EMCABS

EMC Abstracts Osamu Fujiwara, Associate Editor



Dignitaries convened following the opening ceremony and keynote addresses at the 2008 Asia-Pacific Symposium on Electromagnetic Compatibility in Singapore, including (from left) Professor Zhong Xiang Shen, Nanyang Technological University, Singapore, Chair of Technical Program Committee, Professor Ban Leong OOI, National University of Singapore, Dr. Er-Ping Li, Singapore, Symposium President, A-STAR IHPC, Professor Tan Chorth Chuan, Provost and Deputy President, National University of Singapore, Dr. Albert E. Ruehli, IBM T.J. Watson Research Center, USA, keynote speaker, Dr. Raj. Thampuran, General Co-Chair, Executive Director of A-STAR IHPC, Singapore, keynote speaker, Professor Flavio Canavero, Chair of Technical Program Committee, Politecnico di Torino, Italy, Professor Ruediger Vahldieck, General Co-Chair, ETH, Zurich, Switzerland, Professor Kye-Yak See, Organizing Committee Chairman, Nanyang Technological University, Singapore, and Osamu Fujiwara, Chair of Technical Program Committee, Nagoya Institute of Technology, Japan.

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A NEW CONFORMAL TECHNIQUE FOR FDTD (2, 4) SCHEME FOR MODELING PERFECTLY CONDUCTING COMPOSITES

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Proceedings of the 2008 Asia-Pacific Symposium on Electromagnetic Compatibility, Singapore, May 19-22, 2008, pp.64-67.

Abstract: A modified conformal technique for fourth-order finite-difference time-domain (FDTD (2, 4)) is proposed. This conformal scheme has higher-order accuracy than that of conventional FDTD and FDTD (2, 4) methods, which are caused by stair casing errors when modeling curved metallic objects. Two integration loops of Faraday's law for the updating of magnetic field components are introduced. Numerical examples show that the proposed scheme achieves higher accuracy and lower dispersion errors, compared with the low-order conformal method and the conventional stair cased FDTD method.

Index terms. Numerical method, fourth-order FDTD method, conformal method.

EMCABS: 02-08-2008

ACCURATE WIDEBAND EVALUATION OF THE SHIELDING EFFECTIVENESS OF COMPLEX ENCLO-SURES USING AN ASYNCHRONOUS PARALLEL NSP-WMLFMA

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Proceedings of the 2008 Asia-Pacific Symposium on Electromagnetic Compatibility, Singapore, May 19-22, 2008, pp.204-207. *Abstract:* This paper presents the application of the Nondirective Stable Plane Wave Multilevel Fast Multipole

directive Stable Plane Wave Multilevel Fast Multipole Algorithm (NSPWMLFMA) to the simulation of the shielding effectiveness of enclosures with complex fillings. The method is shown in parallel with an asynchronous algorithm in order to allow highly efficient simulations in an inexpensive GRID computing environment. The whole method is fully error controlled. Further increased efficiency is obtained by using Block-Jacobi preconditioners, splay trees (STs) to extract symmetries in the geometry and careful evaluation of self-patch and neighbor-patch integrals. Numerical examples of enclosures with and without equipment illustrate the method. The paper also focuses on the use of lossy materials to increase the shielding efficiency of metal enclosures around resonance frequencies.

Index terms. Shielding effectiveness, lossy material, numerical algorithm.

EMCABS: 03-08-2008

EXPERIENCE WITH THE RMS-AVERAGE DETECTOR Jens Medler

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Proceedings of the 2008 Asia-Pacific Symposium on Electromagnetic Compatibility, Singapore, May 19-22, 2008, pp.299-302.

Abstract: The purpose of weighting along with the defined weighting function for the new RMS-Average detector are introduced. Extensive comparison measurements were performed by using the required Quasi-Peak and Average detectors and the new RMS-Average detector for both conducted and radiated emission measurements to confirm the weighting function and for the definition of emission limits for the new RMS-Average detector.

