



# EMCABS

## EMC Abstracts

*Osamu Fujiwara, Associate Editor*

*(From left) Pascal Leuchtmann, Chairman of the Zurich Technical Program Committee, ETH, Elya Joffe, President of the EMC Society, Francesca Maradei, Professor, University of Rome "La Sapienza" and Osamu Fujiwara, Professor, Nagoya Institute of Technology are shown at the symposium banquet in Kunsthaus, Zurich on Wednesday, January 14, 2009. Since the Zurich EMC Symposium was held in cooperation with the IEEE EMC Society, all the conference papers will be published on IEEE Xplore.*

### EMCABS Committee

Bob Hunter, Consultant

*r.d.hunter@ieee.org*

Sha Fei, EMC Research Section, Northern Jiatong University, Beijing, China

*emclab@center.njtu.edu.cn*

Ferdy Mayer, 7, rue Paul Barruel, F-75015 Paris, France

*ferdymayer@free.fr*

Maria Sabrina Sarto, Department of Electrical Engineering, University of Rome, Italy

*sarto@elettrica.ing.uniroma1.it*

### "How Can I Get a Copy of an Abstracted Article?"

Engineering college/university libraries, public libraries, company or corporate libraries, National Technical Information Services (NTIS), or the Defense Technical Information Center (DTIC) are all possible sources for copies of abstracted articles

or papers. If the library you visit does not own the source document, the librarian can probably request the material or a copy from another library through interlibrary loan, or for a small fee, you can order it from NTIS or DTIC. Recently it became clear that EMCABS were more timely than publications which were being listed in data files. Therefore, additional information will be included, when available, to assist in obtaining desired articles or papers. Examples are: IEEE, SAE, ISBN, and Library of Congress identification numbers.

As the EMC Society becomes more international, we will be adding additional worldwide abstractors who will be reviewing articles and papers in many languages. We will continue to set up these informal cooperation networks to assist members in getting the information or contacting the author(s). We are particularly interested in symposium proceedings which have not been available for review in the past. Thank you for any assistance you can give to expand the EMCS knowledge base.

**EMC**

### EMCABS: 01-05-2009

#### APPLICATIONS OF THE DIRICHLET-TO-NEUMANN BOUNDARY OPERATOR IN TRANSMISSION LINE MODELING

Thomas Demeester and Daniël De Zutter

Dept. of Information Technology, Ghent University Sint-Pietersnieuwstraat 41, B-9000 Ghent, Belgium

*thomas.demeester@intec.ugent.be*

*daniel.dezutter@intec.ugent.be*

Proceedings of the 20th International Zurich Symposium on Electromagnetic Compatibility, 12–16 January 2009, ETH Zurich, Switzerland, pp. 25–28.

*Abstract:* The DtN operator is a useful tool in the characterization of interconnect structures. In combination with the Method of Moments, it can be used for transmission line modeling or to directly determine the internal impedance of conductors. This paper presents a new calculation method for the Dirichlet-to-Neumann (DtN) boundary operator, in the important case of a rectangular block, based on the superposition of slab waveguide modes. Especially for its non-differential form, some numerical issues need to be addressed. It is further explained how the DtN operator can be determined for composite blocks. The theory is illustrated by some numerical examples.

*Index terms:* Dirichlet-to-Neumann boundary operator, the Method of Moments, combination, transmission line modeling, numerical calculation.

### EMCABS: 02-05-2009

#### ANALYSIS OF STOCHASTIC RESONANCES IN ELECTROMAGNETIC COUPLINGS TO TRANSMISSION LINES

+ O.O. Sy, + M.C. van Beurden and ++ B.L.Michielsen

+ Electromagnetics Group, Department of Electrical Engineering, Eindhoven University of Technology Den Dolech 2, 5600 MB, Eindhoven, The Netherlands

++ ONERA – DEMR BP 74025, 2, av. Edouard Belin, 31055 Toulouse Cedex 4, France

*O.O.Sy@tue.nl*

*M.C.v.Beurden@tue.nl*

*Bastiaan.Michielsen@onera.fr*

Proceedings of the 20th International Zurich Symposium on Electromagnetic Compatibility, 12–16 January 2009, ETH Zurich, Switzerland, pp. 33–36.

