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EMC+SIPI Symposium Offered Practical Instruction, Latest Equipment And R&D

by David G. Morrison, Editor, How2Power.com

EMC+SIPI is not your average IEEE conference. I discovered this while attending the most recent edition of the IEEE International Symposium On Electromagnetic Compatibility, Signal Integrity and Power Integrity, held July 22-26, 2019 in New Orleans. While this symposium included numerous papers on the designated topics, its greater emphasis seemed to be on providing professional instruction on these topics. Instead of allotting just a day or two for classes prior to the event, EMC + SIPI spread workshops and tutorials across three days of its five-day program. Some of the educational content was presented within the Clayton R. Paul Global University, which offered eight tutorials on broad topics. Of particular importance to professional engineers, registered technical attendees could earn PDH credit hours from the IEEE EMC Society by "participating in any combination of paper sessions, workshops & tutorials, Global University, and technical meetings."

The instructive nature of the symposium even extended to the expo. On the three days when the exhibition was running, companies presented experiments and demos in the exhibit hall. Even within the technical paper sessions, the heavy emphasis on techniques for measurement, modeling, EMI mitigation and standards compliance gave the impression that the research being presented was also practical in nature. As for the exhibition, all types of instrumentation, and electronic and mechanical equipment or accessories used in EMC testing or software for modeling and analysis of EMC were represented here. On the hardware side, the exhibition carried everything from small probes up to room-size EMC test chambers.

There was a surprising range of product and service options for companies looking to perform pre-compliance testing, including instrument rentals, plus laboratories and firms offering EMC testing and certification, and relevant industry organizations and publications. Naturally, the exhibit also included suppliers of components and materials (such as for shielding) needed to bring new designs into compliance.

In terms of application areas, automotive and military/aerospace standards seemed to get significant attention in the program, but wireless standards also appeared to be top of mind. This year's keynote by professor Gabriel M. Rebeiz explored the significance of 5G as it ushers in a new era of directive communications. In terms of content directly related to power electronics, there were seven papers discussing research in one of two areas—active EMI filters and wireless charging, particularly for automotive applications. But then there were also a number of other papers and/or presentations related to power supplies or power components sprinked among the other sessions. I have attempted to list all of these papers and presentations at the end of this article, just after the table giving an overview of the full program.

Other application areas for EMC that received some attention in the conference program were medical, space and the smart grid. As the symposium name suggests, the key topic areas are EMC, signal integrity (SI) and power integrity (PI). But overall, the program seemed to place more emphasis on EMC than on SI and PI. Additionally, it covered EMC-related areas such as transient and surge immunity, even extending to the subject of electromagnetic pulse (EMP) immunity.

For those looking to increase their practical knowledge, skills and engineering credentials in EMC, SI and PI, or to sample the latest equipment, software or services, or to connect with experts in the field, EMC+SIPI provides a very valuable annual forum. Though its primary audience may be EMC and SI/PI specialists, the resources here should also be valuable to engineers working in other fields such as power electronics, where EMI/EMC design issues are ever present. The sessions provided at this conference can take the power supply engineer well beyond the EMI/EMC tutorials offered at the power electronics conferences and open your eyes to the array of products and services available for precompliance and compliance testing.

Overview of EMC+SIPI 2019 Technical Program

Table. List of sessions (session type = tutorial, technical or special).

Monday July, 22, 2019 Tuesday July 23, 2019	EMC Fundamentals (tutorial)	Introduction to EMI Modeling Techniques (tutorial)	Shielding Effectively (tutorial)	Connected Vehicles: The Future of the Modern Automotive Industry (tutorial)	The Role of the IEC Advisory Committee on EMC (ACEC) in Coordinating IEC EMC Activities (SW) (tutorial)	EM Risk Management: Introduction to IEEE P1848 and the Need for It (tutorial) and Mil-Std-461G and You: Requirements Tailoring For Space Applications
	Keynote presentation: 5G And The Rise Of Directive Communications: The End Of The Marconi Era Is Near. Speaker: Gabriel M. Rebeiz					
	Experiments and Demos			Poster		
	Low Frequency EMC (technical)	Low Cost Software for Environment Measurements (special)	EMC Management (technical)	Design for EMC (technical)	SI Measurements (technical)	Radiated Emissions Measurements (technical)
	Shielding (technical)	Device Characterization (technical)	ESD (technical)	Automotive EMC (technical)	Power Integrity (technical)	Novel EMC Measurements (technical)
	Ask the Experts: EMC					
	Experiments & Demos					
	Ask the Experts: Signal/Power Integrity					
Wednesday, July 24, 2019	Power Electronics (technical)	Device Characterization-2 (technical)	Aeronautics and Space EMC (technical)	Cable Harnesses (technical)	Signal Propagation-1 (technical)	Field Measurements (technical)
	Experiments & Demos					
	Ask the Experts: Aerospace EMC			Poster Sessions: Browse Posters and Discover the Scientific Research and Findings of Your Peers		
	Introduction to Medical EMC (tutorial)	System Level ESD Protection: Device, Design and Test Methodologies (tutorial)	Application of Reverb Chambers (tutorial)	Cable and Connector Design for Product EMC (tutorial)	Basic EMC Requirements (tutorial)	Overview of the P1715 WG—IEEE Guide for the Characterization of the Shielding Effectiveness of Planar Material (tutorial)
	Experiments & Demos					
Thursday, July	Emerging Wireless	Current Challenges	Signal Propagation-2	Computational	Multiphysics	EMC Standards

