



# Automotive EMC 2007

## Navigating Automotive Compliance

The Racecourse, Newbury, 16<sup>th</sup> October 2007



**Conference Abstracts**

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## Introduction

The Automotive EMC 2007 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 will be 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 2007 Conference (this document) 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-per-page thumbnail format.

## AN OVERVIEW OF THE AUTOMOTIVE EMC LABORATORY RECOGNITION PROGRAM, AEMCLRP

**Ayhan Gunsaya**  
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No paper submitted for conference, presentation only.

## REVISION OF ISO 7637-3 – AN INTRODUCTION TO THE NEW REQUIREMENTS

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**Abstract:** Apart from transient immunity testing on supply lines there is also a part of the ISO 7637 standard addressing transient immunity testing on lines other than supply lines. The new edition of ISO 7637-3 is published and specific to applying electrical disturbances by conduction and coupling on vehicles with nominal 12V, 24V or 42V supply voltages. It describes how electrical transients are able to transmit by capacitive and inductive coupling via lines other than supply lines.

With the increasing use of sensors, and with sub-assemblies being interconnected by multiple non-supply lines, it is obvious that such tests are becoming more and more important to ensure the proper functioning of all on-board vehicle parts, especially if safety-related.

Compared to the former standard document dating back to 1995 we are facing new test requirements and coupling mechanisms and therefore we must adopt new tests. In addition we are also adopting tests that are already known to vehicle manufacturers in their own standards.

The aim of this paper is to highlight the changes in the specification as well as to introduce the new test requirements. The new coupling modes and their applicability, the test set-ups, preparation and execution of the tests will also be discussed.

## MODELLING ANTENNAS FOR INTER-VEHICLE COMMUNICATIONS

**John Rajeev Ojha, Christopher Kofi Nyakey, Marc Peters, Lambok Oppusunggu**

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**Abstract:** Circular structures are used as low profile antennas for global positioning systems (GPS) and cellular phones. The latest GPS / Cellular phone combination antenna has been designed for the use in fleet management systems, asset tracking, car navigation and other tracking applications. An efficient method for the characterisation of a circular patch antenna is presented which is validated by standard MOM solvers. The input impedance and the electric far field are studied within the frequency range applicable to GSM and UMTS applications. The input and transfer impedance of circular structures are determined using the Bessel functions of the first kind. The electric far fields are obtained from these transfer impedances. In this paper the roots are determined from the turning points of the Bessel function and therefore the need for obtaining the derivatives and then the zero cross-over points is eliminated. In order to obtain accurate design results, the fringing field effects are considered.

## THE GROUNDPLANE RESONANCE – PROBLEMS WITH RADIATED EMISSIONS MEASUREMENTS BELOW 30 MHz

**Dr Luke Turnbull**

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**Abstract:** This paper describes reproducibility problems when making radiated emissions measurements of automotive, aerospace and military components in the frequency range 10 MHz - 30 MHz. The problems are caused by resonances that are introduced by the test setup. Unfortunately, the behaviour was understood over 20 years ago, but the mitigating changes to the test setup have not become widespread, partly because a pragmatic chamber verification method has not yet been devised. Two novel chamber verification methods are described. It is shown how these can be used to improve the test setup such that resonances are reduced and therefore test reproducibility greatly improved. Recommendations are made to standardisation bodies to incorporate these verification methods and to specifically allow changes to the test setup that will reduce resonances.

## DESIGNING TO MEET ISO7637 PULSE 5 (LOAD DUMP)

**T.P.Jarvis**

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**Abstract:** ISO7637 Pulse 5 is a long high-energy transient. It's high energy means that unprotected Electronic Sub-Assemblies (ESAs) are usually damaged when exposed to it. This paper shows that a single large shunt transient suppressor (as often used by ESA designers) is often not sufficient to guarantee protection against pulse 5. This is especially true of ESAs designed for both 12V and 24V applications. The author derives a model for the energy absorption limit of the commonly used 5KP-series (5000 watt) for long-pulses because product datasheets specify limits only for short pulses. The author then examines alternative circuits employing Darlington transistors and P-FETs. The advantages and disadvantages of each example circuit are explained.

## AUTOMOTIVE ESD CHANGES IN ISO/DIS 10605: 2007

**Martin O'Hara**

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**Abstract:** The automotive ESD standard (ISO 10605) has seen very few changes since the first Technical Report (TR) issue of 1994, however, this year the first revision of the issued standard is due to incorporate some significant changes in the test methods. This paper uses the ISO discussion (DIS) document ISO/DIS 10605:2007 and looks at what these proposed changes are and how they might impact on test service providers, automotive equipment suppliers and designers and manufacturers of automotive electronic products.

## RELEVANCE OF REFERENCE LEVELS FOR IN-VEHICLE FIELD EXPOSURE ASSESSMENT

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**Abstract:** Numerical simulations have been used to investigate the impact of occupant numbers and distribution on in-vehicle SAR levels at frequencies around 400 MHz. The sources considered include a roof-mounted antenna and a portable transmitter located inside the passenger compartment (but not in contact with any of the occupants). The results suggest that comparing the average field levels over the interior of the empty vehicle with the ICNIRP reference levels provides similar safety factors to those associated with plane wave exposure.

## AUTOMOTIVE EMC: CABLE COUPLING AND FILTERING

**Fred German and Paul Duxbury**

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**Abstract:** An important application for EMC simulation is automotive EMC. These applications often involve the need for handling complex geometries such as automobile chassis' as well as complex cabling and wire harnesses. This is an ideal application for MicroStripes. In this paper, typical automotive EMC application examples are presented using MicroStripes.



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