

## EMC MARATHON 2022 Binational Edition

### Part 7: Poland - Denmark, 21<sup>st</sup> April 2022

MARATON EMC2022 Binational Edition is continuation of the series of on-line courses initiated by the IEEE EMC-S PL Board of the Electromagnetic Compatibility Society Polish Chapter of the IEEE (USA)

**Main theme: EMI/EMC Modelling and Assessment in Power Electronics**

### AGENDA

<b>Topic I</b>	<b>Power Converter Impedance and Emission Characterization Below 150 kHz</b>
Date	21st April 2022, 9:30 - 10:15 (CEST)
Description	IEC standardization is preparing general conducted emission limits for grid connected power converters in the frequency range between 2 kHz and 150 kHz, which has until recent years only been regulated for some categories of equipment. With the necessity of analyzing and estimating power converters behavior, this presentation focuses on a black-box modeling approach suitable for this new frequency range of interest. A method for measuring the dynamic power converter impedance during operation has been developed and proven in practice by superposition of a multi-tone signal onto the AC input voltage to the power converter under different load conditions. Later, through extraction of the noise source, an equivalent circuit diagram of the power converter is developed which can be used for emission estimation and further analysis such as EMI filter designing. The provided experimental results showed high accuracy of the proposed method and its suitability in estimating EMI below 150 kHz as a cost-effective and time-efficient approach.
Speaker	<b>Pooya Davari</b> AAU Energy, Denmark  <b>Per Thåstrup Jensen</b> FORCE Technology, Denmark
<b>Topic II</b>	<b>Full Wave Hybrid Simulation of a Flyback Converter</b>
Date	21st April 2022, 10:30 - 11:15 (CEST)
Description	In power converters the main contribution to the radiated emission from power converters is common-mode current on the attached cables. Center for Industrial electronics, University of Southern Denmark suggests a method which use hybrid simulation to reduce modelling effort and simulation time in a step to use full wave simulation as investigation tool. The method combines measured S-parameters with 3D full wave simulations. The hybrid model, which is still premature, was tested and results where compared with near-field scan.
Speaker	<b>Morten Sørensen</b> University of Southern Denmark, Odense, Denmark

<b>Topic III</b>	<b>In situ EM field measurement of high-power bus charging stations</b>
Date	21st April 2022, 11:30 - 12:00 (CEST)
Description	The presentation show the practical approach of both electric and magnetic field in-situ measurements from high-power bus charging stations' installations
Speaker	Adam Maćkowiak, Krzysztof Sieczkarek Radio Technologies and Electromagnetic Compatibility Laboratory, Łukasiewicz Research Network - Poznań Institute of Technology, Poland
<b>Topic IV</b>	<b>LabVIEW-FPGA-based Testbench for EMI Analysis in Variable Speed Drives</b>
Date	21st April 2022, 12:15 - 12:45 (CEST)
Description	Several parameters compromise the variable speed drives' performance in switching modulation techniques for non-linear loads e.g., modulation index and switching frequency. Using a LabVIEW-based FPGA testbench is possible to verify the impact of those parameters on EMI in conducted emissions and assess EMC
Speaker	Douglas Nascimento PhD candidate University of Zielona Góra, Poland and University of Twente, Early Stage Researcher in the ETOPIA project
<b>Topic V</b>	<b>Control algorithms to Mitigate the MMC EMI levels</b>
Date	21st April 2022, 13:00 - 13:30 (CEST)
Description	Multilevel Modular Converter (MMC) is a popular type for lowering the Electromagnetic interference (EMI) emissions in high voltage and medium voltage applications. Next to the inherent reduction of EMI associated with MMC much can be gained by tuning its own components and operating algorithms. This paper presents a study on the relation between the emission levels and the control algorithms used for the operation
Speaker	Amr Madi PhD candidate University of Zielona Góra, Poland
<b>Special lecture</b>	<b>Design and Evaluation of simple Electrical Circuit Components (R, L and C) for High-Voltage and High-Frequency Applications</b>
Date	21st April 2022, 13:45 - 15:00 (CEST)
Description	Resistors, Inductors and Capacitors are common electrical circuit elements. They are easy to design and readily available for use at low frequencies (up to a few MHz). As we increase the frequency to 10's and 100's of MHz, these elements tend to have complex equivalent circuits. New approaches are needed to make them work efficiently at high frequencies. In addition, in high-power electromagnetics (HPE) applications, we are also concerned about arcing and breakdown issues within and across these components. In this presentation certain methods of building electrical components (R, L and C) specifically for HV and HF applications are reviewed.
Speaker	Dave V. Giri 2020-2021 IEEE EMC-S Distinguished Lecturer Research Professor, Dept. of ECE, University of New Mexico Albuquerque, NM, USA
<b>Moderator</b>	Krzysztof Sieczkarek Łukasiewicz Research Network - Poznań Institute of Technology Chairman of IEEE EMC-S PL, Coordinator of IEEE EMC-S R8

Event organized by IEEE EMC-S PL in co-operation with IEEE EMC-S DK

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