# Table of Contents

## Automotive EMC Modeling

**Transient Electromagnetic Field Computation in Automotive Environments using FDTD** ........................................... 1  
Pere J. Riu, Ricardo Jauregui, Ferran Silva, Mireya Fernández

**EMI Modeling in Automotive Data Communication Structure** ......................................................................................5  
Frank X. Li, Tamer Taher, Jalal Jalali, Fred D. Esenwein, Nickolaus J. Lockard, Andriy Ptichkin

**Electromagnetic Conductive Interference Characteristics in Driving System of Fuel Cell Bus** .................................10  
Jinliang He, Bo Zhang, Shaofeng Yu, Wei Li, Rong Zeng, Yong Huang, Jae-bok Lee, Sang-hun Chang

**A Statistical Model of Noises at Input Port of Inverter and its Coupling to Low Voltage Cable on Fuel Cell Bus**......14  
Wei Li, Shaofeng Yu, Bo Zhang, Jinliang He, Yong Huang

## TEM Cell Measurements

**New Test Method for the Pulse Immunity of Microcontrollers** .....................................................................................19  
Tao Su, Markus Unger, Thomas Steinecke, Robert Weigel

**Mode Suppressed TEM Cell Design For High Frequency IC Measurements** ...............................................................25  
Shaowei Deng, David Pommerenke, Todd Hubing, James Drewniak, Daryl Beetner, Dongshik Shin, Sungnam Kim, Hocheol Kwak

**A Field Uniformity Study of a TEM Cell by Using a Short Wire Scatterer** .................................................................31  
Takehiro Morioka

**Evaluation of Electromagnetic Interference Between UWB System and Wireless LAN Using a GTEM Cell** ..........36  
Masashi Yamada, Masamitsu Tokuda, Shinobu Ishigami, Kaoru Gotoh, Yasushi Matsumoto

## Electromagnetic Bandgap Structures

**Noise Suppression in High Speed Digital Circuits by Means of a Novel EBG Structure with Triangle Patches and Hexagonal Arrays** ..................................................................................................................41 
A. Ciccomancini Scogna

**Simplified Computation of Electromagnetic Band-Gap Properties of Via-Holed Metal Patches** .................................47  
K. Rambabu, M. Mokhtaari, J. Bornemann

**EMI Suppression in Microprocessor Packages using Miniaturized Electromagnetic Bandgap Structures with High-k Dielectrics** .........................................................................................................................51  
Baharak Mohajer-Iravani, Omar M. Ramahi

**Miniaturization of Electromagnetic Bandgap (EBG) Structures with High-Permeability Magnetic Metal Sheet** ......55  
Yoshtaka Toyota, Kengo Iokibe, Ryuji Koga, Arif Ege Engin, Tae Hong Kim, Madhavan Swaminathan

## Signal Integrity I

**Power and Signal Integrity and Electromagnetic Emission; the Balancing Act of Decoupling, Planes and Tracks** .....60  
Frank B. J. Leferink

**Signal and Power Integrity Co-Simulation for Multi-layered System on Package Modules** ........................................65  
Krishna Bharath, Ege Engin, Madhavan Swaminathan, Kazuhide Uriu, Toru Yamada

**Signal Integrity of Carbon Nanotube Bundles** ................................................................................................................71  
M. D’Amore, M. S. Sarto, A. Tamburrano

**Concurrent Analysis of Signal-Power Integrity and EMC for High-Speed Signaling Systems** .................................77  
Edward K. Chan, Mauro Lai, Myoung Joon Choi, Woong Hwan Ryu
Table of Contents

EM Environment

Ultra Wideband EMI to Legacy Receivers .................................................................................................................... 85
William G. Duff, Daniel Erndle

Interference Characterization and Mitigation of 5.5 Mbps CCK WI-FI Signals ................................................................. 91
Ayham Z. Al-Banna, Xiaoguang Zhou, Tae Ri Lee, Joseph L. LoCicero, Donald R. Ucci

