

# Automotive EMC 2004

## International and OEM Requirements



### Conference Abstracts

The Racecourse  
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Automobile Division

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## Introduction

The Automotive EMC 2004 conference was organised to bring together OEM's, their suppliers, EMC test houses and electronic circuit designers involved with automotive electronic design. 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](http://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.

## Abstracts

This portable document format (PDF) file contains the abstracts of the papers available on the conference proceedings CD-ROM.

## Papers

The proceedings CD-ROM contains a single combined copy of all the papers presented at the Automotive EMC 2004 conference and that document is considered the official proceedings of the conference. Individual copies of each paper in PDF form are also available on the conference 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.

## Proceedings CD-ROM

The Automotive EMC 2004 conference CD-ROM proceedings includes a HTML index and is easily navigable using any standard internet browser. The conference organisation, sponsor details, contact information and author biographies, as well as the above papers and presentations, are all included on the CD-ROM.

The CD-ROM of the Automotive EMC 2004 conference proceedings is available to order post-conference. The order form and pricing is posted on the Automotive EMC network web site ([www.AutoEMC.net](http://www.AutoEMC.net)), follow the CONFERENCE link.

## The Effects of the New Automotive EMC Directive

**Terry Beadman**

Mira Ltd, Watling Street, Nuneaton, Warwickshire, CV10 0TU

**Abstract:** The latest requirements for vehicle EMC type approval are considered against the background of how the legislation has evolved. The new legislative test requirements are compared with the existing 95/54/EC [1] directive. Both the changes and the additions are identified. The implications for vehicle manufacturers as well as suppliers, especially aftermarket suppliers, are considered with comments on the effects on test houses as well as the affects on the acceptance of test results. The significant changes needed to test house accreditation schedules are described. Whether a test house needs to have a level of radio competence is considered together with the relevant test methods for this important new requirement in the latest directive.

Disclaimer:

At the time of writing the new automotive EMC directive is agreed and its provisions are known. However it has not been published in the Official Journal of the European Union. Hence this paper is based on what is believed to be the final version. It is possible that when the directive is published some details may have been changed. This document refers to directive 2004/XX/EC to identify this new directive.

## Future Directions for Automotive Electromagnetic Emissions Measurements

**Alastair R. Ruddle**

MIRA Ltd, Watling Street, Nuneaton, Warks, CV10 0TU,UK

**Abstract:** The automotive electromagnetic emissions measurement standards (eg. 95/54/EC) were developed at a time when the main threat posed by radio-frequency noise from vehicles was interference to broadcast transmissions from spark ignition systems. Recent work by MIRA on behalf of the Radiocommunications Agency aimed to investigate whether these measurement methods remain appropriate for the modern world of more sophisticated vehicles and increasingly widespread use of radio-based communications.

An investigation of emissions from electric, hybrid and fuel-cell vehicles using methods based on 95/54/EC showed that conventional automotive emissions test methods are not appropriate for the alternative powertrain technologies that are expected to become more prevalent in future. A more recent study of conventional powertrain vehicles included measurements in both static and dynamic operating modes at frequencies in the band 9 kHz to 1 GHz, using test methods based on both 95/54/EC and ANSI C63.4. In addition, emissions in the band 1–10 GHz were also investigated. The results of this work indicate that current automotive emissions test methods are also becoming less relevant for conventional vehicles as new technology is introduced.

## Comparison of “Thresholding in Reverberation Chambers” for Automotive Testing

Martin Wiles<sup>1</sup>, Garth D’Abreu<sup>2</sup>...

<sup>1</sup> ETS-Lindgren, Boulton Road, Stevenage, Herts, SG14TH United Kingdom

<sup>2</sup> ETS-Lindgren, Cedar Park, Texas USA

**Abstract:** The reverberation chamber is gaining widespread acceptance in the EMC community as a viable tool for performing immunity tests. The latest revisions of the GM and Ford automotive standards support the use of reverb chambers for immunity testing of components and subassemblies. The main advantage over anechoic chambers is that most of the energy fed into a reverb chamber can be used to develop the field as opposed to anechoic chambers where, depending upon the transmit antenna pattern, more than 50% of the transmit power can be dissipated in the absorber lining. This coupled with the increased realism of the reverb makes it an attractive and cost effective test chamber.

The purpose of this presentation is to propose a method of thresholding, which reduces the overall immunity test time without compromising the validity of the test.

## Product Compliance v Product Liability: The Gap Narrows?

Chris Andrews\*

**Abstract:** The disparity in EMC testing requirement between component suppliers to a vehicle manufacturer and the minimum legal requirements specified in 72/245/EC (as amended) leave the issue of product liability in the hands of the supplier who may not have the financial willingness or ability to test in excess of the minimum requirements.

