & Robotics In Magnetics Manufacturing

Industry Session Presenter: Martin Kuo, ITG Electronics

Abstract: Automating the production of inductor, transformer and magnetics components remains one of the "final frontier[s]" in smart manufacturing. Unlike traditional assembling, magnetics involve delicate core, tension-sensitive winding and the unpredictable nature of magnetics force. This session breaks down the specific technical hurdles of implementing automation and robotics in this space, why "off the shelf" automation often fails where custom-engineered solution[s] succeed.

IS11.6: Voltage Rating Of Metal Alloy Molded Inductors

Industry Session Presenter: David Ruiz Gomez, Würth Elektronik eiSos

IS11.7: Customizable Magnetic Components For Next-Generation Power Electronics Using Nanocrystalline Flake Ribbon

Industry Session Presenter: Xinru Li, CBMM

IS15: Tools And Automation For Design And Testing

Industry Session Chairs: Anuj S. Narain and Adam Anders, Cyient Semiconductors
Student Session Assistant: Shivangi Sinha, University of Colorado Boulder

IS15.5: Mitigating Extra Eddy Currents Losses In HF Transformers' Aluminium Housing: A Physical-Based Study With Thermal Analysis

Industry Session Presenter: Michael Dunleavy, Bourns Electronics
Co-Authors: Matthew Russell, Masoumeh Amirbandeh, Cathal Sheehan, and Alireza Namadmalan, Bourns Electronics

IS16: Power Converter Circuits And Topologies

Industry Session Chair: Puneet Sareen and Sasikala Thangam, Texas Instruments
Student Session Assistant: Qiang Mu, University of North Carolina at Charlotte

IS16.2: Understanding Inductor And Flyback Transformer Datasheet Specifications And Characteristics

Industry Session Presenter: Andres Arias, Premier Magnetics

IS20: Magnetic Materials For Existing And Emerging Applications Part 1

Industry Session Chairs: George A. Slama, Wurth Elektronik, Ed Herbert, PSMA Independent Inventor, and Matt Wilkowski, Würth Elektronik
Student Session Assistant: Priya Priya, Indian Institute of Technology, Bombay

IS20.1: Relevant Magnetic Material Properties For Existing And Emerging Applications

Industry Session Presenter: Lukas Reißenweber, Coburg Universiy of Applied Sciences and Arts

IS20.2: Metal Chip Power Inductor For IVR Applications: High Performance With Customizable Flexibility

Industry Session Presenter: Toshio Hiraoka, TAIYO YUDEN

IS20.3: Magnetic/Resin Composite Sheets For High-Frequency Power Electronics: From Fundamental Properties To Packaging Integration Challenges

Industry Session Presenter: Hideki Ooyama, Ajinomoto Fine-Techno

IS20.4: Superparamagnetic Nanocomposites For Power Electronic Applications

Industry Session Presenters: Dale Huber and Jason Neely, Sandia National Laboratories

IS24 - Pairing Capacitors With Inductors To Create Better Solutions

Industry Session Chairs: Alan J. Cooper, YAGEO and Matt Wilkowski, Würth Elektronik
Student Session Assistant: Ayush Dixit, Indian Institute of Technology Delhi

IS24.1 - A Practical Design Guide For Resonant Power Conversion

Industry Session Presenter: Simon Reuning, YAGEO Group

IS24.2: The Importance Of Magnetic Components In EMC Filter

Industry Session Presenter: Szymon Pasko, TE Connectivity-Schaffner

IS24.3: EMI Filter Success—Smart Inductor Selection

Industry Session Presenter: Jared Quenzer, Würth Elektronik

IS24.4: Performance Of Common-Mode Chokes With Enhanced Differential-Mode Inductance In EMI Filters Including Capacitive Interactions

Industry Session Presenter: Bryce L. Hesterman, Utah State University

IS26: Magnetic Materials For Existing And Emerging Applications Part 2

Industry Session Chairs: George A. Slama, Wurth Elektronik, Ed Herbert, PSMA Independent Inventor, and Matt Wilkowski, Würth Elektronik
Student Session Assistant: Sida Chen, University of Pennsylvania