25, 2019	Technologies (technical)	in Spectrum Engineering (special)	(technical)	EM (technical)	(technical)	Measurements (technical)
	Experiments & Demos					
	Channel Modeling (technical)	Radiation Source Modeling (technical)	HPEM (technical)	Machine Learning (technical)	Electromagnetic Compatibility of Wireless Power Transfer Systems (special)	Reverberation Chambers (technical)
Friday, July 26, 2019	Signal Integrity Fundamental for High-Speed Signaling for Computing and Communication Systems (SIPI) (tutorial)	Product Safety Compliance and Global Market Access (tutorial)	Application of EMC Methodology to Information Security Evaluations/Countermeasures/Education (tutorial)	EMC Consultant's Toolkit (workshop)	Automotive EMC Standards and Instrumentation Update (tutorial)	
	Advanced Methodology for EMC Design Rule Checking (tutorial) Chip Aware Platform Power Integrity Design Approach with Standard PI Model (SPIM) and Unified PI Design Target (UPIT) (tutorial)	Establishing Work Level in EMC Mitigation (tutorial)	Advances in Antenna Calibration and Measurements for EMC Applications (tutorial)	The EME Database (workshop)	Practical EMC Training and Education (tutorial)	Guide to the IEEE P370 Standard (tutorial)

Power Supply-Related Presentations

Technical Session: Power Electronics

Co-Chairs: Chulsoon Hwang, Missouri University of Science and Technology, Rolla, MO, USA and Seungyoung Ahn, Korean Advanced Institute of Science and Technology, Daedeok Innopolis, Daejeon, South Korea

"Design and Implementation of a Novel Differential Mode Active EMI Filter with a Twin Circuit" by Balaji Narayansamy and Fang Luo, University of Arkansas, Fayetteville, AR, USA.

"Improvement of Surge Immunity by using Transformer-Isolation in an Active EMI Filter" by Sangyeong Jeong and Jingook Kim, Ulsan National Institute of Science and Technology and EM coretech, Ulsan, Korea, Republic of (South).

"Modeling and Critical Winding Geometric Parameter Identification for the Near Electric Field from Helical Inductors" by Mohamed El-Sharkh and Shuo Wang, University of Florida, Gainesville, FL, USA.

Special Session: Electromagnetic Compatibility of Wireless Power Transfer Systems

Co-Chairs: Shuo Wang, University of Florida, Gainesville, FL, USA and Fang Luo, University of Arkansas, Fayetteville, AR, USA

"Resonant Frequency Selection Method for Wireless Power Transfer System Considering Electromagnetic Interference Reduction" by Jaehyoung Park, Yujun Shin, Jongwook Kim, Bumjin Park, Hyunwoong Kim and Seungyoung Ahn, Korean Advanced Institute of Science and Technology, Daejeon, Korea, Republic of (South).

"Design and Analysis of Double-Eight Shaped Shielding Coil for Solenoid Coil in Loosely-Coupled Wireless Power Transfer System" by Boogyo Sim, Seungtaek Jeong, Seongsoo Lee, Seokwoo Hong, Korean Advanced Institute of Science and Technology, Daejeon, Korea, Republic of (South); Hongseok Kim, Missouri University if Science and Technology, Rolla, MO, USA; and Joungho Kim, Korean Advanced Institute of Science and Technology, Daejeon, Korea, Republic of (South).

