EMCABS

EMC Abstracts

Osamu Fujiwara, Associate Editor

Professors Ryuji Koga, Gao Yougang, Shuichi Nitta and Osamu Fujiwara (from left) are shown during CEEM 2006, the Asia-Pacific Conference on Environmental Electromagnetics held in Dalian, China in August.

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

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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: 01-11-2006

DEVELOPMENTS IN THE STUDY OF LIGHTNING ELECTROMAGNETIC EFFECTS WITH APPLICATIONS TO THE PROTECTION OF DISTRIBUTION POWER LINES

Michel Ianoz
Swiss Federal Institute of Technology of Lausanne, Switzerland

Proceedings of Asia-Pacific Conference on Environmental Electromagnetics, Dalian, China, August 1-4, 2006, pp.1-6.

Abstract: In the last twenty years, the widespread use of sensitive electronic devices has increased the interest on transients, in particular those caused by lightning (direct and/or indirect). The paper presents the developments in modeling the electromagnetic (indirect) effects of lightning achieved in the last 20 years of the 20th century. Then it discusses in more detail two important achievements of the last two to three years, namely the problem of lightning strikes on tall construction, such as telecommunication towers, and the modeling of coupling to shielded cables. These developments permit today the study of the reliability of protection against lightning electromagnetic effects of medium voltage power networks, telecommunication installations and the correct EMC design of very complex configurations, for example, control and protection circuits in power network substations.

Index terms: Lightning, power line, protection.

EMCABS: 02-11-2006

GAP BREAKDOWN FIELD CAUSED BY AIR DISCHARGE THROUGH HAND-HELD METAL PIECE FROM CHARGED HUMAN-BODY

Yoshinori Taka and Osamu Fujiwara
Nagoya Institute of Technology, Japan

Proceedings of Asia-Pacific Conference on Environmental Electromagnetics, Dalian, China, August 1-4, 2006, pp.103-106.

Abstract: We measured the discharge currents due to air discharge through a hand-held metal piece from a charged human-body with respect to charge voltages below 1000 V. The gap breakdown fields were thereby estimated, which were validated from the Paschen's law and other researcher's experimental results.

Index terms: Electrostatic discharge, charged human body, discharge current, gap breakdown field.

EMCABS: 03-11-2006

AN EFFICIENT AND AUTOMATED METHOD FOR ELECTROMAGNETIC COMPATIBILITY ANALYSIS ALONG CONGESTED RIGHT-OF-WAY

Y. Li, S. Fortin, and F. P. Dawalibi
Safe Engineering Services & Technologies Ltd, Montréal, Canada

Proceedings of Asia-Pacific Conference on Environmental Electromagnetics, Dalian, China, August 1-4, 2006, pp.151-160.

Abstract: Electromagnetic interference caused by electric power lines can cause serious damage to nearby utilities and may pose safety hazards to the public. The computation of interference effects along a long and congested right-of-way is a complex and time-consuming procedure. This paper discusses recent advances in techniques developed to automate EMC analysis. With these advanced techniques and automation, all relevant parameters used for representing a right-of-way (such as soil resistivity, line characteristics, right-of-way configurations, etc.) can be modeled accurately. The maximum interference levels due to both the inductive and conductive components are automatically determined under steady state and fault conditions at all specified locations.

Index terms: Electromagnetic interference, EMI, inductive coupling, conductive coupling, electromagnetic interference.

EMCABS: 04-11-2006

CORRELATION BETWEEN THE FIELD STRENGTH MEASUREMENT AND THE ABSORBING CLAMP MEASUREMENT

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Proceedings of Asia-Pacific Conference on Environmental Electromagnetics, Dalian, China, August 1-4, 2006, pp.189-192.

Abstract: In the frequency range of 30 to 300 MHz, radiated disturbances from electronic equipment are usually measured with an antenna. In contrast, disturbances of household appliance are evaluated using an absorbing clamp attached on the mains cable. Hence, theoretical and experimental investigations are carried out on the correlation between the field strength measurement and the absorbing clamp measurement.