Index terms: Conducted and radiated emission measurement, RMS-average detector, quasi-peak detector.

EMCABS: 04-08-2008

AN ESTIMATION METHOD OF CHIP LEVEL POWER DISTRIBUTION NETWORK INDUCTANCE USING FULL WAVE SIMULATION AND SEGMENTATION METHOD

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Proceedings of the 2008 Asia-Pacific Symposium on Electromagnetic Compatibility, Singapore, May 19-22, 2008, pp.343-346.

Abstract: An impedance profile of a power distribution network (PDN) in system is an efficient criterion to evaluate the system performance in high-speed and high-performance semiconductor system design. Especially, PDN inductance estimation is more important because high impedance occurs at high frequency bandwidth with larger inductance and it generates larger simultaneous switching noise. In this paper, a new calculation method to extract the inductance of chip level PDN based on full wave simulation and segmentation method is proposed. The authors fabricated two kinds of chip level PDN and measured the impedance profiles of test vehicles in the frequency domain up to 20 GHz so as to verify the proposed estimation method.

Index terms: Chip level EMI, full wave simulation, segmentation method.

EMCABS: 05-08-2008

A NOVEL BROADBAND COMMON-MODE FILTER FOR HIGH-SPEED DIFFERENTIAL SIGNALS

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Proceedings of the 2008 Asia-Pacific Symposium on Electromagnetic Compatibility, Singapore, May 19-22, 2008, pp.359-362.

Abstract: A novel low-cost filter design for common-mode noise suppression in high-speed differential signals is proposed. It is realized by periodically etching the dumbbell-shape defected ground structure (DGS) to perturb the return

current of the common-mode noise. A transmission-line model for the proposed structure is also developed with good agreement to the full-wave simulation and measurement result. It is found that over 20 dB of common-mode noise suppression can be achieved over a wide frequency ranges from 3.3 to 5.7 GHz with three cascaded DGS cells, while the differential signals still keep good signal integrity in eye-pattern observation.

Index terms: Signal integrity, commonmode filter, EMI, defected ground plane, differential signal.

EMCABS: 06-08-2008

EFFECT OF PACKAGE PARASITICS ON CONDUCTED AND RADIATED EMISSION WITH MIXED-MODE ANALYSIS

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Proceedings of the 2008 Asia-Pacific Symposium on Electromagnetic Compatibility, Singapore, May 19-22, 2008, pp.423-426.

Abstract: Based on a case study, it is shown that the mixed-mode scattering parameters allow consideration of some

important effects related to package parasitics, which cannot be explained by considering completely differential type package models. In particular, a differential mode source at the IC level can generate a common mode current at the package level, which is in part transformed back into differential mode current and flows through the port connected to the PCB. Some design equations based on mixed-mode analysis are proposed, in order to reduce the common mode excitation, and make the package more reliable.

Index terms. Conducted emission, radiated emission, package parasitics.

EMCABS: 07-08-2008

PERFORMANCE OPTIMIZATION ASPECTS OF COM-MON MODE CHOKES

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Proceedings of the 2008 Asia-Pacific Symposium on Electromagnetic Compatibility, Singapore, May 19-22, 2008, pp.447-450.

Abstract: Optimization aspects of common mode chokes are presented. These are based on a behavioral model for common mode chokes and its sensitivity study. Results are used to show the influence of the design parameters on the final performance



of the choke placed in a circuit.

Index terms: Common mode, common mode choke, optimization.

EMCABS: 08-08-2008

PULSED MICROWAVE EFFECTS ON ELECTRONIC COMPONENTS

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Proceedings of the 2008 Asia-Pacific Symposium on Electromagnetic Compatibility, Singapore, May 19-22, 2008, pp.455-458.