*Abstract:* Resonances present in coupling phenomena between a randomly varying thin-wire transmission-line, and an electromagnetic field is stochastically characterized.

This is achieved by using the first four statistical moments in order to appreciate the intensity of the resonance phenomena. The stochastic method proposed is applied to a thin-wire transmission line connected to a variable impedance and undergoing random geometrically localized perturbations.

*Index terms:* Randomly varying thin-wire transmission line, electromagnetic coupling, stochastic resonances, analysis.

---

#### EMCABS: 03-05-2009

##### CONTRIBUTION OF IMPEDANCE IMPERFECTION OF THE T-TYPE ISNS IN MEASUREMENT UNCERTAINTY OF CONDUCTED DISTURBANCES

Jan Sroka

EMC-Testcenter Zürich AG Zürich, Switzerland

j.sroka@emc-testcenter.com

Proceedings of the 20th International Zurich Symposium on Electromagnetic Compatibility, 12–16 January 2009, ETH Zurich, Switzerland, pp. 61–64.

*Abstract:* Method of uncertainty estimation due to impedance imperfection of the T-type Impedance Stabilization Networks (ISNs) is presented. Elaboration is performed for two cases: for measured common mode impedance of the ISN and for assumption of tolerances imposed on this impedance. Estimation is illustrated with uncertainty calculation for the ISN designed for one pair of symmetrical, unshielded lines, so called T2 ISN. There is only one publication, namely [7] in which this uncertainty is mentioned. Numbers cited in this document are underestimated compared with what is presented in this paper.

*Index terms:* Impedance stabilization network, conducted disturbances, impedance perfection, measurement uncertainty.

---

#### EMCABS: 04-05-2009

##### THE MALFUNCTION AND IMMUNITY LIMIT OF INFORMATION TECHNOLOGY EQUIPMENT UNDER HPEM ENVIRONMENTS

+ Hidenori Sekiguchi, + Shinji Seto, ++ Ikuya Minematsu

+ Security Fundamentals Group, Information Security Research Center, National Institute of Information and Communications Technology 4-2-1, Nukui-Kitamachi, Koganei-shi, Tokyo, 184–8795 Japan

++ Kansai Electronic Industry Development Center 12128, Takayama-cho, Ikoma-shi, Nara, 630–0101 Japan

hide@nict.go.jp

setos@nict.go.jp

minematu@kec.jp

Proceedings of the 20th International Zurich Symposium on Electromagnetic Compatibility, 12–16 January 2009, ETH Zurich, Switzerland, pp. 69–72.

*Abstract:* This paper presents the investigation results of the relation with the malfunction and the immunity limit of an Ethernet hub that is put in the high-power electromagnetic (HPEM) environments. Several HPEM environments are built to induce the malfunction of the Ethernet hub. First, the radiated HPEM environments are built using a transverse electromagnetic (TEM) cell. Next, the conducted HPEM environment was built using a bulk current injection

(BCI) method. From these test experiments, it is discussed on the relation with the malfunction and the immunity limit of the Ethernet hub.

*Index terms:* High power electromagnetic environment, Ethernet hub, malfunction and immunity limit, TEM cell and BCI method, experiments.

---

#### EMCABS: 05-05-2009

##### CONDUCTED INTERFERENCE IMMUNITY TEST TO HIGH-SPEED POWER LINE COMMUNICATION SYSTEM

+ Satoshi Hosoya, + Masamitsu Tokuda, ++ Takashi Matsuo

+ Musashi Institute of Technology, Tamazutsumi, Setagaya-Ku, Tokyo, 158–8557 Japan

++ Sumitomo Electric Industries, LTD. Information & Communication Laboratories, 1-1-3, Shimaya, Konobana-Ku, Osaka, 554–0024 Japan

s-hosoya@csl.ec.musashi-tech.ac.jp

tokuda@csl.ec.musashi-tech.ac.jp

matsuo-takashi@sei.co.jp

Proceedings of the 20th International Zurich Symposium on Electromagnetic Compatibility, 12–16 January 2009, ETH Zurich, Switzerland, pp. 77–80.