Index terms: EMI measurement, disturbance, absorbing clamp.

EMCABS: 05-11-2006

STATISTICAL ANALYSIS OF CONDUCTED DISTURBANCE SOURCE IN FUEL CELL BUS

Shaofeng Yu, Jinliang He, Bo Zhang, Wei Li and Yong Huang
Tsinghua University, Beijing, China

Proceedings of Asia-Pacific Conference on Environmental Electromagnetics, Dalian, China, August 1-4, 2006, pp.279-282.

Abstract: A fuel cell vehicle could cause serious EMC (electromagnetic compatibility) problems. Now the related EMC research is being focused on. Up to now, there still have been no expert EMC standards on it. So it is necessary to realize the characteristics of the disturbance source on the new type of fuel cell vehicle. This paper applies statistical methods to analyze the conducted disturbance sources on fuel cell bus in time-domain based on a quantity of experimental results. The influence of time and operation condition is analyzed. The characteristics of the EMI sources are summarized. The results are a necessary reference for simulation and other further automotive EMC research.

Index terms: Fuel cell bus, conducted disturbance source, statistical analysis.

EMCABS: 06-11-2006

SATELLITE COMMUNICATION EQUIPMENTS RELIABILITY AND LIGHTNING SURGE MEASUREMENT RESULTS

Md Hisam Hanapei and Mohd Rezadzudin Hassan
Lightning Protection and EMC Unit, Malaysia

Proceedings of Asia-Pacific Conference on Environmental Electromagnetics, Dalian, China, August 1-4, 2006, pp.301-306.

Abstract: This paper presents the measurement results of lightning induced surges on the AC mains connected to satellite equipment. Observation shows that the total surges recorded was 26 sets over a duration of seven months during 11 thunderstorm days. The measurement was done at four locations in a remote suburban area. The largest surge was recorded as 300 A. An estimated value of occurrence probability gives the ratio of 4.4 times higher than the Japan AC mains measurement result. The wave shape of induce surge is 10.2/37.3μs. The observed rise time was 10.2μs and time to half value was 37.3μs. This waveform shows a good agreement of 8/20μs current waveform on the IEEE testing waveform. Calculated specific energy is 6.22X10-2A2s. As a result, the surge protection should be a higher level than in other countries.

Index terms: surge, reliability, tropical region.

EMCABS: 07-11-2006

SIMPLE EXPRESSIONS FOR EXTERNAL WIRE IMPEDANCE AND ADMITTANCE FOR LIGHTNING CURRENT PULSE PROPAGATION IN BURIED WIRES

Nelson Theethayi and Rajeev Thottappillil
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Proceedings of Asia-Pacific Conference on Environmental Electromagnetics, Dalian, China, August 1-4, 2006, pp.513-517.

Abstract: Lightning surge propagation in buried cables and grounding systems is a subject of practical interest. In this paper we present simple expressions for external wire impedance and admittance that are valid for studying the lightning interaction with buried wires based on transmission line analysis. Buried wires can be either bare (counterpoise) or insulated (cables). Due to certain drawbacks of existing ground impedance expressions, a modified empirical ground impedance expression for buried wires is proposed. As it's well known that lightning transients have frequencies between few kHz to few MHz, the ground impedance and ground admittance behavior

is investigated for a wide frequency range.
Index terms: Transmission line theory, lightning, impedance, admittance, cables.

EMCABS: 08-11-2006

ANALYSIS OF HBM-ESD CURRENT RISE TIME AND ITS DECIDING FACTOR
Zhou Feng+, Huang Jiusheng++, Gao Yougang+, Liu Sulin+, Wang Xiqing+ and Wang Langfeng+++
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Proceedings of Asia-Pacific Conference on Environmental Electromagnetics, Dalian, China, August 1-4, 2006, pp.529-533.
Abstract: The circuit model of an ESD test circumstance is established. By Inverse Laplace transform, analytical expression of current is achieved. Then we obtain simulation of current rise time (tr) under a different combination of circuit parameters. A few fitted polynomials that describe the relationship of tr to these parameters are achieved, whose accuracy is also analyzed.
Index terms: Electrostatic discharge (ESD), circuit model, rise time, simulation, fitted polynomial.