IS26.1: Multi-Cut Nanocrystalline Cores Through Classical Modeling

Industry Session Presenter: Abrahan Solis, MK Magnetics

IS26.2 - Nanocrystalline Cores For EMI Applications

Industry Session Presenter: Tobias Trupp, Magnetec

IS26.3: Role Of Nb In Nanocrystalline Ribbon And Core Manufacturing

Location: 213
Industry Session Presenter: Naoki Ito, CBMM

IS26.4: Fe-based Nanocrystalline Alloys For Power Choke Applications

Industry Session Presenter: Michael Freitag, Yageo Group/KEMET Electronics

IS30: Vertical Power for AI Data Centers

Industry Session Chairs: Chris Casey and Chance Dunlap, Amber Semiconductor
Student Session Assistant: Shivangi Sinha, University of Colorado Boulder

IS30.3: Advancing Magnetic Designs For High Density Designs

Industry Session Presenter: Youssef E. Elasser, NVIDIA

Exhibitor Presentations

EX: Custom, Cost-Optimized Powder Core Design For High-Power Inductors

Exhibitor Presenter: Chris Turocy, Magnetics
Abstract: High power applications such as renewable energy systems, datacenters, and electric vehicles (EVs) demand inductor cores that can handle high current while maintaining cost efficiency. Magnetics offers advanced powder core materials and manufacturing capabilities designed for high-density, high performance components.

Magnetics' capabilities include toroid stacks, custom dimensions, cut toroids, composite cores, specialized blends, and round centerpost shapes. Core material blends allow engineers to determine the exact core loss and saturation characteristics that deliver the required performance with no excess core volume or cost.

This presentation highlights Magnetics' latest powder core materials, manufacturing capabilities, and a practical design example that demonstrates how to develop an ideal powder core tailored to your application.

EX: ON-ON & ON-OFF Operation Mode, Ultra Small And Highly Efficient Isolated TriMagiC Converter

Exhibitor Presenter: Mitsunao Fujimoto, Diamet

Abstract: Until now, many SMPS designers have taken the ON-ON transformer operation mode—widely adopted in topologies such as FBPS and LLC—for granted. As a result, the vast majority of high-performance switched-mode power supplies (dc-dc converters) that use transformers have operated in this mode. Technological approaches to achieving further miniaturization and higher efficiency have mainly focused on soft-switching techniques, higher switching frequencies, and improvements in passive components.

In this presentation, we introduce a new approach that enhances dc-dc converter performance by reexamining the transformer operation mode and magnetic flux density behavior, incorporating a low-permeability magnetic core.

EX: Parasitic In Push-Pull Transformers: How Interwinding Capacitance And Leakage Inductance Drive EMI/EMC Results On Auxiliary Power Supplies

Exhibitor Presenter: Vidal Gonzalez, Wurth Elektronik

Abstract: Meeting EMI requirements such as CISPR 25 and CISPR 32 is a key challenge in isolated power converter design. This presentation explores how transformer parasitics such as the interwinding capacitance and leakage inductance contribute to conducted and radiated emissions, with a focus on push-pull topologies.

EX: VAC Magnetics

EX: Interfacing To Current Transformers

Exhibitor Presenter: George A. Slama, Wurth Elektronik

Abstract: Measuring current is an important aspect of energy management. Whether it is within a power supply or external to it, measuring ac currents (unipolar or bipolar, sinusoidal or rectangular) with isolated current sense transformers looks easy but does require attention to a few important details.

Why are there so many similar circuits and what is the difference? Where are the measurement errors? What precautions are needed to protect the analog to digital conversion? Using the new REDEXPERT current selector to find the right part. This session explains how the current transformer works and sorts through the most common circuits to help you decide which is correct for your application.

EX: New Generation High Power Density MHz Power Inductor For GPU VRM Application

Exhibitor Presenter: Qing Lu, Zhejiang ThanTech Technology

Abstract: With the rapid development of global AI, the demand for computing power has risen sharply, and the performance requirements for computing power have also increased accordingly, which has promoted the development of GPU power and efficiency. As an important power supply module of GPU, VRM's power density and efficiency have also been improving year by year. To be one of the key components of VRM, power inductor plays a very important role in the efficiency and power density of VRM.

In this PPT, we mainly introduce the new generation of high-power-density megahertz high-frequency power inductor, it adopts a completely new metal magnetic powder material and metal sintering technology. The developed copper-iron sintered inductors have extremely low high-frequency losses, higher initial inductance, excellent dc superposition characteristics, good heat dissipation performance, and smaller volume that enhance the power density and efficiency of GPU VRM.

