EMCABS

EMC Abstracts
Osamu Fujiwara, Associate Editor

Osamu Fujiwara (left) and Dr. Yoshinori Taka, both with the Nagoya Institute of Technology in Japan, enjoy a tour in the suburbs in Kaunas, Lithuania. They attended the 16th International Conference on Electromagnetic Disturbances held in Kaunas from September 27 to 29.

Following are abstracts of papers from previous EMC symposia, related conferences, meetings and publications.

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“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.

EMCABS: 01-05-2007

EXPERIMENTAL INVESTIGATIONS OF LIGHTNING SURGE VOLTAGE WITHSTAND OF DATA AND SIGNAL TRANSMISSION NETWORK COMPONENTS
Marek Loboda, Konrad Sobolewski and Dominik Krasowski
Warsaw University of Technology, Poland
Abstract: Over voltage protection of data and signal transmission networks (DSTN) for informatics, telecommunication and other applications is a very important problem in electromagnetic compatibility. When designing and installing DSTN, it is necessary to correlate the selection of over voltage protection devices with the impulse withstand level of components used, i.e., twisted pair cables, connectors, adapters, data cards, etc. The manufacturers of such components usually do not give any information on their surge characteristics, which in some cases can be “the weakest” element of such lines. The paper deals with experimental lightning withstand tests and the results of different kinds of components made by different manufacturers, which are used for installation and construction of typical data transmission lines.
Index terms: Lightning surge withstand, data and signal line components, EMC immunity.

APPLICATION OF WAVELET TRANSFORM TO DE-NOISE PARTIAL DISCHARGE SIGNALS IN COVERED-CONDUCTOR DISTRIBUTION NETWORKS
G. Murtaza Hashmi, Matti Lehtonen, and Mikael Nordman
Power Systems and High Voltage Engineering Laboratory, Helsinki University of Technology (TKK), Finland
Abstract: Partial discharge (PD) measurements conducted in a High Voltage (HV) laboratory are less affected by electromagnetic disturbances (EMD). However, on the other hand, on-site PD measurements are often affected by several EMD sources. Extracting a low level PD signal from a noisy background is a major challenge for on-line condition monitoring. In this paper, the wavelet transform (WT) technique is proposed as a powerful tool to de-noise PD signals in medium voltage (MV) covered-conductor (CC) overhead lines, which are completely buried by electromagnetic interference (EMI). The proposed method would be implemented in a real system environment to get more stable and reliable PD detection results.
Index terms: Partial discharge measurements, high volt-
age, electromagnetic disturbances, wavelet transform, medium voltage, covered-conductor, electromagnetic interference.

EMCABS: 03-05-2007

ANALYSIS OF HAZARDS CAUSED BY LIGHTNING CLOUD TO GROUND DISCHARGES FOR LOCAL COMPUTER NETWORKS
Konrad Sobolewski
Warsaw University of Technology, Poland
Abstract: In this paper, measured voltages induced in a working local computer network due to voltage surges simulating cloud to ground lightning (CG) discharges are described. The measured voltages were dependent upon positioning to a transmission cable type of examined network to direction of the discharge channel. Also tested were various kinds of SPDs designed to protect devices connected to the network. The results have been discussed and adequate conclusions have been formulated.
Index terms: Induced voltages, computer network, surge protective devices.

EMCABS: 04-05-2007

MODELING OF LIGHTNING ELECTROMAGNETIC DISTURBANCES TRANSMITTED INTO THE GROUND
Jerzy Bajorek, Mariusz Gamracki and Grzegorz Maslowski
Rzeszów University of Technology, Rzeszów, Poland
Abstract: In this paper, the plane-wave model of the lightning electromagnetic field transmitted into the ground is compared with the vertical lightning channel model. Results for the horizontal component of the electric field in the buried observation point show the assumptions and the area of utility for the plane-wave model.
Index terms: Computer simulations, Fourier transform, frequency-domain analysis, lightning electromagnetic impulse, lightning-induced effects, mathematical models, time-domain windows.

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EMCABS: 06-05-2007

LIGHTNING CURRENTS IN LOW-VOLTAGE SYSTEMS POWERED BASE TRANSCEIVER STATIONS
Renata Markowska, Andrzej Sowa
Bialystok Technical University, Poland

Abstract: The paper presents an overview on investigation methods of lightning effects in low-voltage systems powering the GSM base stations. On-site current injection methods, real lightning recordings, reduced-scale models, as well as numerical methods are described. The final purpose is to develop the values of lightning currents, which appeared in power systems during direct lightning strokes to the towers of GSM stations. These currents can cause a threat to the equipment inside the station and for the other users of energy.

