

Automotive EMC 2006

DRIVING THE NEW DIRECTIVE

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Conference Abstracts

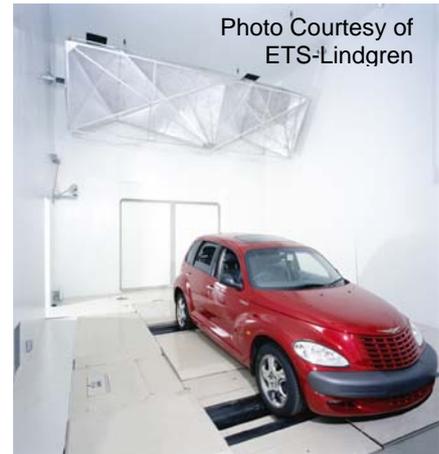


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Introduction

The Automotive EMC 2006 conference has been organised to bring together vehicle manufacturers, their suppliers, EMC test houses and electronic circuit designers involved with designing for the automotive environment. Many of the existing EMC conferences are too generic for the practitioners of automotive EMC to gain useful information from, consequently a niche conference aimed at this specific market sector was devised after the launch of the Automotive EMC professional network in April 2003 (www.autoemc.net).



The conference aim is to bring together design engineers, EMC specialists and test service providers to share information on the latest standards, test methods and design practices for achieving EMC compliance in the automotive environment.

Proceedings

The proceedings are supplied on CD-ROM and all papers are compiled into a single portable document format (PDF) file. The compiled copy of all the papers presented at the Automotive EMC 2006 conference is considered the official proceedings of the conference. Individual copies of the papers in PDF form are available on the CD-ROM.

Presentations

Presentations are included on the CD-ROM in both a combined PDF presentation document, containing all the presentations, and individual PDF files for each speaker. The presentations copies are in two-per-page thumbnail format.

Additional Material

The proceedings CD-ROM contains additional background material in PDF form, including the automotive EMC directive 95/54/EC and 2004/104/EC, plus the York Report which formed the background to the updated directive, the DTI information on phasing out of the old directive and the VCA guidance to the new directive.

EMC GUIDELINES FOR AUTOMOTIVE INTEGRATED CIRCUITS

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Abstract: This paper presents some important aspects of electromagnetic compatibility (EMC) of integrated circuits. The main mechanisms for parasitic emission and susceptibility to electromagnetic waves are introduced, with a discussion of the impact of technology scale down. The measurement techniques applicable for radiated/conducted emission and susceptibility to harmonic aggressions are then illustrated. Design guidelines applicable to automotive integrated circuits are then presented, focusing on low emission and improved immunity techniques.

HIGH FIELD IMMUNITY CHALLENGES IN AUTOMOTIVE ELECTRICAL SYSTEMS

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Abstract: Electronic and power electronic printed circuit boards (*PCBs*) are a commonplace in automotive electrical systems. The electromagnetic radiation of such single layer and multilayer circuit boards due to switching power-bus noise is investigated within the scope of electromagnetic compatibility. An analytical computation for the determination of spurious radiation from such structures is based on the first order Bessel functions and the roots of their derivatives. The radiation levels are a measure of the input and the transfer impedances. The input and transfer impedance is studied within a frequency range of 100 MHz – 1 GHz. Certain parameter are varied to suggest the best combination so as to bring down the radiation levels.

CONSIDERATION OF SHIELDED CABLES IN EMC SIMULATIONS

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Abstract: A new theory and technique is introduced for simulating non-ideal braided shields in coaxial cables as commonly used in automotive industry applications. The paper contains a summary of theoretical basics and comparisons between simulations and measurements. It is demonstrated that today's simulation tools are able to predict EMC effects with high accuracy, thus making virtual test benches for virtual prototypes possible.



2004/104/EC – A COMPONENT MANUFACTURER'S PERSPECTIVE

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Abstract: After having 10 years to adapt to 95/54/EC, the automotive industry is now faced with a new automotive EMC Directive, 2004/104/EC. This paper discusses the origins of 2004/104/EC and the effects on component manufacturers.

2004/104/EC - THE VEHICLE MAKERS' VIEWPOINT

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Abstract: This paper reviews the latest revision to European Automotive EMC directive 2004/104/EC from the vehicle makers point of view. The upper test frequency for radiated immunity has been extended from 1 GHz to 2 GHz and test modes increased to a minimum of two but the limits remains at 30 V/m. The scope of radiated emissions has been extended to cover all devices capable of generating emissions that can be turned on permanently. The broadband requirements are now applicable to all types of engines including diesel and hybrids whereas 95/54/EC only covered spark ignition (gasoline) engines. Other potential emitters, such as electric motors, were not required to be active during homologation tests. However, the most significant change is with respect to RF transmitters whereby the vehicle manufacturer must provide a publicly available statement clarifying suitability of a vehicle type for radio transmitter installation. This statement must include basic parameters such as allowed frequency bands, maximum permissible transmitter power and antenna positions. In summary, this revision has generally been welcomed by the industry as it clarifies the applicability and test limits. On the other hand, it has increased the overall burden on vehicle makers with respect to approval documentation and testing.

2004/104/EC - THE VCA VIEWPOINT (Questions and Answer Session)

Gareth Jones

Vehicle Certification Agency

NO FORMAL PAPER OR ABSTRACT SUPPLIED

LOAD DUMP PULSES ACCORDING TO VARIOUS TEST REQUIREMENTS: ONE PHENOMENON – TWO METHODS OF GENERATION – A COMPARISON

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Abstract: Although the new European Directive 2004/104/EC as well as a First Draft of a European Standard drawn by CENELEC technical committee 210, working group 8 do not specify any immunity testing against high-energy Load Dump pulses this kind of tests is widely known in both international standards (e.g. ISO 7637-2:2004, SAE J1113 etc.) as well as in most specifications of car manufacturers world wide. Some test requirements still consider the Load Dump test as a transient immunity test while others rather see it as a phenomenon being related to battery voltage simulation.

