Industry-Academic Forum on EMC 2023

"Applications that Look for Solutions"

Contributions from Industry – Part 2 of 2 (Day 1, 14:00 – 15:30)

Electric Vehicle Powertrain EMC Simulation
(Matthias Tröscher)

Dassault Systèmes Deutschland, Germany

The electric drive constitutes a critical component for the electrification of vehicles and hence the electro-mobility strategy. A complex system in its own right, the electric drive needs to be integrated into both the electric powertrain and the full vehicle. Gaining early insights into system interdependencies using Model-Based Systems Engineering (MBSE) is key to achieving the best possible performance for competing design objectives. This short presentation highlights the benefits of state-of-the-art electromagnetic (EMC) simulation tools and shows what still needs to be done.

Volvo Cars EMC R&D Activities and Challenges of EMC Compliance // CAN-FD Filter with Improved Radiated Immunity & Signal Quality
(Helin Zhou, Shefeen Maliyakkal)

Volvo Car Corporation, Sweden

1st part: In this presentation, we will review the EMC R&D Activities within Volvo Cars and its collaboration with universities in Sweden. Volvo Cars have set the goal to be 50% electric by 2025 and 100% electric by 2030. With the acceleration of electrification, to fulfill EMC compliance of battery electric vehicles is not easy. Here we have listed some challenges like crosstalk between high voltage propulsion system and low voltage components, conducted and radiated emissions of electric drive system on vehicle level, and so on.
2nd part: Radiated immunity for CAN-FD buses is a concern. In the most problematic frequency range 20-30 MHz, where the car body has its lowest electromagnetic resonances, the buses might fail to tolerate legal requirements for the radiated immunity. A new CAN-FD filter has been proposed with improved radiated immunity & signal quality

EMC/SI Research Activities at Rosenberger Hochfrequenztechnik
(Thomas Schmid, Simon Sturm)

Rosenberger Hochfrequenztechnik, Germany

Rosenberger Group is a leading manufacturer of radio frequency, fiber optic and high-voltage connectivity solutions with wide-ranging applications in automotive, communications, industrial and medical environments as well as in measurement equipment. In order to meet the diverse requirements in that spectrum of applications, EMC and SI are prominent topics in Rosenberger's R&D laboratory team. We like to use this talk to give insights into our EMC/SI laboratories and equipment and to touch two current research topics in automotive measurement techniques for EMC and SI, respectively. Finally, we would like to give an outlook to future challenges posed by electric mobility and high-speed data channels..

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EMC Challenges in Power Electronic Converters
(Arne Schröder)

Hitachi Energy, Switzerland

Power electronic converters are key enablers for power grids of the future – they connect renewable energy sources to the grid, enable DC grids, control power quality and provide energy storage systems, for example. In this context, EMC is an important design aspect to facilitate technology advances in power electronics. This presentation gives an industrial view on EMC challenges in modelling, prediction, solution development and design for various applications ranging from power semiconductors to large-scale high voltage systems.

Conducted and Radiated EMC in Industrial Power Converters
(Bernhard Wunsch)

ABB Corporate Research, Switzerland

In this talk I will present EMC related projects at ABB Corporate Research with focus on industrial converters used to drive motors. EMC simulations are an indispensable tool to analyze EMC noise propagation in power converters and to assess the best filtering options. First, I will show examples of EMC design and analysis of conducted EMC in power converters using passive or active filter components. Then I will discuss status and challenges of radiated EMC emissions of converters.

Need of New VRM Model for Power Tree Design in Equipment Constraint by TEMPEST Standard (Benoit Goral)

Thales, France

Thales designs and produces information and communication secured systems for security and armed forces, governments and vital operator (energy, water treatment, telecommunication). In order to ensure sensitive data protection, Thales products and systems are sometimes subject to an EMC standard field called TEMPEST. However, in a very competitive market, other constraints are applied to Thales equipment like SWAP-C optimized design. These constraints are unfortunately antagonist with the design rules applied to ensure TEMPEST qualification success. Power Delivery Networks often present a weakness in TEMPEST qualification and therefore lot of filtering must be added. When designing the power tree of a new product, no attenuation brought by DC-DC function is considered. In order to optimize Thales product (Size and Consumption) a new model for VRM could be introduce to quantify the attenuation brought by DC-DC from their output on the input. This new figure of merit could be called CARR (component activity Rejection Ratio). Measurement techniques could also be developed aiming to verify the concept and calibrate the model.

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Electric Vehicle Powertrain EMC: Challenges for Composite Chassis and Thermal Interfaces of Filter Components (Guido Rasek)

Valeo eAutomotive, Germany

The electric power train in the automotive industry involves high power ratings, high voltages and high currents. Additionally high time derivatives occur in the operation of such devices. Sounds like an EMC riddle. We suggest looking at two applications that look for solutions: First: Carbon fiber reinforced composites and Glass fiber composite vehicle chassis roadmaps for low frequency magnetic fields ICNIRP exposure originating from a high power powertrain. Second: For higher frequency ranges filtering, the thermal interfaces of filter components, which need to improve.

Conducted EMI of an Inverter-Driven Electric Power Train
(Robert Kebel)

Airbus, Germany

Due to the electrification in mobility applications, electric (high) power trains become an increasingly important subject of investigating EMI. This talk provides an overview about the systematic root cause of electromagnetic conducted emissions of a power train. Direct current (DC) power sources such as batteries or fuel cells provide the energy for propulsion. Alternating current (AC) electric engines drive the vehicle, because AC engines have advantages in maintenance and reliability. Pulse-width modulating (PWM) inverters convert DC into AC voltages. PWM technology can lead to significant electromagnetic interference (EMI) issues pending e.g. on power level and more electric parameters, which should be chosen early for mitigating the EMI risk. A simple predictive simulation model supports making integration decisions in view of the EMI risk.