

# Automotive EMC 2005 The Road to Compliance

## Conference Abstracts

11<sup>th</sup> May 2005  
CCN Ost, Messezentrum  
Nuremberg, Germany

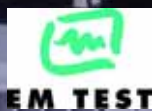


Photo courtesy of ETS-Lindgren

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## Introduction

The Automotive EMC 2005 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.

## Proceedings

The proceedings are supplied on CD-ROM and all papers are compiled into a single portable document format (PDF) file. The combined copies of the papers presented at the Automotive EMC 2005 conference is considered the official proceedings of the conference. Individual copies of the papers in PDF form are also 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-page thumbnail format.

## Delegate Conference Bag

Conference delegates received a bag to collect any papers and notes they made, as well as holding the CD-ROM of the conference proceedings.



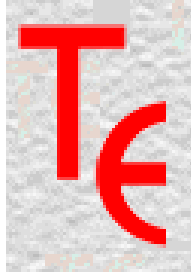
The bag was supplied free-of-charge thanks to generous sponsorship by EM Test AG, who also provided direct marketing material in the delegate bag ([www.emtest.com](http://www.emtest.com)).



## Conference Sponsors

The Automotive EMC 2005 Conference was run on a “not-for-profit” basis, this entails maintaining a low cost for delegates. To keep the costs of running the conference low the Automotive EMC network accepted sponsorship in the form of services or equipment loans in-lieu of any direct financial support.

We are grateful to the following organisations who have provided sponsorship for the Automotive EMC 2005 Conference;



**Transparent Engineering**  
([www.treng.biz](http://www.treng.biz))



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**ETS-Lindgren**  
([www.ets-lindgren.com](http://www.ets-lindgren.com))

## Media Sponsors

We are grateful to the following organisations who have provided media coverage and promotion for the Automotive EMC 2005 Conference;



compliance journal

**EMC & Compliance Journal**  
([www.compliance-club.com](http://www.compliance-club.com))

**Automotive Digest**  
([www.automotivedigest.com](http://www.automotivedigest.com))



## Conference Programme

- 09:00 Registration  
*(refreshments will be available in conference room)*
- 09:30 **Welcome and Notices**
- 09:40 **Keynote Address: The Automotive Power Network; Past, Present and Future**  
*Peter Hartnett, Transparent Engineering*
- 10:10 **The Aftermarket and 2004/104/EC**  
*Terry Beadman, Dove House Associates Ltd (on behalf of MIRA Ltd)*
- 10:40 **Aftermarket Component Test Standards for the North American Market**  
*Martin O'Hara, Trafficmaster PLC, Rick Goodwin, Solectron Invotronics*
- 11:10 Refreshment Break
- 11:30 **Using Pulsed Amplifiers to meet the Narrow Frequency Band, High Field Strength, Automotive Immunity Tests**  
*Dominic FitzPatrick, Milmega*
- 12:00 **A Transient Measurement System for the Evaluation of Vehicle Electromagnetic Radiation**  
*V. Chauvet, M. Lalande, N. Feix, E. Martinod, V. Bertrand, J. Andrieu, B. Jecko, IRCOM*
- 12:30 Lunch
- 13:30 Time for Visiting the SENSOR+TEST 2005 Exhibition
- 14:30 **Integration Strategies of HF Antennae in Vehicles by Simulation**  
*M. Trgovčević, Dr. D. Gospodarić, Trimerics GmbH, Dr. Siegfried Götz, Johnson Controls*
- 15:00 **Linkage of PCB and Cable Harness Simulations for Automotive EMC Analyses**  
*Dr. Matthias Troescher, SimLab Software GmbH*
- 15:30 Refreshment Break
- 15:50 **EMC Testing of Networked Vehicles and Subsystems – A Challenge to Track Failures**  
*Dr. Uwe Reinhardt, EMCtech GmbH, Ivo Rynda, Daimler-Chrysler Consult Graz*
- 16:20 **Conducted Immunity Testing in Automotive: International Standards and Vehicle Manufacturer Requirements – an Overview**  
*Harald Kunkel, Roland Spiessler, EM Test AG*
- 16:50 **Closing Remarks**
- 17:00 Conference Closes

### Conference Administration

**Organiser/Chairperson:** *Martin O'Hara, Trafficmaster PLC*

**Reception/Registration:** *Christine Hodgins, 3C Test Ltd*

## The Automotive Power Network; Past, Present and Future

**Peter Hartnett**

Transparent Engineering Ltd,  
[peter.hartnett@treqn.biz](mailto:peter.hartnett@treqn.biz)