EX: Technologies Powering The Shift To Solid-State Transformers: How TDK Technologies Enable The Transition

Exhibitor Presenter: Anirban Roy, TDK Electronics

Abstract: The move to solid state transformers (SSTs) requires compact, high frequency power architectures and robust component solutions. This session describes how TDK component technologies support SST design at both the component and system levels.

Key topics:

• Component solutions: advanced magnetics, dc link and CeraLink capacitors, high voltage contactors, circuit protection, and sensing modules.

• Performance benefits: enabling higher switching frequencies, increased power density, improved thermal management, and enhanced safety and reliability.

• Enablers and trends: impact of wide bandgap devices (SiC, GaN) on SST requirements and the role of materials innovation in reducing size and weight while improving lifetime.

• Practical guidance: component selection tradeoffs, layout and thermal considerations, and system level integration strategies to accelerate SST deployment.

Intended for power electronics and system engineers seeking concise, product focused guidance on designing scalable, reliable solid state transformer solutions using TDK technologies.

EX: Percolation In Power Inductors: Silent Performance Shifts Under Thermal And Voltage Stress

Exhibitor Presenter: Efrain Bernal Alzate, Wurth Elektronik

Abstract: Percolation phenomena in composite magnetic materials can lead to subtle yet impactful changes in the behavior of power inductors when exposed to elevated temperatures and voltages.

These microstructural transitions affect particle connectivity within the molded structure, influencing magnetic permeability, inductance stability, and core losses. While often unnoticed during standard qualification, these effects become critical in demanding environments such as automotive and industrial power electronics, where thermal and electrical stress are prevalent.

This presentation explores the physics behind percolation, its role in altering magnetic pathways, and the resulting impact on energy storage and conversion efficiency. Practical design considerations and mitigation strategies are discussed to ensure reliable performance under extreme operating conditions

Technical Lecture Sessions

T07: Magnetics Application

Technical Lecture Session Chairs: George A. Slama and Matt Wilkowski, Würth Elektronik
Student Session Assistant: Ashwini Kumar Dubey, University of Colorado Boulder

T07.1: Low-Profile Embeddable Chip Inductors For 10 W, 40-50 MHz DC-DC Converters

Technical Lecture Presenter: Youssef Kandeel, Tyndall National Institute

Co-Authors: Liang Ye, Yi Dou, Cian Ó Mathúna, Ranajit Sai and Séamus O'driscoll, Tyndall National Institute and Takayuki Tsuchida, Sumiaki Kishimoto, Toshio Hiraoka, Masanori Nagano, TAIYO YUDEN

T07.2: Extreme Temperature Nanocrystalline Inductor Design And Demonstration For Medium Frequency Applications

Technical Lecture Presenter: Paul Ohodnicki, University of Pittsburgh

Co-Authors: Veda Duppali, Kevin Byerly, Brett Riale, Samuel Kernion, CorePower Magnetics; Tyler Paplham and Yuankang Wang, University of Pittsburgh; Vladimir Keylin, NASA Glenn Research Center; Baljit Riar, RTX Technology Research Center; Lauren Wewer, University of Pittsburgh; Alex Leary, NASA Glenn Research Center; Ron Noebe, NASA Glenn Research Center; Jeffrey Ewanchuk, RTX Technology Research Center; Suman Dwari, Raytheon Technologies

T07.3: A High-Frequency Planar Transformer With Medium-Voltage Isolation And Embedded Thermal Management

Technical Lecture Presenter: Shivangi Sinha, University of Colorado Boulder

Co-Authors: Zayed Ahmed and Jeffery Diebold, Advanced Cooling Technologies; Dragan Maksimovic, University of Colorado Boulder

T07.4: Asymmetric Magnetic Integration For Three-Phase LLC With Improved Efficiency, Thermal, And Current Balancing

Technical Lecture Presenter: Dakai Wang, Delta Electronics

Co-Authors: Chao-Fong Chang, Meng-Chi Tsai, Misha Kumar, and Peter Barbosa, Delta Electronics

T07.5: Three-Winding HF Transformer Design For A Multiport System Integrating Battery Storage Or Renewables With The Grid For EV Charging

Technical Lecture Presenter: Aditya Zade, Delta Electronics Americas

Co-Authors: Bryce L. Hesterman, Utah State University; Shubhangi Gurudiwan, Rivian; Regan Zane, Utah State University

T07.6: Evaluation Of Commercially Available MHz Magnetic Materials Using A Virtual Datasheet Framework