Airborne RF Measurement System and Analysis of Representative Flight RF Environment ........................................... 99
Sandra V. Koppen, Jay J. Ely, Laura J. Smith, Richard A. Jones, Vincent J. Fleck, Maria Theresa Salud, John Mielnik

Small Aircraft RF Interference Path Loss ........................................................................................................................ 105
Truong X. Nguyen, Sandra V. Koppen, Jay J. Ely, George N. Szatkowski, John J. Mielnik, Maria Theresa P. Salud

EM Modeling I

Patch Antenna Modeling Issues Using Commercial Software .......................................................................................... 111
William O. Coburn, Canh Ly, Steven Weiss

EMI Analysis of a GSM 900 MHz Antenna for a Large Wind Turbine Hub with Method-of-Moments ......................... 118
B. Lewke, J. Kindersberger, F. Krug

Predicting Electromagnetic Coupling between HF, VHF, UHF Antennas using NEC .............................................. 122
Patrick Perini, William Duff

EMI Prediction Under Different Program Behavior ........................................................................................................... 128
Shih-Yi Yuan, Chi-Feng Yang, Etienne Sicard, Chiu-Kuo Chen, Shry-Sann Liao

Special Session - Automotive EMC Design and Integration Session
Chairs: Mark Steffka, Richard Wiese

Circuit Board Layout for Automotive Electronics ............................................................................................................. 135
Todd H. Hubing

Modeling Coax Cable EMI Shielding Performance for Automotive AM Broadcast Band Applications ......................... 138
Richard Wiese

Validation of Worst-Case and Statistical Models for an Automotive EMC Expert System ........................................... 143
Daryl G. Beetner, Haixiao Weng, Meiin Wu, Todd Hubing

Impact of Intra-Vehicular Electromagnetic Interference On Tire Pressure Monitoring Systems ..................................... 148
Vikas Kukshya, Hyok J. Song, Hui P. Hsu, Richard W. Wiese

Poul Andersen

Vehicle EMI Integration Issues Identified by Precompliance Test Methods ................................................................. 156
Scott W. Mee, Sreenivas Ranganathan, Craig Harder, Steve Mainville

Evaluating Cell Phone and Personal Communications Equipment and their EMC Effects on Automotive Audio and In-Cabin Modules ........................................................................................................... 162
Craig W. Fanning

Special Session - Waveform Diversity Session
Chair: Andy Drozd

The True Meaning of Electromagnetic Diversity Seen Through the First Principles of Fundamental Physics .......... 168
Tapan K. Sarkar
# Table of Contents

**Waveform Diversity and Electromagnetic Compatibility**

G. T. Capraro, I. Bradaric, M. C. Wicks ........................................ 173

**Why and What is Waveform Diversity, and How Does it Affect Electromagnetics?**

John W. Garnham, Jaime R. Roman ........................................ 180

**Distributed and Layered Sensing: Relevant EMC Issues**

Michael C. Wicks, William Moore ........................................ 184

**Electromagnetic Diversity and EMI Implications for Multiple Co-sited Radars and Targeting Applications**

Andrew L. Drozd, Irina Kasperovich, Ruixin Niu, Pramod K. Varshney ........................................ 191

**Effect of In-band Intermodulation Interference on Direct-Sequence Spread Spectrum (DSSS) Communication Systems for Electromagnetically Diverse Applications**

Iteris Demirkiran, Donald D. Weiner, Andrew Drozd ........................................ 198

**Detection/Imaging of Buried Objects: Using Spatial/Angular Diversity with Distributed/Embedded Sub-Surface Sensors for Reduced Mutual Coupling and Suppressed EM Emissions**

John Norgard, Kevin Magde, Michael Wicks, Andy Drozd, Randy Musselman ........................................ 204

**Polarization Diversity for Detecting Targets in Heavy Inhomogeneous Clutter**

Martin Hurtado, Arye Nehorai ........................................ 209

**EMC Measurements**

**Development and Application of a High-Resolution Thin-Film Probe**

Shaohua Li, Kui Feng Hu, Daryl Beetner, James Drewniak, James Reck, Matt O’Keefe, Kai Wang, Xiaopeng Dong, Kevin Slattery ........................................ 216