Tendencies show that the Load Dump test is separated from electrical fast transients and microsecond pulses and joined with battery voltage phenomenon like cranking, short interruptions etc. This could be considered as one of the reasons that some test requirements ask to simulate the Load Dump pulse by means of a programmable dc amplifier while others prefer the pulse generation being based on an energy storage capacitor that is discharged into a passive pulse forming network.

This paper will introduce the physical background of the Load Dump pulse and show measuring results of the real phenomenon found in a vehicle. Based on this the two methods of generating Load Dump pulses will be explained followed by a comparison of the waveforms achieved under different load conditions. Finally, an overview will be given about the method being applicable as per the various standards and requirements.

HIGH FIELD RADAR FREQUENCY PULSE TEST FOR AUTOMOTIVE COMPONENTS

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Abstract: This work introduces the EMC engineer to the problems of generating 600V/m pulses at two different bands, the 1.2 to 1.4GHz and the 2.7 to 3.1GHz bands. The paper presents measured data that shows the effects of the conductive top bench on the two polarizations. The problems of scaling low power data to predict high power results are discussed as well. The errors of assuming far field equations in predicting field levels when using antennas in the near field in the presence of reflective objects are also studied. The measurement of the power and field at these frequencies in a pulse waveform is also discussed. Other interesting aspects of high fields generation in the near field of antennas are presented. The latest changes to the Ford specifications for radar pulse testing are also presented.

2004/104/EC FULL VEHICLE BRAKE CYCLE TESTING

Ray Burn

Intertek

NO FORMAL PAPER OR ABSTRACT SUPPLIED

DESIGNING ESAs TO MEET PITO5

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Abstract: The Police Information Technology Organisation (PITO) Automotive Conformance Specification 5^[1] puts extremely tight constraints on emissions from aftermarket Electronic Sub-Assemblies (ESAs). Specification 5 is designed to ensure that ESAs are compatible with existing police and fire service radios, particularly that ESAs don't block or quieten (de-sensitise) in-vehicle radios. The police in particular love high-tech gadgets in their patrol vehicles but getting these approved by the Home Office can be an arduous task. This paper explains PITO5 testing and conformance requirements and goes on to describe methods for achieving compliance to the radiated emissions requirements using some examples that the author has worked on.

A GENERIC AUTOMOTIVE (TIER1) EMC TEST STANDARD

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Abstract: The number of different EMC test standards available from the vehicle manufacturers (VM's) is large, disparate and often not always the most logical for the product under design or test. It can be particularly frustrating for an automotive application innovator to design a product to a suitable EMC standard that allows them to take the product around to the VM's prior to implementation on a vehicle itself. This is similarly true of aftermarket suppliers wishing to take their products directly into the VM's, but being either unsure of what tests or levels each VM will require, and being unable to justify on a speculative product the cost of testing to all the VM standards that they can obtain.

Presented here is a suggested "Generic Automotive Tier 1 Supplier EMC Test Standard", available as an open-source document, that is essentially derived from consideration of most of the larger VM EMC standards and compiled to give a "best fit" to all the data that was available to the author at the time of writing. The resulting standard is not as comprehensive as some of the VM standards, nor does it necessarily give any guarantee that meeting this standard will give a supplier easy or even easier access into a VM than any other route. What it provides is an independent perspective on what the most sensible EMC tests and test levels are, for a vehicle environment which meets the majority of VM requirements. The resulting test document gives the supplier a measure that they can present to a VM to demonstrate that their product can meet the basic VM requirements, and if not a particular full VM requirements first time, then at lower cost than a completely untested or e-mark only tested product.

The tests cover the supply of electrical products to a VM only and do not extend to whole vehicle testing, which remains exclusively the domain of the VM. The test methods employed are all based on international standards (CISPR and ISO) and the levels suggested are derived from the aggregated VM standard levels and frequency ranges.

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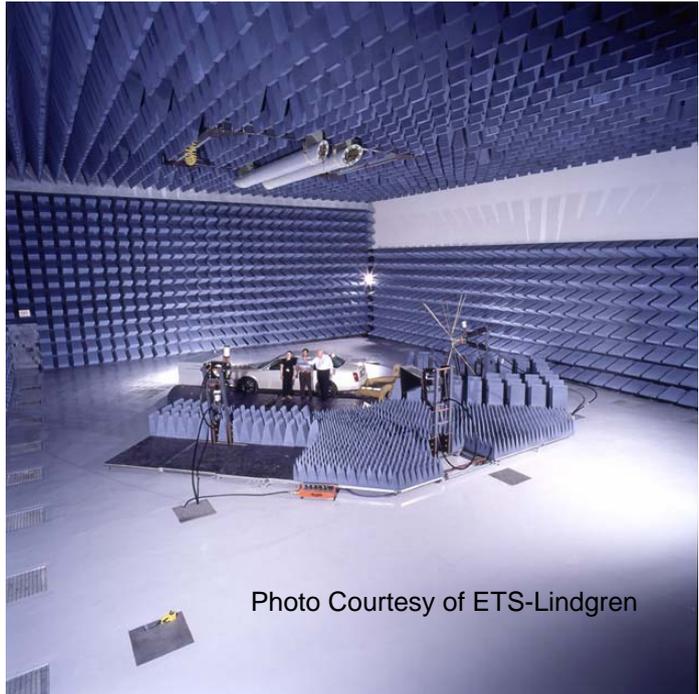


Photo Courtesy of ETS-Lindgren

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