**KEYNOTE ADDRESS**  
**PRESENTATION ONLY**  
**NO PAPER OR ABSTRACT SUPPLIED**

## The Aftermarket and 2004/104/EC

**Terry Beadman**

(Dove House Associates Limited)  
[terry@DoveHouseAssociates.ltd.uk](mailto:terry@DoveHouseAssociates.ltd.uk)  
for MIRA Ltd  
[certification@mira.co.uk](mailto:certification@mira.co.uk)

**Abstract:** The new automotive EMC directive (2004/104/EC) came into force on 3<sup>rd</sup> December 2004 and approvals could be granted to it from that date. From 1<sup>st</sup> January 2006 a member state cannot refuse to grant type approval or to prohibit entry into service if the product complies with the directive. It treats aftermarket Electronic Sub-Assemblies very differently to the directive it replaces (95/54/EC). These ESAs only need to be "CE" marked if they are not immunity related. An "e" mark is an additional requirement if they are immunity related. In either situation the EMC requirements are now better defined. The paper examines the new directive for aftermarket suppliers and explains the procedures for compliance. The implications of the new EMC directive replacing 89/336/EEC are also considered in the automotive context. The advantages and disadvantages of the new situation for aftermarket suppliers are presented. Other "CE" marking directives are considered for their EMC requirements where relevant for automotive usage of the ESA.

## Aftermarket Component Test Standards For The North American Market

**Martin O'Hara**

Trafficmaster, University Way, Cranfield, MK43 0TR, England

**Abstract:** This paper looks at the minimum testing required, the basic testing recommended and what is essentially good design practice for any automotive component to be sold in the North American market for aftermarket fit. The SAE EMC standards (SAE J1113), that are the usually quoted standards for the North American market, are compared with their international equivalents and recent updates discussed. Some of the SAE standards that have no ISO or CISPR equivalent are also examined in brief, particularly where these have an OEM test origin. The paper will conclude with a matrix of recommended SAE standards that are good practice to apply to aftermarket automotive components intended for the North American market and some guidelines on which to apply and what severity standards might be considered "due diligence".

## Using Pulsed Amplifiers to Meet the Narrow Frequency Band, High Field Strength, Automotive Immunity Tests

**Dominic FitzPatrick**

Milmega Ltd., Ryde Business Park, Nicholson Road, Ryde, Isle of Wight, PO33 1BQ, U.K., e-mail: [dominic@milmega.co.uk](mailto:dominic@milmega.co.uk),

**Abstract:** The requirement by automotive manufacturers for components to be tested in the presence of field strengths up to 600 V/m in specified radar frequency bands, may significantly increase the capital equipment costs of test laboratories needing to generate these fields. Typically the method used is to produce a field using an amplifier capable of CW operation and calibrate the area over which the test is to be carried out. The amplifier input signal is then modulated to produce the pulse profile required. The cost of amplifiers capable of CW operation is at least 3-4 times that of ones that can only operate in a pulsed mode, with similar increases in size and weight. This paper describes the operation of a pulsed amplifier specifically targeted at meeting the pulsed immunity tests now required by many of the automotive manufacturers. The radar signal characteristics are described, as are methods of calibrating the chamber using pulsed only signals. A number of techniques are described, along with their implications. The advantages of cost, power consumption and size are contrasted with the changes required to existing calibration methods and control software.

## A Transient Measurement System for the Evaluation of Vehicle Electromagnetic Radiation

**V. Chauvet**

<sup>1</sup>I.R.C.O.M. / Antenne de Brive, 7 rue Jules Vallès, 19100 Brive FRANCE  
e-mail : [chauvet@brive.unilim.fr](mailto:chauvet@brive.unilim.fr)

**Abstract :** A transient measurement device is tested to characterise electromagnetic radiation in open area test site. This paper will describe a measurement system which is based on a transient differential measurement device. The paper will show how the ambient disturbances are taken into account thanks to an outdoor differential measurement. Then, how the method allows to identify the useful spectral lines radiated by the vehicle under test will be presented. Finally, we will focus on the advantages and disadvantages of an outdoor differential transient measurement device.