"A Dual Resonance Near Field Communication Coil for EMF Reduction in Near Field Communication and Wireless Power Transfer Dual Coil System" by Seokwoo Hong, Seungtaek Jeong, Seongsoo Lee, Boogyo Sim, Korean Advanced Institute of Science and Technology, Daejeon, Korea, Republic of (South); Hongseok Kim, Missouri University if Science and Technology, Rolla, MO, USA; and Joungho Kim, Korean Advanced Institute of Science and Technology, Daejeon, Korea, Republic of (South).

"Analytical Expressions of Differential-Mode Harmonics in Loosely-Coupled Series-Resonant Wireless Power Transfer System" by Hongseok Kim and Jun Fan, Missouri University if Science and Technology, Rolla, MO, USA; Seongsoo Lee, Seokwoo Hong, Boogyo Sim, and Joungho Kim, Korean Advanced Institute of Science and Technology, Daejeon, Korea, Republic of (South).

Session: Mil-Std-461G and You: Requirements Tailoring For Space Applications

"Spacecraft Charging and Mil-Std-461G Tailoring" by Tim McDonald, Electro Magnetic Applications, Lakewood, CO, USA.

Tutorial Session: Low-Frequency EMC Issues In Transportation Systems

"EMI Interferences due to Power Converting Systems in Automotive Applications" by Sven Fisahn and Heyno Garbe, Leibniz Universität Hannover, Hannover, Germany.

"Conducted Emissions Prediction of Switching Regulators in Automotive Infotainment Systems with Power and Data Over Shared Cabling" by Patrick DeRoy, Analog Devices, Wilmington, MA, USA; Abhishek Ramanujan, Analog Devices International, Limerick, Ireland; Joseph Tarkoff, Analog Devices, Somerville, MA, USA.

Technical Session: Device Characterization-2

"Modeling Strategy for Film Capacitors in EMI Filters" by Ruijie He, Sameer Arun Walunj, Shaohui Yong, Victor Khilkevich and David Pommerenke, Missouri University if Science and Technology, Rolla, MO, USA; Hermann Aichele, Robert Bosch, Martin Boettcher, Philipp Hillenbrand and Andreas Klaedtke, Renningen, Germany.

"A Simple Measurement Method for Frequency-Dependent Impedance and Parasitic Parameters of Common-Mode Chokes" by Peng Hu, Zhongyuan Zhou, Mingjie Sheng, Ya Li, Xiang Zhou, Peng Li, and Qi Zhou, Southeast University, Nanjing, China.

Poster Session:

"Impacts of Undesired Radio Waves on Mobile Communications Nearby Inverter Power Devices" by Koh Watanabe, Yoshifumi Sugimoto, Noriyuki Miura and Makoto Nagata, Kobe University, Kobe, Japan; Satoshi Tanaka, Yasunori Miyazawa, Masahiro Yamaguchi, Tohoku University, Sendai, Japan.

Technical Session: Low Frequency EMC

"Measuring the Noise Impedances of Switched-Mode Power Supplies" by Enrico Mazzola, Schaffner Group and Politecnico di Milano, Luterbach and Milan, Switzerland and Italy; Flavia Grassi, Politecnico di Milano, Milan, Italy; Alessandro Amaducci, Schaffner Group, Luterbach, Switzerland.

"Hybrid Direct Frequency Cycloconverter with Power Factor Correction for use in Single and Multi-Phase Electric Power Systems" by Aleksandr Kornilov and Stanislav B. Reznikov, Moscow Aviation Institute, Moscow, Russia.

Technical Session: Device Characterization-1

"A Novel Method for High Frequency Battery Impedance Measurements" by Thomas F. Landinger and Guenter Schwarzberger, Infineon Technologies, Munich, Germany; Andreas Jossen, Technical University of Munich, Munich, Germany.

Technical Session: Computational EM

"Estimating Electromagnetic Interference from Solar Panels for Space Vehicles" by David Norte, Ball Aerospace, Boulder, CO, USA.

Experiments & Demos

"How To Measure The Real Rail Voltage On Your Board And Not The Near Field RF Noise" by Eric Bogatin, Teledyne LeCroy, Boulder, CO, USA.

"EMC Sniffer & EMC Box" by Jared Quenzer, Field Application Engineer, Wurth Elektronik eiSos, Watertown, SD, USA and Antonio Alcarria, Wurth Elektronik eiSos, Waldenburg, baden-Württenberg, Germany.

To read more about the demos at this conference, see "Experiments and Demonstrations at EMC+SIPI 2019" by Bob Scully and Sam Connor, IEEE Electromagnetic Compatibility Magazine, Volume 8, Quarter 3.