This paper considers the potential implications of ignoring those aspects. It will then consider the current disparity between the existing 95/54/EC, its draft replacement and the requirements of two vehicle manufactures; namely Ford Motor Company and Daimler Chrysler. Finally it will be shown that for the majority of products, the draft replacement will go somewhere to bridging the gap between product compliance and product liability within the context of automotive EMC requirements

*\*The presentation by Chris Andrews was unavailable due to illness and substituted by the "Higher Voltage Vehicle Systems and EMC" presentation from Peter Hartnett (also included in the proceedings). However, Mr Andrews had supplied the paper and agreed for it to remain in the conference proceedings at the request of the Automotive EMC Network due to the papers' relevance and clarity of the written text.*

## Simulation of Field Exposure and SAR for Vehicle Occupants

Alastair R. Ruddle

MIRA Ltd, Watling Street, Nuneaton, Warks, CV10 0TU,UK

**Abstract:** Vehicle and communications equipment manufacturers, as well as those with responsibility for deploying communications systems for vehicle applications, have a duty of care to ensure that the vehicle occupants are not exposed to high field levels from on-board transmitters. Numerical simulation is well suited to the analysis of in-vehicle field exposure issues, offering numerous advantages over experimental methods of evaluation. A possible approach for assessing field exposure risks is outlined, and illustrative results are presented for both an empty vehicle model excited by a simple vehicle-mounted antenna, and the same model augmented with a homogenized representation of the driver.

## The Best Automotive Grounding Solution for Reduced Emissions

**Martin O'Hara**

Telematica Systems Ltd, Trafficmaster PLC, University Way, Cranfield, MK43 0TR

**Abstract:** Investigations into the level of radiated and conducted emissions from an automotive electronic sub-assembly (ESA) given either a chassis grounded case or a wired ground return have been examined using standard cables and a comparison noise emitter as a simulated ESA. The cable harnesses used have been the maximum 2.0m length allowed in CISPR-25 for radiated emissions and the standard 0.2m for CISPR-25 conducted emission tests.

The results have been previously released as comparison of the effect of harness length variations on different automotive test standards [1,2]. Here the results have been examined specifically to determine if using a wired ground return or a chassis ground return offers any benefit with respect to emissions performance.

## Practical Power Planes for EMC

**T.P.Jarvis**

RadioCAD Ltd

**Abstract:** The ability of the ground-plane to provide a ubiquitous return path for signal traces in Printed Circuit Boards (PCBs) led to its adoption to preserve signal integrity as clock speeds increased. Additional power-planes were added as multi-layer PCB technology became commercialised. Although primarily planes were added in pairs for manufacturing reasons, it was quickly realised that a plane-pair could provide an effective method of powering Integrated Circuits.

Plane-pairs provide the dual advantages of 'free' power-supply decoupling capacitance and reduced noise coupling between IC power pins. They have become the de-facto solution for multi-layer digital designs.

The physical resonance of such structures are often neglected in the design process, thereby introducing serious undesirable side-effects. This paper investigates these side-effects both in theory and by practical example. The investigation shows that plane-pairs are not always the best solution to IC power problems and should not be employed simply by default. The author concludes by deriving best practice guidelines for the appropriate use of power and ground planes.

## The Road to Bluetooth®

**Steve Flooks**

RFI Global Services Ltd, Ewhurst Park, Ramsdell, Basingstoke, England, RG26 5RQ

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**Abstract:** *Bluetooth* is emerging as a key add-in technology for the automotive industry, some major manufacturers are showing their support by integrating in-car *Bluetooth* systems. The number of after-market products, such as Hands Free Units and Headsets, gives a clear indication that users are becoming more commercially aware of *Bluetooth* as a brand name.

The Bluetooth SIG Inc (BSIG) has focused its efforts into a structured qualification program for its members. This paper will discuss some of the important aspects of the qualification program and some of the routes available to manufacturers to enter the *Bluetooth* market.

It will look not only at administration processes but also the technical aspects of integrating *Bluetooth* as an after-market option and as a fully integrated system. As a final summary it will discuss some of the developments within the *Bluetooth* community that will affect automotive applications.

## Managing the Automotive EMC Design Process

**Peter Hartnett.**

Transparent Engineering Ltd. Venture House, Fifth Avenue, Letchworth, Herts, UK.

**Abstract:** Electromagnetic Compatibility (EMC) features heavily at every stage of the automotive electrical design process. Normally project management of an automotive electronics product is rigorously defined through standard procedures and work instructions. However, the complex, cross-functional nature of the EMC challenge makes managing it difficult. The failure to plan for and to promptly address EMC problems can lead to delays, cost over-run and ultimately disaster for the project. This paper examines the project management of automotive electrical design to ensure the EMC requirements are not lost in the design process.

## Contact Details

**e-mail:** [enquiries@AutoEMC.net](mailto:enquiries@AutoEMC.net)

**Post:** Automotive EMC 2004  
PO Box 3622  
Newport Pagnell  
MK16 0XT  
England

**Website:** [www.AutoEMC.net](http://www.AutoEMC.net)

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