*Abstract:* In this paper, the authors calculated the immunity characteristics of a PLC system to the conducted interference wave, from the aspect of PHY rate (physical layer data rate) by using MATLAB/Simulink, and compared with measurement results. The results revealed that the PHY rate of the PLC modem can be calculated by using MATLAB/Simulink as well as the measurement one even when the narrowband interference signal is impressed through the power line. In addition, the authors confirm by using MATLAB/Simulink that the PHY rate normalized by the maximum value increases by about 20% by inserting the notch when impressing the interference signal in the notch band. C/I is improved by 10–15 dB by inserting the notch.

*Index terms:* Power line communication system, conducted interference, PHY rate, immunity test, calculation.

---

#### EMCABS: 06-05-2009

##### PRINTED ATMOSPHERIC SPARK GAPS AS ESD-PROTECTION

Morten Soerensen

Bang & Olufsen a/s, Struer, Denmark

mse@bang-olufsen.dk

Proceedings of the 20th International Zurich Symposium on Electromagnetic Compatibility, 12–16 January 2009, ETH Zurich, Switzerland, pp. 149–152.

*Abstract:* Printed atmospheric spark gaps as ESD-protection on PCBs are examined. First an introduction to the physics behind spark gaps is provided. Afterward, the time lag (response time) vs. voltage is measured with high load impedance. The dependable clamp voltage (defined later) is measured as a function of the load impedance and the local field in the air gap is simulated with FIT simulation software. In conclusion, the observed results are discussed on the basis of the physics and the simulations.

*Index terms:* PCB, ESD protection, printed atmospheric spark gap, time lag versus voltage, measurement.

**ESD FIELD COUPLING STUDY IN RELATION WITH PCB GND AND METAL CHASSIS**

+ Jong-sung Lee, ++ David Pommerenke, + Jae-deok Lim and + Byong-su Seol  
 + Samsung Electronics Manufacturing Technology R&D Center, Suwon, Korea

++ Electrical and Computer Engineering Dept., Missouri University of Science and Technology, Rolla, MO, U.S.A.

js7582.lee@samsung.com

deok.lim@samsung.com

byongsu.seol@samsung.com

davidjp@mst.edu

Proceedings of the 20th International Zurich Symposium on Electromagnetic Compatibility, 12–16 January 2009, ETH Zurich, Switzerland, pp. 153–156.

*Abstract:* This work demonstrates a simple experimental setup to measure ESD-induced voltage to traces on a printed circuit board when ESD current is injected directly onto the outside of a metal case and presents how the induced voltage can be affected by the physical structure of the PCB ground and the metal case. The correlation between ESD-induced voltage and the method of connecting the PCB and chassis grounds is discussed, as well as how the PCB ground fill affects ESD. These experimental results may provide guidance for a better design for ESD immunity.

*Index terms:* PCB, ESD, ground and metal chassis, field coupling, measurement.

**EMCABS: 08-05-2009****COMPARING CABLE DISCHARGE EVENTS TO IEC 61000-4-2 OR ISO 10605 DISCHARGES**

+ Bastian Arndt, ++ Friedrich zur Nieden, +++ Rainer Pöhmerer, + Johannes Edenhofer and ++ Stephan Frei  
 + Continental Automotive GmbH, Regensburg, Germany

++ Technische Universität Dortmund, Dortmund, Germany

+++ Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

bastian.arndt@continental-corporation.com

johannes.edenhofer@continental-corporation.com

friedrich.zurnieden@uni-dortmund.de

stephan.frei@uni-dortmund.de

extern.rainer.pohmerer@audi.de

Proceedings of the 20th International Zurich Symposium on Electromagnetic Compatibility, 12–16 January 2009, ETH Zurich, Switzerland, pp. 157–160.

