

interference ITEM™
THE INTERNATIONAL JOURNAL OF
ELECTROMAGNETIC COMPATIBILITY | **technology**

**TOP 13
OF 2013**

TOP 13 OF 2013: ARTICLES

INTRODUCTION

Interested in the design or application of high frequency current probes, cable shielding or antennas? Need to brush up on your standards requirements? Have a question about automotive RF emission and RF immunity testing? All this and more is covered in this list of the 2013 most-read EMC articles on InterferenceTechnology.com!

ARTICLES

1

The HF Current Probe Theory and Application

Kenneth Wyatt, Wyatt Technical Services

High frequency current probes, arguably one of the most important tools in the EMC engineer's "bag of tricks," are invaluable for measuring high-frequency common-mode currents flowing on wires or cables. Experience has proven that poorly terminated cables are the No. 1 cause for radiated emissions failures at a test facility. However, by measuring the common-mode currents on these cables, it's possible to troubleshoot and apply fixes to a product right there in the development laboratory.

2

New EMC Requirements for Commercial Avionics: RTCA/DO-160G

Erik J. Borgstrom, Environ Laboratories LLC

RTCA/DO-160G, "Environmental Conditions and Test Procedures for Airborne Equipment," was issued on Dec. 8, 2010, replacing the previous version, DO-160F. DO-160G covers standard procedures and environmental test criteria for testing airborne electrical and electronic equipment with respect to Federal Aviation Administration (FAA) or other international regulations. The purpose of this article is to provide an overview of each of the sections that deal with EMC in DO-160G, as well as any changes and potential future revisions.

3

Fundamentals of EMC Design: Our Products are Trying to Help Us

Keith Armstrong, Cherry Clough Consultants

We often design electronic products, only to find that when we test them for EMC their emissions and/or immunity are not as good as we need them to be. While we may feel as if we are fighting against the laws of physics to contain the conducted and radiated emissions or to reduce susceptibility, in fact the laws of physics are causing our design to have the best emissions and immunity that the physical structure allows. Rather than fighting the laws of physics, what we are fighting is our own lack of understanding of how the laws of physics work. Once we understand this, we can work with these laws from the start of our design to easily and quickly create cost-effective products that meet EMC specifications.

4

Electromagnetic Interference in the Data Center: To Shield or Not to Shield

Jordi Ferri, Advanced Shielding Technologies

Low and high frequency EMI caused by power equipment, cell phones, microwaves, TV and radio signals can produce harmful effects on IT equipment, thus reducing quality of service and availability. EMI is usually ignored when designing a data center; this article will discuss some reasons why EMI, though invisible, may produce serious visible effects and why protection measures need to be taken.

5

Requirements of CISPR 16-1-1 Test Receivers, Spectrum Analyzers and FFT-Based Measuring Instruments

Stephan Braun and Arnd Frech, Gauss Instruments

With the expansion of the generic standard CISPR 16-1-1 to include spectrum analyzers and the "FFT-based measuring instrument," the floodgates have been opened for a change in technology. This article gives an overview of the requirements for measurement equipment with respect to the extended CISPR 16-1-1 standard. It discusses the challenges, approaches, and possible limitations. Newer procedures such as Noise Floor Extension (NFE) are also discussed with respect to opportunities and risks.

6

A Risk Assessment for Lightning Protection System (LPS)

Bryan Cole, Technology Research Council

This article will focus on risk assessment to determine if a lightning protection system and surge protection devices (SPDs) should be installed using the National Fire Protection Association standard on Lightning Protection Systems, NFPA 780. Annex L of NFPA 780 describes methods for simplistic and complex risk assessment. This article focuses on a simple risk assessment.

7

Differential Transfer Impedance of Shielded Twisted Pairs

Michel Mardiguian, EMC Consultant

The concept of Shield Transfer Impedance (Z_s) is a very convenient parameter for the prediction and control of EMI coupling through cable shields. Although widely applied to coaxial cables against EMI susceptibility problems, the Z_s parameter can be easily extended to coaxial cables EMI emissions problems, as well as to Shielded Twisted Pairs (STP). This latter is more specifically addressed in this article, through the concept of Differential Transfer Impedance (Z_{td}).

8

Designing Electronic Systems for EMC: Grounding for the Control of EMI

William G. Duff, Semtas Corporation

There are two primary reasons for grounding devices, cables, equipment and systems. The first reason is to prevent shock and fire hazards in the event that an equipment frame or housing develops a high voltage due to lightning or an accidental breakdown of wiring or components. The second reason is to reduce EMI effects resulting from electromagnetic fields, common impedance or other forms of interference coupling. In order to avoid creating EMI problems, it is essential to recognize that an effective grounding system, like any other piece of equipment or system, must be carefully designed and implemented.