**The Design of Electric-optical Modulator Used in EMC Measurements**

Yinan Geng, Rong Zeng, Jinliang He, Shuiming Chen, Bo Zhang ........................................ 221

**The Development of Integrated Electro-optic Sensor for Intensive Electric Field Measurement**

Rong Zeng, Wei Yuan Chen, Jinliang He, Puxua Zhu ........................................ 227

**On the Selection of Telecommunication Port Impedance Stabilization Networks (ISNs)**

David Arnett, Ed Blankenship ........................................ 232

**Addressing an EMC Weakness Due to Strong Static Magnetic Fields**

Marian Soinski, Roman Rygal, Wojciech Pluta, Peter Kepski ........................................ 237

**Logistic Regression in Immunity Testing**

G. Giunta, B. Audone ........................................ 243

**Basis for a Wireless Network for EMC Measurements in Electric Substations**

W. H. Siew, Y. C. Liu, B. Musa, F. Mir, Y. Wang ........................................ 249

**Signal Integrity II**

**An Improved Cavity Model for the Analysis of the Voltage Bounce in Power-Bus Structures**

Giulio Antonini, Mauro Lai, Todd Bermensolo ........................................ 254

**Causal Modeling and Extraction of Dielectric Constant and Loss Tangent for Thin Dielectrics**

A. Ege Engin, Abdemanaf Tambawala, Madhavan Swaminathan, Swapan Bhattacharya, Pranabes Pramanik, Kazuhiro Yamazaki ........................................ 260

**Determination of Propagation of Fast Induced Transient Impulses on PCB-Level**

Mohamed Taki, Werner John ........................................ 265
# Table of Contents

Noise Isolation Modeling and Experimental Validation of Power Distribution Network in Chip-Package ........................................... 270
Hyunjeong Park, Changwook Yoon, Kyoungchoul Koo, Joungho Kim

Signal Integrity Analysis of a 1.5 Gbit/s LVDS Video Link .................................................................................................................. 276
Volker Zwillich, Michael Wollitzer, Thomas Wirschem, Wolfgang Menzel, Helmut Leier

Implementation of On-Chip and On-Package Reactive Equalizer to Minimize Inter-symbol Interference (ISI) and Jitter from Frequency Dependent Attenuation ..................................................................................................................... 282
Seungyoung Ahn, Jongtae Chun, Joungho Kim

Causality Enforcement in Transient Simulation of HDMI Interconnects with Magnitude Equalization ........................................... 288
Eakhwan Song, Jeonghyeon Cho, Joungho Kim, Gun Kam Dong

Product Safety Testing

How to Perform EMI Testing within an Existing EMI Chamber on an EUT with Low Particle Count Cleanliness Requirements ........................................................................................................................................................................... 292
Larry Freeman

Medical Equipment Immunity Assessment by Time Domain Analysis Application to GSM signals ............................................... 298
Mireya Fernández-Chimeno, Miguel Angel García-González, Ferran Silva

Recent Developments in Standardization Related to EMC and Functional Safety .................................................................................................................. 302
Bernd W. Jaekel

Validation, Verification and Immunity Testing Techniques for EMC for Functional Safety ................................................................. 308
EurIng Keith Armstrong

A Novel Assessment Methodology for the EMI Occurrence in Implantable Medical Devices Based Upon Magnetic Flux Distribution of RFID Reader/writers .................................................................................................................. 314
Shunichi Futatsumori, Takashi Hikage, Toshio Nojima, Ben Koike, Hiroshi Fujimoto, Takeshi Toyoshima

EM Modeling II

Measurement of a Point Source Radiator Using Magnetic and Electric Probes and Application to Silicon Design of Clock Devices .................................................................................................................................................................................. 320
Kevin Slattery, Kevin Daniel, Xiaopeng Dong

Efficient Low-Frequency Modal Analysis of Anechoic Chamber ................................................................................................................ 326
Ignacio Monterde, Luis Nuño, Juan Vicente Balbastre, Fernando Niño

Calculation of the H-Plane Pattern Influence to the Site VSWR Result using the Monte Carlo Method ......................................................... 331
Alexander Kriz, Wolfgang Müllner