Technical Lecture Presenter: Burkhard Ulrich, Reutlingen University

T07.7: EMI Filter Performance Enhancement Through Novel Use Of Multi-Material Magnetic Cores

Technical Lecture Presenter: Marcin Kącki, Hitachi Energy

Co-Authors: Adam Ruszczyk, Arne Schroeder, and Simon Round, Hitachi Energy

T07.8: Hybrid Planar Inductor With Thin-Film Magnetic Core And Homogeneous Current-Density Windings In MHz Power Converters

Technical Lecture Presenter: Raul Henares, Tyndall National Institute

Co-Authors: Guannan Wei, Ranajit Sai, Cian O'Mathuna and Yi Dou, Tyndall National Institute

T07.9: Advantageous Applications For Permanent Magnet Hybrid Core Inductors

Technical Lecture Presenter: Rachel Yang, Olin College of Engineering

Co-Authors: Sarah Coston, Andrew Nadler, Thomas Guillod and Charles R. Sullivan, Dartmouth College; David Perreault, Massachusetts Institute of Technology

T16 - Wireless Power Technologies

Technical Lecture Session Chairs: Omer C. Onar and Shajjad Chowdhury, Oak Ridge National Lab
Student Session Assistant: Subhabrata Basak, Indian Institute of Science

T16.1: A New Transmitter Coupling Structure With Inductive-Capacitive Decoupling System For Interoperable Dynamic Wireless Charging

Technical Lecture Presenter: Ashwaini Goswami, Indian Institute of Technology Madras
Co-Authors: Rakesh Pulletikurthi, Deepak Ronanki, and Subbarao Pichuka, Indian Institute of Technology Madras

T16.3: Optimization Design of Dual-Layer Coil For Wireless Charging Under Wide Coupling Coefficient Variations

Technical Lecture Presenter: Yongbin Jiang, Nanyang Technological University

Co-Authors: Yanbo Wang, Xi'an University of Technology; Qinlan Wang, Jiangsu University; Sicheng Wang, China Electrical Power Research Institute; Yaohua Li, Nanyang Technological University; Zhigang Yao and Zhiling Liao, Nanyang Technological University; Lei Yang, Xi'an University of Technology; and Yi Tang, Nanyang Technological University

T16.4: Multi-Objective Optimization For Constant-Power DWPT Under Mutual And Self-Inductance Drift

Technical Lecture Presenter: Yihao Wu – The University of Texas at Austin

Co-Author: Zongyang Zhu, Chenmin Deng, Ziyang Xu, and Alex Hanson, The University of Texas at Austin

T16.6: Reactive Power Analysis of EV Wireless Power Transfer Systems Using Magnetomotive Force and Magnetic Circuit

Technical Lecture Presenter: Jung-Ik Ha, Seoul National University

Co-Authors: Sunghyuk Choi and Jinwook Jung, Seoul National University

T16.7: Physics-Informed Neural Network Based Modeling Of Magnetic Couplers For EV Wireless Charging System

Technical Lecture Presenter: Chang Li, Beijing Institute of Technology

Co-Author: Junjun Deng, Yi Zheng, Mengchen Duan, and Shuo Wang, Beijing Institute of Technology

T18: Magnetics Modelling

Technical Lecture Session Chairs: Matt Wilkowski and George A. Slama, Wurth Elektronik

Student Session Assistant: Aobo Yang, University of Pennsylvania

T18.1: Partial Discharge Behavior Of PET Films Under High dV/dt Stress In Sphere–Plate Tests

Technical Lecture Presenter: Lukas Reißenweber, Coburg Universiy of Applied Sciences and Arts

Co-Authors: Alexander Stadler, Coburg University of Applied Sciences and Arts and Ingo Hahn, Friedrich-Alexander-Universität Erlangen-Nürnberg

T18.2: Electrical Model and Characterization Of Near-Field Antennas For Communications From Induction Cooktop

Technical Lecture Presenter: Jesús Acero, Javier Hernandez, and Óscar Lahuerta Sediles, Universidad de Zaragoza

Co-Authors: Sergio Llorente and Francisco Villuendas, BSH Home Appliances Group

T18.3: Integrated Resonant Structures Using Stray Capacitance Of Litz Wire Strands For Resonant Converters

Technical Lecture Presenter: Pramod Apte, University of Kassel

Co-Author: Xiao Yu and Jens Friebe, University of Kassel

T18.4: Modeling of N-Level Current Balancing Transformers For Modular High Power Transformer Winding Building Blocks