*Abstract:* Cable Model (CM) discharge events can cause serious ESD damage, especially during the automotive production process when numerous cables are connected to electronic devices. Here exists a potential risk for electronic devices. Typical cable discharges occurring in the automotive production environment are investigated and characterized. Possible charging effects of the wiring harness are identified. Discharge shapes depending on automotive wiring harness configurations are classified. Modeling of the cable parameters is done and cable discharge events are simulated. The simulation results are verified with measurements. Possible impact on affected electronic control units is identified and a comparison between ISO/IEC electrostatic discharges and cable discharges is drawn.

*Index terms:* Automotive production environment, cable model discharges, wiring harness, simulation and measurement.

**EMCABS: 09-05-2009****SIMPLIFICATION METHOD FOR THE ASSESSMENT OF THE EM RESPONSE OF A COMPLEX CABLE HARNESS**

+ J-P. Parmantier, + I. Junqua, + S. Bertuol, + F. Issac, ++ S. Guillet, ++ S. Houhou and +++ R. Perraud

+ ONERA, DEMR, CEM research group, 2 av. Edouard Belin, 31055 Toulouse, France

++ Eurocopter, General Environment & Militarization, Marseille-Provence International Airport, 13725 Marignane, France

+++ EADS Innovation Works, 12 rue Pasteur, 92152 Suresnes Cedex, France

jean-philippe.parmantier@onera.fr

isabelle.junqua@onera.fr

solange.bertuol@onera.fr

francois.issac@onera.fr

steven.guillet@eurocopter.com

sofiane.houhou@eurocopter.com

Proceedings of the 20th International Zurich Symposium on Electromagnetic Compatibility, 12–16 January 2009, ETH Zurich, Switzerland, pp. 161–164.

*Abstract:* This paper describes a simplification technique in order to model a complex cable bundle made of a large amount of wires. The basic principle consists in the description of the topology of the cable bundle in terms of point-to-point cable links and to model those cable-links as equivalent wires in a multiconductor transmission line network model. The different steps required to build the model are first presented. Then, a validation on a wiring bundle of the NH90 helicopter, carried out in the frame of the French MOVEA project, demonstrates the pertinence of such an approach in industrial contexts.

*Index terms:* Complex cable bundle, electromagnetic response, simplified modeling, validation.

**EMCABS: 10-05-2009****IDENTIFICATION OF OVERHEAD LINES USING MEASUREMENTS OF THE ELECTRIC FIELD STRENGTH**

C. Henze and H. Bauer

IEEH, TU-Dresden Mommsenstraße 10, 01069 Dresden, Germany

christian.henze@tu-dresden.de

hartmut.bauer@tu-dresden.de

Proceedings of the 20th International Zurich Symposium on Electromagnetic Compatibility, 12–16 January 2009, ETH Zurich, Switzerland, pp. 225–228.

*Abstract:* The basis for creating a novel safety system for mobile building machines is laid after analyzing building site accidents caused by mobile machines in the vicinity of overhead lines and examining currently used alert systems. This paper aims to provide a mathematical model to describe a two-stage collision zone around overhead lines and to ensure monitoring of the collision zone during construction work. A prerequisite for the description of the collision zone is the identification of the overhead line. An algorithm for the identification of overhead lines on the basis of electric field strength measurement is presented. The focus here is on measurement simulation and an analytical method that is used to identify the position of the conductors and the

nominal voltage of the overhead line. The sensitivity of the algorithm is analyzed.

*Index terms:* Overhead lines, mobile building machines, collision zone, mathematical model, electric field measurement.

