



Industrial Forum IF-1, EMC Zurich 2007

## EMC in the Product Life Cycle

An introduction to methods of EMC planning, design and verification in industry

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For electronic devices, like equipment for telecommunication, automation, automotive components and medical devices, EMC-requirements are defined by authorities and customers on the relevant market. In order to meet these requirements in time and to minimize the economic effort, EMC-activities should be started in the early product-generation process phase.

The planning, tracing and the consequent roll out of EMC-activities should be included in all process phases, such as

- concept
- design
- approval
- certification
- installation
- operation and maintenance

Cost effective qualification concepts for product variants and changes demand the definition of suitable requirements for sub-devices, which can be verified by appropriate measuring methods for OEM-products, modules and components like shielding and filtering devices.

The industrial forum especially addresses engineers in industry. A number of examples taken from practice are presented in a way easy to understand without a deep academic theoretical background.

Speaker	Affiliation	Topic	Duration/min	Time
Detlef Hoffmann	Nokia Siemens Networks	EMC in the Product Life Cycle (Introduction and Overview)	20	14:00-14:20
Dr. Sven Helmers	Nokia Siemens Networks	Shielding Effectiveness and System Measures	35	14:20-14:55
Prof. Marco Leone	University of Magdeburg	On Board EMC	35	14:55-15:30
		BREAK	20	15:30-15:50
Thomas Steinecke	Infineon	Chip Level EMC	35	15:50-16:25
Michael Steinmüller	Nokia Siemens Networks	Precompliance Measurements with Focus on Time Domain	35	16:25-17:00
Detlef Hoffmann	Nokia Siemens Networks	EMC in the Product Life Cycle (Summary and Conclusion)	15	17:00-17:15

## Topic

## Abstract

EMC in the Product Life Cycle  
(Introduction and Overview)

To reach the goals of compliance to emc-regulation and competitive time to market of products, effective emc-activities accompany all parts of the product live cycle, with special effort focused in the early phases of product generation process. The importance of early definition of emc-requirements, emc-concept, definition of protective zones, design-reviews and precompliance verification is highlighted.

Shielding Effectiveness and  
System Measures

Housings, cables and EMI-filters are essential elements for realization of EMC of devices and installations. Transfer impedance and filter attenuation versus frequency give important parameters to describe the degree of protection of components and circuits against unintentional electromagnetic influence. Measurement procedures for unambiguous determination of the EMC-Parameters of element for mechanical design are presented. Using this knowledge on fundamentals, parameters and measurement procedures, participants will be able to respond profoundly to questions on EMC-protection which will come up in practice.

On Board EMC

Methods for EMI-analysis on the printed-circuit-board level are presented. For state of the art modules, the most important radiation mechanisms are identified. The way how to model such radiation effects is introduced and simple calculations useful for practical estimations are presented. The participant is provided with a quantitative understanding of the influence of design improvements on emission levels. The relation of the models to on-board diagnostic measurements is discussed.

Chip Level EMC

Integrated circuits (IC) are the major contributors to electromagnetic emission (EME). Millions of simultaneously switching transistors draw very high currents from the power supply network which is distributed along chip, IC-package and printed circuit board (PCB). Without dedicated noise decoupling design measures on these various system levels, EME could not be handled, especially with respect to the tough demands in the automotive industry. This talk gives an overview of RF noise generation and coupling mechanisms as well as efficient countermeasures in chip and IC-related PCB design. Special user configurations of ICs which help to reduce EME are introduced. IC emission models (ICEM) for system-level simulations are described. Finally, RF and pulse immunity issues of VLSI ICs are discussed.

Pre-Compliance Measurements  
with Focus on Time Domain

The presentation gives a short overview on the methods for effective pre-compliance testing, including EM-scans, extended conducted test, G-TEM and stripline. Focus of the presentation will be on the practice of accelerating emission measurements using time domain data acquisition followed by Fast-Fourier-Transformation (FFT). Different approaches are presented, which differ in base band systems and systems with external mixer. The experience of a testlab implementing new emission testing systems that provides extreme fast measurement and advanced information for signal analysis is presented. Results are shown to be helpful to identify the sources of radiation during pre-compliance-testing. The new time domain based system allows measurements of single events or short time occurring events.

EMC in the Product Life Cycle  
(Summary and Conclusion)

Lessons learned with focus on the use of prior results on approval of product variants and product changes are discussed.