Technical Lecture Presenter: Minh Ngo, Virginia Polytechnic Institute and State University

Co-Authors: Aakash Kamalapur and Dong Dong, Virginia Polytechnic Institute and State University

T18.5: Integrated Magnetics Design Of A Two-Winding HF Transformer Achieving Load Current-Dependent Variable Leakage Inductance Characteristics

Technical Lecture Presenter: Annoy Kumar Das, National University of Singapore

Co-Author: Baylon G. Fernandes, Indian Institute of Technology Bombay

T18.6: Integrated Planar Transformer With Embedded Zero-Sequence Inductance For Active Power Decoupling In Three-Phase Dual Active Bridge Converters

Technical Lecture Presenter: Yi Han, University of Toronto

Co-Author: Satyam Sa and Olivier Trescases, University of Toronto

T18.7: Split-PCB Planar Inductor Design For High-Density High-Efficiency Power Converters

Technical Lecture Presenter: Ashwini Kumar Dubey, University of Colorado Boulder

Co-Authors: Sayan Paul, University of Colorado Boulder; Yanghe Liu and Shailesh Joshi, Toyota Research Institute of North America; Dragan Maksimovic, University of Colorado Boulder

T18.8: Analysis Of Magnetic Configurations To Enhance DAB Converter Performance Over A Wide Power Range At High Voltage

Technical Lecture Presenter: Siddhesh Shinde, Technical University of Delft

Co-Authors: Gautam Rituraj, Gautham Ram Chandra Mouli and Pavol Bauer, Technical University of Delft

T18.9: FEA Prediction Of Parasitic Capacitance And Common-Mode Current Performance In Planar Transformers

Technical Lecture Presenter: Kuan-Yi Chen, National Taipei University of Technology

Co-Authors: Yu-Chen Liu and Shang-Hsun Wu, National Taipei University of Technology; and Huy Nguyen Quang, Hanoi University of Science and Technology

T24: Wireless Energy Systems—High Frequency

Technical Lecture Session Chairs: Sounak Maji, Texas Instruments and Erdem Asa, Oak Ridge National Laboratory

Student Session Assistant: Sina Navaiyan Kalat, University of Pittsburgh

T24.5: Modeling And Optimization Of MHz Self-Resonant Planar Coil For Wireless Power Transfer

Technical Lecture Presenter: Ghovindo Siadari, University of Washington

Co-Author: Jungwon Choi, University of Washington

T24.6: A 6.78-MHz kW-Level Capacitive Wireless Power Transfer System Utilizing Low-Loss Optimized Hollow Cylindrical Wire Based Inductors

Technical Lecture Presenter: Asif Mushtaq Bhat, Indian Institute of Technology Delhi

Co-Authors: Ayush Dixit and Sreyam Sinha, Indian Institute of Technology Delhi

T27: Modeling and Simulation: Device & Component Modeling

Technical Lecture Session Chairs: Didier Balocoo, Onsemi and Adam W. Skorek, University of Québec at Trois-Rivières

Student Session Assistant: Writtik Dutta, Arizona State University

T27.2: High-Fidelity Modeling Of Dynamic Magnetic Components For Power Electronics with Double-Pulse Testing, Automated Circuit Simulation and Deep Learning

Technical Lecture Presenter: Haisheng Shen, Nagasaki University

Co-Authors: Takehiro Motomatsu and Noritaka Shigei, Kagoshima University; Atsushi Itagaki, Ryowa Electronics; Masahiro Yamaguchi, Tohoku University; and Yoichi Ishizuka, Nagasaki University

T36: Magnetics Design And Modelling

Technical Lecture Session Chairs: Matt Wilkowski, Würth Elektronik and Adam W. Skorek, University of Québec at Trois-Rivières

Student Session Assistant: Ashwini Kumar Dubey, University of Colorado Boulder

T36.1: Analysis And Design Of Integrated Magnetic Components Using Magnetic Shunts For A Dual Active Bridge Converter

Technical Lecture Presenter: Aitor Vázquez, University of Oviedo

Co-Author: Alberto Carcamo, University of Oviedo; Sayan Paul, Ashwini Kumar Dubey, Dragan Maksimovic, and Luca Corradini, University of Colorado Boulder

T36.2: Coaxial Through-Silicon Via Micro-Transformers: Design, Fabrication, And Power Conversion Demonstration