## Integration Strategies of RF Antennae in Vehicles By Simulation

**Miodrag Trgovcevic**

<sup>1</sup>TRIMERICS GmbH, Karl Benz Str. 19, FILDERSTADT, Deutschland,  
[m.trgovcevic@trimerics.com](mailto:m.trgovcevic@trimerics.com),

**Abstract:** To reduce the number of testing cycles in vehicles and thereby shorten the development time and costs, a practice-oriented, simulative approach is shown for the development and adaptation of a remote garage antenna system and its integration in vehicles. Opportunities for designing virtual EM models for design studies at the component and system level and the use of automated modelling and simulation procedures are discussed. The advantages and possibilities of the virtual product approach are shown on Johnson Controls products integrated in DC vehicles, showing that time-consuming and expensive RF measurements which, in addition, are influenced by human factor can be significantly reduced. In addition, the product quality is improved, on the supplier (component) as well as on the OEM (vehicle) side, thus resulting in higher customer satisfaction.

## Linkage of PCB and Cable Harness Simulation for Automotive EMC Analyses

**Matthias Tröscher**

SimLab Software GmbH, Munich, Germany

**Abstract:** For a long time the focus of EMC investigations in automotive industry is not only concentrated on antenna systems anymore but most of all on the cable harness and its attached control modules (PCBs). Any single weak part in such a complex system may lead to unwanted disturbances that might cause serious faults for certain functionality. In such cases it is important to understand from where such problems come and how engineers can get rid of it.

## EMC Testing of Networked Vehicles and Subsystems – A Challenge to Track Failures

**Uwe Reinhardt**

EMCtech GmbH, Heerstr. 100, 71332 Waiblingen, Germany, e-mail: [uwe.reinhardt@mbtech-group.com](mailto:uwe.reinhardt@mbtech-group.com)

**Abstract:** Modern vehicles contain a multitude of networked electronics. This feature causes distributed functions in distributed electronics. Failures which occur during EMC testing cannot be allocated precisely without detailed knowledge of the data streams within the investigated system. The electromagnetic environment during EMC-testing, limits the possibilities of using standard solutions to detect these malfunctions. Occurring malfunctions at vehicle test level need a clear identification of the failing module to introduce a fast solution together with the supplier. The paper presents a new tool, which is able to track the data streams in a CAN-Bus system during EMC-testing. By integrating EMC related parameters in the existing data stream of the vehicle's data bus, it is possible to keep a record of malfunctions conveniently. The procedure is compatible with standard state-of-the-art software tools. Together with that existing CAN software tools an error tracking can be conveniently established with minimized efforts and costs. Error limits can easily be defined in that tool. When these limits are exceeded, the current EMC parameters are automatically stored together with the occurred malfunction. This feature improves the reproducibility dramatically. The new version of the presented measuring system is able to record electromagnetic environmental data to the vehicles data bus during specified test drives. Additionally the system can be implemented in long term measurements to verify the electromagnetic environment during a cars life cycle.

## Conducted Immunity Testing to International Standards and Vehicle Manufacturer Requirements – An Overview

**Roland Spriessler**

EM Test AG, Sternenhofstrasse 15, CH-4153 Reinach (BL), Switzerland  
e-mail: [sales@emtest.ch](mailto:sales@emtest.ch)

**Abstract:** Never before has the automotive market seen such rapid developments as those experienced over the last couple of years. The force behind this is the demand from the market place for greater technical features and passenger convenience for all classes. High-energy systems such as air conditioning and highly sophisticated mobile audio & communication technology is in close proximity with sensitive safety electronics.

The rapid change in technologies requires standards and requirements for testing the electronics of a vehicle to be continuously adapted. However, not only the standards change but also the application of the test procedures, the test levels and test set-up's have to be adapted consequently. The years 2003 and 2004 have been seen as the years of considerable and substantial standard changes. The new ISO 7637-2 has been published in June 2004 cancelling some obsolete test requirements and at the same time introducing new or changed test specifications. Many manufacturer specifications have been changed as well in line with the development of the vehicles and disturbances being seen on the supply system.

## Contact Details

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

**Post:** Automotive EMC 2005

PO Box 3622

Newport Pagnell

MK16 0XT

England



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

**Telephone:** +44 0790 403 6652

Please only use the above telephone number before the conference if the information you require is not available on the website. During the conference the above number will not be answered.

The organisers of Automotive EMC 2005 would like to thank EM Test AG, 3C Test Ltd, Transparent Engineering, ETS-Lindgren, MIRA Ltd, EMC & Compliance Journal and Automotive Digest for their assistance with the conference organisation and advertising.