

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.

EMCABS COMMITTEE

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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

Proceedings of THE 16th INTERNATIONAL CONFER-ENCE ON ELECTROMAGNETIC DISTURBANCES, Kaunas, Lithuania, September 27-29, 2006, pp.13-17.

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.

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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: 02-05-2007

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 Proceedings of THE 16th INTERNATIONAL CONFER-ENCE ON ELECTROMAGNETIC DISTURBANCES, Kaunas, Lithuania, September 27-29, 2006, pp.22-27. 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 COM-PUTER NETWORKS

Konrad Sobolewski

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Proceedings of THE 16th INTERNATIONAL CONFER-ENCE ON ELECTROMAGNETIC DISTURBANCES, Kau-

nas, Lithuania, September 27-29, 2006, pp.28-33.

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 DISTUR-BANCES TRANSMITTED INTO THE GROUND

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Proceedings of THE 16th INTERNA-TIONAL CONFERENCE ON ELEC-TROMAGNETIC DISTURBANCES, Kaunas, Lithuania, September 27-29, 2006, pp.34-37.

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 horizon-tal 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.

EMCABS: 05-05-2007

CONTROVERSIAL QUESTIONS AND NEW STAN-DARDS ON PROTECTION AGAINST LIGHTNING AND RELEVANT OVER VOLTAGES

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Proceedings of THE 16th INTERNATIONAL CONFER-ENCE ON ELECTROMAGNETIC DISTURBANCES, Kaunas, Lithuania, September 27-29, 2006, pp.44-49. *Abstract*: The paper deals with the hazard impending over structures and their equipment due to lightning flashes and



over voltages. Special attention is paid to the controversy on the need of protection measures against lightning over voltages in electrical and electronic installations. Professional and standard suggestions on this matter differ extremely. Considerations of the paper show that only the risk assessment allows finding the proper solution to avoid this controversy.

Index terms: Risk of lightning damages, lightning over voltages, risk components, protection against over voltages, protection measures.

EMCABS: 06-05-2007

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

Proceedings of THE 16th INTERNATIONAL CONFER-ENCE ON ELECTROMAGNETIC DISTURBANCES, Kaunas, Lithuania, September 27-29, 2006, pp.122-127.

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

Siemens AG, Automation and Drives, Erlangen, Germany Proceedings of THE 16th INTERNATIONAL CONFER-ENCE ON ELECTROMAGNETIC DISTURBANCES, Kaunas, Lithuania, September 27-29, 2006, pp.154-157.

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 criterion, safety integrity, SIL.

EMCABS: 08-05-2007

EMF REGULATION AND STANDARDISATION IN THE EUROPEAN UNION AND THE IMPACT ON MANU-FACTURERS, EMPLOYERS, PRODUCTS, AND GENER-AL PUBLIC

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Proceedings of THE 16th INTERNATIONAL CONFER-ENCE ON ELECTROMAGNETIC DISTURBANCES, Kaunas, Lithuania, September 27-29, 2006, pp.158-163.

Abstract: The issue of human exposure to electromagnetic fields (EMF) has become more important in recent years. This is partly due to the increasing use of equipment and systems, which produce and radiate electromagnetic fields and partly due to the increased public awareness to health and safety. As a consequence, human exposure to electromagnetic fields has become the subject of numerous scientific studies, surveys, and investigations that provide the basis for the assessment of exposure and for the derivation of exposure limits. Due to the relationship of this topic to issues of health and safety, national and international authorities have had to take notice of the issue and pass corresponding legal documents. The paper describes the approach taken by the Council and the Parliament of the European Union, which considers both the exposure of the general public as well as that of employed persons. It also provides an overview of existing exposure limits and regulations in three European countries: Germany, Italy, and the United Kingdom.

Index terms: Electromagnetic fields, EMF, exposure, council recommendation, Directive, limits, workers.

EMCABS: 09-05-2007

DIFFERENCES IN LIGHTNING CURRENT WAVE-FORMS AT THE TOP AND BASE OF A COMMUNICA-TION TOWER DIRECTLY STRUCK BY LIGHTNING Renata Markowska

Bialystok Technical University, Poland

Proceedings of THE 16th INTERNATIONAL CONFER-ENCE ON ELECTROMAGNETIC DISTURBANCES, Kaunas, Lithuania, September 27-29, 2006, pp.195-200.

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 SUP-PRESSION OF SIMULTANEOUS SWITCHING NOISE

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Proceedings of 2006 Asia-Pacific Microwave Conference, Yokohama, Japan, December 12-15, 2006, pp.55-58.

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.

EMCABS: 11-05-2007

REDUCTION EFFECT OF GROUND PATTERNS ON CONDUCTIVE NOISE CURRENTS FROM PRINTED CIRCUIT BOARD

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Proceedings of 2006 Asia-Pacific Microwave Conference, Yokohama, Japan, December 12-15, 2006, pp.59-62.

Abstract: Conductive noise currents flowing out from vehiclemounted 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.

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Index terms: Vehicle-mounted electronic equipment, PCB, wire-harnesses, conducted noise current, ground layer pattern.

EMCABS: 12-05-2007

WAVE ABSORBER BASED ON REINFORCED PLASTIC WITH PERIODIC LATTICE FOR IMPROVING ETC ENVIRONMENT

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Proceedings of 2006 Asia-Pacific Microwave Conference, Yokohama, Japan, December 12-15, 2006, pp.63-66.

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. **EMC**