Technical Lecture Presenter: Yixiao Ding, University of Pennsylvania

Co-Authors: Xuan Wang, Aobo Yang, and Yifan Zhu, University of Pennsylvania; Minjie Chen, Princeton University; Lei Gu, University of Pennsylvania and NVIDIA; and Mark Allen, University of Pennsylvania

T36.3: LLG-SPICE: A Unified Model For Simulating Planar Magnetics With Material Physics Properties

Technical Lecture Presenter: Davit Grigoryan, Princeton University

Co-Authors: Minjie Chen, Princeton University and Han Cui, University of Tennessee Knoxville

T36.4: Coupled Inductor Design For IPOP LLC Resonant Converter Considering Voltage Gain Model And Current Sharing

Technical Lecture Presenter: Yu Zuo, KU Leuven

Co-Authors: Diego Bernal-Cobaleda, Wout Vanderwegen, Jiaze Kong, Bangli Du, Qingcheng Sui, Yang Li, Hans Wouters, Wilmar Martinez, KU Leuven

T36.5: Reversed-Winding Passive Coil For Simplified Flexible Induction Heating Zones

Technical Lecture Presenter: Ignacio Lope Moratilla, Universidad de Zaragoza

Co-Authors: Claudio Carretero Chamarro, Jesús Acero, Óscar Lahuerta Sediles and José-Miguel Burdio Pinilla, Universidad de Zaragoza

Technical Dialogue Sessions

Technical D10: Wireless Power Transfer 1

Dialogue Session Chair: Khurram Afridi, Cornell University

Technical Dialogue Session Chair: Shajjad Chowdhury, Oak Ridge National Lab

D10.9: High-Power Wireless Phone Charging Via Reconfigurable MagSafe-Coil

Technical Dialogue Presenter: Liang Jia, Google

Co-Authors: Giulia Segatti, University of Udine; Liyu Yang, Li Wang, and Yanchao Li, Google and Stefano Saggini, Università di Udine DPIA

D11: Magnetics Applications & Characterization

Technical Dialogue Session Chair: George A. Slama, Wurth Elektronik

Technical Dialogue Session Chair: Ed Herbert, PSMA Independent Inventor

D11.1: Winding Loss Model For Toroidal Core Magnetics Using The Mirroring Method

Technical Dialogue Presenter: Jonas Muehlethaler, Frenetic

Abstract: This paper presents a winding-loss model for toroidal cores with arbitrary conductor layouts and air gaps. The classical method of images has been extended with a Kelvin transformation to enforce boundary conditions in case of toroidal cores. Validation against FEM simulations for four representative configurations shows loss predictions within 6% accuracy. The model accommodates both solid round and Litz conductors.

D11.2: A Lightweight Deep Learning Model For Core Loss Prediction Based On Waveform Segmentation

Technical Dialogue Presenter: Yingyi Yan, University of Electronic Science and Technology of China

Co-Authors: Shangrong Li, University of Electronic Science and Technology of China and Bo Zhang, UESTC

D11.3: High-Efficiency 10 kW Transformer Design, Loss Evaluation, And Misalignment Analysis For Inductive Wireless Charging Of Autonomous Underwater Vehicles (AUVs)

Technical Dialogue Presenter: Prasanth Thummala, Zhuzhou CRRC Times Electric UK Innovation Center

Co-Authors: Xiulin Chen, Avinash Maguluri, Yu Qi, Zihao Liu, Yong Pang, Xin Gao, Xiaoyun Rong, Zhongxun Jiang, CRRC Times Electric UK Innovation Center

D11.4: Comparison of DC Biased Inductances With Small- and Large-Signal AC-Excitation

Technical Dialogue Presenter: Pierre Küster, University of Kassel

Co-Authors: Lennart Hoffmann and Jens Friebe, University of Kassel

D11.5: A New Winding Structure For Balance Technique Considering Soft Saturation Characteristics Of Powder Cores

Technical Dialogue Presenter: Gaku Kondo, Nagoya University

Co-Authors: Yota Omizu, Sihoon Choi, and Jun Imaoka, and Masayoshi Yamamoto, Nagoya University

D11.6: Automated Characterization And Loss Modeling Of Medium Frequency Magnetic Cores

Technical Dialogue Presenter: Joaquin E. Tristan University of Pittsburgh

Co-Authors: Jacob Ferrer, Christopher Bracken, Todd Marzec, Brandon Grainger, and Paul Ohodnicki, University of Pittsburgh