#### EMCABS: 11-05-2009

#### INTERACTIONS BETWEEN VIAS AND THE PCB POWER-BUS

Gerd Heinrich and Stefan Dickmann

Fakultät für Elektrotechnik, Helmut - Schmidt - Universität/ Universität der Bundeswehr Hamburg, Germany

gerd.heinrich@hsu-hh.de

stefan.dickmann@hsu-hh.de

Proceedings of the 20th International Zurich Symposium on Electromagnetic Compatibility, 12–16 January 2009, ETH Zurich, Switzerland, pp. 257–260.

*Abstract:* In this paper, a method for the investigation of the interactions between a via and a PCB power-bus is described. Starting with an initial via model and two types of de-embedding algorithm, which extract the scattering parameters of the via, the elements of the via model are derived. After that, the influence of the via on the power-bus impedance and the interactions between the via and the power-bus are described.

*Index terms:* PCB, via and power-bus, electromagnetic interaction, via model.

#### EMCABS: 12-05-2009

#### DIFFERENT STRATEGIES FOR CIRCUIT CHARACTERIZATION OF POWER DELIVERY NETWORKS

G. Antonini, A. Orlandi and R. M. Rizzi

UAq EMC Laboratory, Dept. of Electrical Engineering, University of L'Aquila, Poggio di Roio I-67040, L'Aquila, Italy

antonini@ing.univaq.it

orlandi@ing.univaq.it

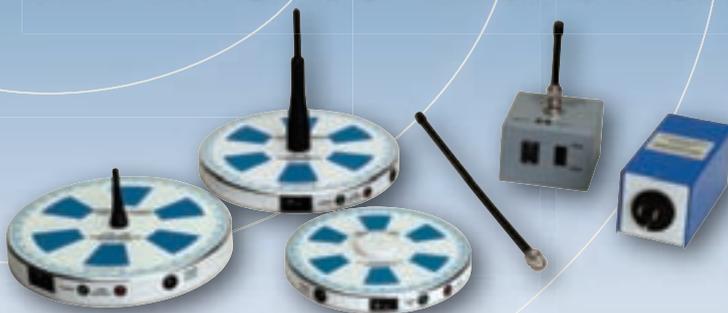
rmrizzi@ing.univaq.it

Proceedings of the 20th International Zurich Symposium on Electromagnetic Compatibility, 12–16 January 2009, ETH Zurich, Switzerland, pp. 341–344.

*Abstract:* In this paper, general strategies for the characterization of a power delivery network are presented. A different approach is applied to measured or simulated S-parameters of a multiport system to generate an equivalent circuit network representation of the system of interest. The synthesized networks are compatible with Spice-based circuit simulators. The Spice netlist is usable in a general circuit environment consisting of lumped/distributed elements and active devices. Five- and eight-port structure examples are analyzed, and the simulation results are compared to each other.

*Index terms:* Power delivery networks, circuit characterization, S parameters, spice-based circuit simulation. **EMC**

# EMI Site Reference Source



## Reduce measurement errors by using a Comb Generator

- Radiated output up to 33 GHz
- For OATS or Anechoic chambers
- Stable and consistent output
- Battery powered

**Competitive Pricing**

**Fast Delivery**

**Three-year Warranty**

A Comb Generator is a great solution for quick daily site validation between calibration intervals. Calibrating an EMI site before each test is not practical. By using a Comb Generator a test engineer can check for damaged or malfunctioning test equipment, faulty RF connections or site problems. This procedure will detect problems with your site which may not be noticed easily during the compliance test. In addition, the Comb Generator can also help compare performance of multiple test sites. For more information, please visit our website.

**OTHER PRODUCTS:** Spectrum Analyzers & Receivers • Antennas • Near Field Probes • Preamplifiers LISNs • CDNs • Power Amplifiers • Turntables • Masts & Tripods • Product Safety Accessories • Part 68

Contact us at 714.528.8800 or sales@com-power.com  
[www.com-power.com](http://www.com-power.com)



114 Olinda Drive, Brea, California 92823 • tel 714.528.8800 • fax 714.528.1992 • sales@com-power.com