9

The International Medical Device EMC Standard – IEC 60601-1-2

Dan Houlihan, Houlihan EMC Consulting

The most well-known and used EMC standard for electrical medical devices is IEC 60601-1-2, "Medical Electrical Equipment – Part 1-2: General Requirements for Basic Safety and Essential Performance – Collateral Standard: Electromagnetic Compatibility – Requirements and Tests." The standard was most recently released as the Third Edition in March 2007. This article discusses some of the changes from Edition 2 to Edition 3, reviews key requirements of IEC 60601-1-2 and discusses possible future directions for the standard.

10

Automotive RF Immunity Test Set-up Analysis: Why Test Results Can't Compare

Mart Coenen, EMC MCC; Hugo Pues, Melexis; and Thierry Bousquet, Continental

Though the automotive RF emission and RF immunity requirements are highly justifiable, the application of those requirements in a non-intended manner leads to false conclusions and unnecessary redesigns for the electronics involved. When the test results become too dependent upon the test set-up itself, inter-laboratory comparison, as well as the search for design solutions and possible correlation with other measurement methods, loses ground. In this paper, the ISO bulk-current injection (BCI) and radiated immunity (RI) module-level tests are discussed together with possible relation to the DPI and TEM cell methods used at the IC level.

11

EMC Antenna Parameters and Their Relationships

John D. M. Osburn, EMC Test Systems

The basics of the EMC profession often get buried under the day-to-day effort of continuous measurement and the volume of test and reporting paperwork. The fundamental parameter of the most common of technical tools, the EMC antenna, is used over and over without thought as to its actual meaning. This parameter is the antenna factor (AF). A review of the basics behind this parameter and a related parameter, the transmit antenna factor (TAF), provides a basis for the use of the numerical values, and a more fundamental understanding of radiated EMC measurements.

12

Spread Spectrum Clock Generation – Theory and Debate

Kenneth Wyatt, Wyatt Technical Services

During World War II, the U.S. Navy was having problems with radio-controlled torpedoes that were being jammed by high-strength RF signals tuned to the same frequency as the transmitting radio. In August 1942, Austrian actress Hedy (Lamarr) Keisler Markey and pianist and composer George Antheil, with the help of an electrical engineering professor at the California Institute of Technology, solved this problem and were granted U.S. Patent No. 2,292,387 for a "Secret Communication System." While their prototype system used up to 50 perforations, or frequency hopping codes, it still formed the basis of the frequency hopping spread spectrum systems used today.

13

RF Emissions of Compact Fluorescent Lights

W.G. Fano, Faculty of Engineering, University of Buenos Aires

Fluorescent lamps, in particular compact fluorescent lamps, are replacing incandescent lamp worldwide. This new technology offers the benefit of lower energy consumption—about five times that of incandescent lamps—but, due to the employment of the electronic ballast of high frequency, could interfere with electronic equipment because of electromagnetic field emissions produced by the electronics and arc mechanism of the lamp, as well as conducted emissions by electrical wires. This article is devoted to the measurement and the study of the radiated emissions characteristics of the CFL at short distances.

TOP 13 OF 2013: HEADLINES

INTRODUCTION

2013 encompassed a lot of news in the EMC world, including interference problems with Canadian military helicopters, Toyota automobiles and Apple iPads; the release of new European electromagnetic field exposure guidelines and the development of new technology to stop moving vehicles in their tracks. Here is our list of the most popular headlines from 2013.

- 1 — **Newly Released Toyota Documents Show EMI in Electronics as Possible Root of Sudden Acceleration Problem** (March 2013)
- 2 — **Keyless Entry Theft on the Rise as Thieves Identify High-Tech Means to Unlock Cars Remotely** (April 2013)
- 3 — **Toyota Issues Vehicle Recall Due to Electrical Interference** (February 2013)
- 4 — **Attorney Alleges EMI Cause of Veteran's Parade Train Crash** (December 2012)
- 5 — **Sistine Chapel Was Fitted with Faraday Cage, Electronic Jammers to Prevent Information Leak in Papal Election** (March 2013)
- 6 — **EM Field Exposure Directive Approved by European Parliament** (June 2013)
- 7 — **Canadian Air Force Helicopters Beset with EMI Woes** (September 2013)
- 8 — **Apple iPad 2 May Interfere with Implanted Cardiac Devices, Study Suggests** (May 2013)
- 9 — **EMP Blasts Emitted by 'Space Dust' Determined as Cause for Satellite Failure** (March 2013)
- 10 — **Apple to Investigate Electrocution Death Allegedly Caused by iPhone** (July 2013)
- 11 — **NATO Scientists Testing EM Beam to Stop Suicide Bombers** (September 2013)
- 12 — **EMC Pioneer Ralph Showers Passes Away** (September 2013)
- 13 — **FAA to Lift Electronics Flight Ban by End of Year, Sources Say** (March 2013)

Published by ITEM Media, Interference Technology is dedicated to Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC) with a unique focus on solving EMI problems in today's electronic equipment.

At Interference Technology, you will find in-depth information on the latest product development, standards, and news for the following technologies: amplifiers, antennas, cables and connectors, conductive coating, ferrites, filters, lightning and surge, shielding, software, test instrumentation, and testing.

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