D11.7: Enhancing Efficiency And Increasing Leakage Inductance By Using Aluminium Foil Winding In Transformer For Dual Active Bridge Converter

Technical Dialogue Presenter: Priya Priya, Indian Institute of Technology, Bombay

Co-Authors: Sandeep Anand and Baylon G. Fernandes, Indian Institute of Technology, Bombay

D11.8: FEA-Driven High-Frequency Transformer Design, Fabrication And Loss Characterization

Technical Dialogue Presenter: Sandun Kuruppu, Western Michigan University

Co-Authors: Thilina Dissanayake, Western Michigan University; Vandana Rallabandi, Rafal Wojda, and Clayton Hickey, Oak Ridge National Laboratory; Ethan Kotre, Pablo Gomez, and Sahan Wijethunga, Western Michigan University

D11.9: Low Profile, Laminated Nife Transformers For High-Frequency LLC Resonant Converters

Technical Dialogue Presenter: Xuan Wang, University of Pennsylvania

Co-Authors: Farrukh Jamshed, University of South Carolina; Victor Gao, University of Pennsylvania; Lei Gu, University of Pennsylvania and NVIDIA; Adel Nasiri, University of South Carolina; and Mark Allen, University of Pennsylvania

D11.10: Circuit-Based Analytical Model For The Airgap Effect On Current Sharing In Parallel Windings Of A Planar PCB Transformer

Technical Dialogue Presenter: Yan Liang, Virginia Tech

Co-Authors: Yi-Hsun Hsieh, Center for Power Electronics Systems, Virginia Tech and Qiang Li, Virginia Polytechnic Institute and State University

D11.11: Flatwise Windings For Improved Thermal Management In High Power Transformer Applications

Technical Dialogue Presenter: Karl Raymond D. Roque, Department of Electrical Engineering, Nagoya University

Co-Authors: Itsuki Masuda, Sihoon Choi, and Masayoshi Yamamoto, and Jun Imaoka, Nagoya University; Matti Kauhanen, ABB Drives; and Kengo Tashiro, HighQ Power

D21: Wireless Power Transfer 2

Technical Dialogue Session Chair: Hua Zhang, Lehigh University

Technical Dialogue Session Chair: Sounak Maji, Texas Instruments

D21.9: Low-Loss Pavement-Embedded Multi-MHz Capacitive Wireless Power Transfer System Using Optimized Curved Couplers

Technical Dialogue Presenter: Syed Saeed Rashid, Cornell University

Co-Authors: Raquel Sarabia-Soto, Dheeraj Etta, and Khurram Afridi, Cornell University

D21.10: Optimal Litz Wire Design For High-Power Wireless Charging System

Technical Dialogue Presenter: Mostak Mohammad, Oak Ridge National Laboratory

Co-Authors: Emrullah Aydin, Omer C. Onar and Jon Wilkins, Oak Ridge National Laboratory; and Bernhard Hoess, BMW Group

D22: Magnetics Applications & Design

Technical Dialogue Session Chairs: Matt Wilkowski, Würth Elektronik and Ed Herbert, PSMA Independent Inventor

D22.1: A New Low Profile, Power Dense Geometry For A 50 kW Transformer With PCB Windings For Electric Aircraft Applications

Technical Dialogue Presenter: Lufan Zhou, Universidad Politecnica de Madrid

Co-Authors: Daniel Rios Linares, Pedro Alou, Miroslav Vasic, and Alberto Delgado Expósito, Universidad Politécnica de Madrid

D22.2: Geo2Field: A Deterministic DDPM For Accelerated Magnetic Field Simulation In Medium-Frequency Transformers

Technical Dialogue Presenter: Xiao Yang, Eindhoven University of Technology

Co-Authors: Ward Taborsky and Dongsheng Yang, Eindhoven University of Technology

D22.3: Design And Analysis Of Leakage Inductance Integrated Transformer Structures Utilizing Interleaved Windings

Technical Dialogue Presenter: Sihoon Choi, Nagoya University

Co-Authors: Kota Okada, Nagoya Universiy and Masayoshi Yamamoto, Nagoya University; Takayuki Ikari, Akinori Okubo, Yuichi Iwasaki and Takahiro Tokita, EV System Laboratory, Research Division Nissan Motor

D22.4: Accurate MHz-Range Hysteresis Simulation Via A Delay-Enhanced Jiles-Atherton Model In Verilog-A