Abstract: An investigation of short electromagnetic pulse (500 ps~500 ns) effects on some electronic (microwave) components, such as a low noise amplifier (LNA), limiter, and mixer, is summarized in this paper. Not only the damage thresholds of some microwave components, but also their regularities have been obtained by experiments and theoretic analyses. The relations of the threshold with pulse duration and rise time of the electromagnetic pulse were studied by changing the simulation pulse generator's output parameters. The features and the principle of microwave effects on microwave components are also discussed in this paper. The test data obtained in this study has been used to improve electro-magnetic compatibility for some microwave devices and systems.

Index terms: Immunity, pulse microwave field, electronic component.

CASE STUDIES ON THE PERFORMANCE OF COMMER-CIAL-GRADE LIGHTNING EVENT COUNTERS

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Proceedings of the 2008 Asia-Pacific Symposium on Electromagnetic Compatibility, Singapore, May 19-22, 2008, pp.494-497.

Abstract: The non-conventional lightning air terminals and their associated commercial-grade lightning event counters were introduced in Malaysia more than three decades ago. These event counters have been widely used to justify the use of the air terminals among users and non-expert engineers. Case studies are presented of the lightning event counter data and comparison against similar nearby event counter data and to the estimated number of lightning flashes to an air terminal based on the keraunic level.

Index terms: Lightning, lightning event counter.

EMCABS: 10-08-2008

ANALYSIS ON SWITCHING TRANSIENT EMI IN ± 500 -KV HVDC CONVERTER STATIONS

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Proceedings of the 2008 Asia-Pacific Symposium on Electromagnetic Compatibility, Singapore, May 19-22, 2008, pp.526-529.

Abstract: Transient processes are generated by operations of disconnect switches and circuit breakers in the AC side of converter stations. Several trips in different ± 500 -kV HVDC converter stations in China happened recently. Characteristics of transient electromagnetic interference due to switching operations are summarized based upon onsite tests in a practical converter station. Measurements are performed to analyze the propagation mechanism of transient processes due to variable switching operations. The EM noise generated by the switching operations in secondary systems, especially the measuring system, is analyzed as well. The high frequency characteristics of DC shunts, which is the most important path for EM noise propagation, is analyzed based upon tests and calculations. *Index terms*: HVDC converter stations, switching operations, electromagnetic noise, analysis.

EMCABS: 11-08-2008

MUTUAL COUPLING EFFECT ON THE PERFORMANCE OF ANTENNA ARRAYS WITH CORPORATE FEED

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Proceedings of the 2008 Asia-Pacific Symposium on Electromagnetic Compatibility, Singapore, May 19-22, 2008, pp.554-557.

Abstract: Mutual coupling effects on the performance of linear antenna arrays with corporate feed are investigated in this paper. Formulas of the reflection coefficients for arrays fed through Y-branch power dividers are derived. For a two-element array, it is shown that the reflection coefficient at the input of the array is approximately the linear superposition of scattering coefficients S11 and S12 of the array. Therefore, mutual coupling can be utilized to achieve bandwidth enhancement with desired reflection coefficient and realized gain. Simulation and experimental results verify the validity of the analysis.

Index terms: Mutual coupling, antenna array, corporate feed.

EMCABS: 12-08-2008

TIME DOMAIN DISCONTINUOUS GALERKIN METHOD WITH EFFICIENT MODELING OF BOUND-ARY CONDITIONS FOR SIMULATIONS OF ELECTRO-MAGNETIC WAVE PROPAGATION

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Proceedings of the 2008 Asia-Pacific Symposium on Electromagnetic Compatibility, Singapore, May 19-22, 2008, pp.606-609.

Abstract: 3D Discontinuous Galerkin Finite Element Method (DG-FEM) in Time Domain using high-order local Lagrange polynomials is presented. The modeling of boundary conditions at interfaces to perfect electric conductors (PEC) as well as perfect magnetic conductors (PMC) is described using the numerical flux of a strong DG formulation. A perfectly matched layer (PML) as well as a uniaxial PML is taken into account and demonstrated with two numerical examples.

Index terms: Discontinuous Galerkin, finite element method, high-order method, PML. EMC