EMCABS: 09-11-2006

EXPERIMENTAL RESEARCH ON EMI OF PLC SYSTEM OF ±500-KV HVDC CONVERTER STATION
Zhanqing Yu, Jinliang He, Rong Zeng, Bo Zhang and Shuiming Chen
State Lab of Power Systems, Tsinghua University, Beijing, China
Proceedings of Asia-Pacific Conference on Environmental Electromagnetics, Dalian, China, August 1-4, 2006, pp.624-627.
Abstract: The Power Line Carrier (PLC) system used in a HVDC converter station is connected directly to the primary system via coupling devices, and may be interfered with by the electromagnetic noise produced by valves or switch operation procedure. In this paper, the EM noise in the PLC system of a $^{+}/_{-}$500-kV HVDC Converter Station is measured in the steady state. The transient disturbance during the switch operation procedure appearing in the PLC system is also taken into account in this paper. The characteristics of EMI in the PLC system are analyzed based upon the experimental results.
Index terms: EMI, power line carrier system, HVDC converter station, transient disturbance.

EMCABS: 10-11-2006

CROSSTALK ANALYSIS BETWEEN NON-PARALLEL COUPLED LINES CONNECTED WITH VIAS IN A 4-LAYER PCB
Jae Kwon Han and Dong Chul Park
Chungnam National University, Korea
Proceedings of Asia-Pacific Conference on Environmental Electromagnetics, Dalian, China, August 1-4, 2006, pp.728-731.
Abstract: Multi-layer PCBs are often used in compact microwave circuit design as the density of PCB layout is increased. In this paper, the crosstalk between non-parallel coupled lines connected with vias in a 4-layer PCB is investigated theoretically based on the circuit-concept approach. Non-parallel coupled lines connected with vias in a 4-layer PCB are divided into three sections, which are coupled microstrip lines and upper via section, center via section, and lower via and coupled microstrip lines section, respectively. Each section is represented by an ABCD matrix. By cascading these three ABCD matrices, crosstalk between nonparallel coupled lines connected with vias in a 4-layer PCB is approximately calculated. The validity of this theoretical approach is verified by comparing the calculated results with the simulated ones using HFSS.
Index terms: Crosstalk, 4-layer PCB, non-parallel coupled lines, circuit-concept approach.

EMCABS: 11-11-2006

A STUDY ON PULSE PROPAGATION ON DOUBLE SIDE PCB
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++Salesian Polytechnic, Tokyo, Japan
+++NEC Co., Ltd., Kanagawa, Japan
Proceedings of Asia-Pacific Conference on Environmental Electromagnetics, Dalian, China, August 1-4, 2006, pp.744-749.
Abstract: This paper clarifies the differential mode pulse propagation characteristics on the parallel plates consisting of a DC power supply plane and its return plane, from the viewpoint of series resonance of parallel plates, experimentally and by PSPICE simulation. It is concluded that the practical pulse propagation characteristics are dominated by the characteristics of not only the parallel plates, but also the wirings connected to the parallel plates.
Index terms: Pulse propagation, parallel plates, resonance, ESD, PSPICE simulation.

EMCABS: 12-11-2006

WAVE PROPAGATION CHARACTERISTICS OF CYLINDRICAL WAVEGUIDE FILLED WITH TIME-VARYING MEDIA
Zhng Ying, Chen Bing-kang and Gao Ben-qing
Beijing Institute of Technology, Beijing, China
Proceedings of Asia-Pacific Conference on Environmental Electromagnetics, Dalian, China, August 1-4, 2006, pp.900-903.
Abstract: Separation of variables method is used and the field expression of both the cylindrical waveguide and the coaxial line are obtained in the time-varying media. It is clearly shown that both the amplitude and frequency of the waves change with time in time-varying media. The phase constant and the phase velocity that vary with time have also been derived
Index terms: Time-varying media, separation of variables, waveguide, cylindrical coaxial line. EMC