Index terms: Lightning, LEMP, simulation methods, over voltage protections, GSM base stations.

EMCABS: 07-05-2007

EMC AND FUNCTIONAL SAFETY CONSIDERATIONS ON COMPATIBILITY, IMMUNITY AND SAFETY INTEGRITY LEVELS
Bernd W. Jaekel
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Abstract: Safety functions are more and more carried out by electrical, electronic, or programmable electronic systems. Such systems are exposed to electromagnetic phenomena as they typically exist in installations and could therefore be affected. As a consequence, a failure of the safety function could arise which might cause harm to people. Thus, appropriate immunity has to be achieved which is not ensured in every case by complying with normal EMC requirements because they are usually derived from issues of availability and of economic circumstances. Therefore, the topics of EMC and safety requirements have to be merged in order to ensure the reliability of a safety-related system when being exposed to electromagnetic disturbances. This paper describes an approach on how to establish proper function and/or reaction of such safety functions by introducing particular immunity levels in combination with a special performance criterion called “Functional Safety”. A particular challenge results from taking into account requirements related to the different safety integrity levels. This situation is considered and discussed regarding the determination of appropriate immunity test levels.

Index terms: EMC, electromagnetic phenomenon, safety, functional safety, immunity, compatibility, performance criteria, safety integrity, SIL.

EMCABS: 09-05-2007

DIFFERENCES IN LIGHTNING CURRENT WAVEFORMS AT THE TOP AND BASE OF A COMMUNICATION TOWER DIRECTLY STRUCK BY LIGHTNING
Renata Markowska
Bialystok Technical University, Poland

Abstract: Experimental data on lightning current waveforms obtained in various towers reveal substantial differences between the peak values of currents recorded at the top of the tower and base. The paper presents theoretical considerations on lightning current waveforms at the top and base of a communication tower directly struck by lightning. As a starting point, numerical simulations performed for a typical GSM base station are presented. Then, the dependence of the lightning current wave shapes on the values of the reflection coefficients at the tower top and base and on the tower height is studied in case of a subsequent lightning stroke.

Index terms: Lightning, lightning current, towers, transients, traveling waves.
ANALYSIS OF SEPARATELY ARRANGED PATTERNS FOR SUPPRESSION OF SIMULTANEOUS SWITCHING NOISE
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Proceedings of 2006 Asia-Pacific Microwave Conference, Yokohama, Japan,
Abstract: In this paper, the separately arranged suppression patterns are investigated. The suppression band of SSN is critically influenced from the size of patterns rather than the periodicity. By arranging the suppression patterns separately on the power plane, SI problems can be reduced, as well as good suppression characteristics are achieved.
Index terms: SSN (Simultaneous Switching Noise), EBG (Electronic Band Gap), PCBs (Printed Circuit Boards), suppression, equivalent circuit.

REDUCTION EFFECT OF GROUND PATTERNS ON CONDUCTIVE NOISE CURRENTS FROM PRINTED CIRCUIT BOARD
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Abstract: Conductive noise currents flowing out from vehicle-mounted electronic equipment composed of multi-layer printed circuit boards (PCBs) to wire-harnesses form a major disturbance source for vehicle-mounted radios. Using actual vehicle-mounted electronic equipment, the paper shows that, to reduce the noise current outflow of this type, combining, not separating, the ground layer patterns of a digital circuit and an analog circuit is more advantageous, while the mechanism remains unknown. In the present study, based on an idea that this mechanism generates from a change in the amount of common-mode return currents flowing to the ground, simulated noise current outflows with the method of moment from three types of simple PCBs having different ground patterns, which were validated from measurement of scattering parameters. Furthermore, the paper confirms that slits on a ground pattern allow conductive noise currents to flow out from PCBs.
Index terms: Vehicle-mounted electronic equipment, PCB, wire-harnesses, conducted noise current, ground layer pattern.

WAVE ABSORBER BASED ON REINFORCED PLASTIC WITH PERIODIC LATTICE FOR IMPROVING ETC ENVIRONMENT
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Abstract: A wave absorber based on reinforced plastic including glass fiber with periodic lattice is proposed; while the absorption and the shielding effect are examined at 5.8GHz for ETC. As a result, the absorption of 10dB or more can be obtained at the incident angle ranging from 5 to 55 degrees for a circularly polarized wave. Furthermore, the shielding effect of 20dB or more is also obtained. Therefore, realization of the wave absorber with a periodic lattice for ETC is clarified.
Index terms: Wave absorber, reinforced plastic, periodic lattice, ETC lanes, circularly polarized wave.