Technical Dialogue Presenter: Bohua Zhang, Technical University Dortmund

Co-Author: Martin Pfost, Technische Universität Dortmund

D22.5: A Noval Integrated-Core Lateral-Flux Coupled Inductor For Vertical Power Delivery In Voltage Regulator Modules

Technical Dialogue Presenter: Yu-Chen Chung, National Taiwan University of Science and Technology

Co-Authors: Chien-Chun Chan, Huang-Jen Chiu and Yu-Chen Chang, National Taiwan University of Science and Technology

D22.6: Universal SPICE Modeling Of Magnetic Components Applying Vector Fitting Algorithms And State-Space Modeling

Technical Dialogue Presenter: Alberto Vital Pagola, Universidad Politécnica de Madrid

Co-Authors: Alberto Delgado Expósito, Universidad Politécnica de Madrid; Jesus Oliver Ramírez, European Space Agency; and Miroslav Vasic and Daniel Rios Linares, Universidad Politecnica de Madrid

D22.7: Physically Correct Magnetic Dimensions Of Toroidal Cores Based On Material Type And Excitation

Technical Dialogue Presenter: Lukas Mueller, Micrometals

Co-Authors: James Cox, Micrometals; Jun Wang, University of Nebraska–Lincoln; and Enrique Garcia, Micrometals

D22.8: MagNet Challenge 2023 Revisited: Beyond The Bounds Of Equation-Based Core Loss Modeling

Technical Dialogue Presenter: Asier Arruti, Mondragon Unibertsitatea

Co-Authors: Anartz Agote, Iosu Aizpuru and Mikel Mazuela, Mondragon Unibertsitatea

D22.9: Matrix Transformer For Data Center Applications With Field-Balanced Secondary Winding And Integrated Shielding

Technical Dialogue Presenter: Thomas Jochmans, Katholieke Universiteit Leuven - Energyville

Co-Authors: Hans Wouters and Wout Vanderwegen, Diego Acevedo-Bueno, and Wilmar Martinez, KU Leuven - Energyville

D22.10: Transformer Design With Enhanced Ap Method Using Readily Available And Customizable Magnetics In DAB Converters For Wide Range EV Chargers

Technical Dialogue Presenter: Mahmoodreza Eskandarpour Azizkandi, North Carolina State University

Co-Authors: Wensong Yu, NC State University; Liming Liu, Eaton; and Hongrae Kim, Eaton

D22.12: An Improved Analytical Methodology For High-Frequency Planar Transformer Design In LLC Converters

Technical Dialogue Presenter: Kaushik Basu, Indian Institute of Science (IISc) Bengaluru

Co-Authors: Venkata Praneeth Somina, Sethuram Ronanki, Bharath T, and Sidhartha Chakroborty, Indian Institute Of Science, Bangalore; and Shailesh Ghotgalkar, Texas Instruments

D23: Power Electronics Integration and Manufacturing 1

Technical Dialogue Session Chairs: Zhou Dong, ABB and Justin Henspeter, IBM

D23.6: Binder Jet Printed Ferrite Cores And Lithographically Printed Ceramic Bobbins For Power Conversion

Technical Dialogue Presenter: Sam Mahmodicherati, GE Aerospace

Co-Authors: Ramanujam Ramabhadran, GE Aerospace; Jiale Xu and Juan Rivas-Davila, Stanford University; and Cathleen Hoel, GE Aerospace

D29: Power Electronics Integration And Manufacturing 2

Technical Dialogue Session Chair: Vidhi Patel, ABB USCRC and Justin Henspeter, IBM

D29.4: Forced Cooling Thermal Model For 1-MHz, 5-kW LLC Converter Planar Transformer

Technical Dialogue Presenter: Aqarib Hussain, Tesla

Co-Author: Kristen Booth, University of South Carolina

D31: Power Electronics Applications 2

Technical Dialogue Session Chair: Juan Ramón G. Meré, University of Oviedo

Technical Dialogue Session Chair: Daniel Rios Linares, Universidad Politecnica de Madrid

D31.8: Design Of High-Frequency, High-Voltage Planar Transformer For Driving Dielectric Barrier Discharge Loads

Technical Dialogue Presenter: Hyeongmeen Baik, University of Wisconsin Madison

Co-Authors: Saket Kapse and Jinia Roy, University of Wisconsin-Madison

Reference

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