Em Fields Between Two Parallel Plates Supported by Conductive Multi-Poles - Pole-Plate System: Shield Effectiveness and Field Leakage .................................................................................................................................................. 337
Kazuo Aizawa, Hiroshi Echigo

Analysis of Radiated Emissions and Shielding Effectiveness for a Metallic Enclosure with Shielding Springs ........................................ 343
A. Ciccomancini Scogna, G. Antonini, A. Orlandi

Extending Winding Capacitance Cancellation to Three-Phase EMC Input Filter Networks ................................................................. 349
Marcelo L. Heldwein, Johann W. Kolar

Ultra-Wideband Printed-Circuit Antenna in Coplanar Technology ........................................................................................................ 358
Hung-Jui Lam, Jens Bornemann
Table of Contents

Biological Effects

Enabling the Use of Broadband Tissue Equivalent Liquids for Specific Absorption Rate Measurements .................. 362
Mark G. Douglas, C-K. Chou

Electromagnetic Field Radiation of Mobile Phone Inside Metallic Enclosure ................................................................. 368
C. K. Tang, L. C. Fung, S. W. Leung

Testing Large Industrial Systems, Preparations and Techniques .................................................................................. 374
Kenneth L. Boston

SAR Measurements and Models

Relationship Between Temperature Elevation and Spatial Average SAR in Japanese Human Head Model Due to Dipole Antenna .................................................................................................................................. 380
Akimasa Hirata, Kazuyuki Shirai, Osamu Fujiwara

Numerical Prediction of SAR and Thermal Elevation in a 0.25-mm 3-D Model of the Human Eye Exposed to Handheld Transmitters ........................................................................................................ 385
Concettina Buccella, Valerio De Santis, Mauro Feliziani

Study of Using Fractional Spherical Phantom on SAR Evaluation ................................................................................. 391
K. H. Chan, S. W. Leung, W. K. Lam, Y. M. Siu

SA/SAR Analysis for UWB Pulse .................................................................................................................................. 395
Jianqing Wang

Poster Session 01 - PCB and IC EMC

Effectiveness of PCB Simulation in Teaching High-Speed Digital Design ................................................................. 400
Jianjian Song, Keith E. Hoover, Edward Wheeler

Transmission Line Attenuation-Impedance Realistic Corner Modeling by Scaled-Down Tolerance Boundary Scan ................................................................................................................................. 406
Zhaoqing Chen

Impact of Linear Regulator Topology on Integrated Circuit Emissions ......................................................................... 412
Kevin Lavery, Ricky Smith

Degree of Unbalance About Earth and Radiated Emission of Differential Type Microstrip Line in GHz Band ........ 416
Masahiro Shiota, Kiyotaka Matsumura, Chiharu Miyazaki, Masamitsu Tokuda

A Scalable Model of Board to FPC Interconnect Using Neural Networks ................................................................. 422
Hoon Hwangbo, Jongmin Kim, Minkyu Shim, Jongsung Lee, Hyungseok Lee, Byongsu Seol, Seunghoo Jung, Wansoo Nah

The Solutions of LCD Panel (T-Con) EMI Noise for Wireless Integration ................................................................. 429
Sung-Kyu Lee, Jung-man Lim, Ki-Seob Lee, On-Sik Choi, Bae-Won Lee, Do-Wan Kim, Masashi Hayakawa, Yoshio Kami

Comparative Analysis of Intel Pentium 4 and IEEE/EMC TC-9/AEM CPU Heat Sinks ........................................... 433
Junwei Lu, Xiao Duan

Chip Level EMI Approach for LCD TV Panels ............................................................................................................... 439
Do-Wan Kim, On-Sik Choi, Bae-Won Lee, In-Gu Kwak, Sung-Kyu Lee

A Study on the Reduction Method of the Magnetic Field Radiated from PCB Including Multi-Loops (n=2) 443
Atsuo Mutoh, Shuichi Nitta, Yuxin Yan
Table of Contents

Experimental Evaluation of Isolation Effect on Printed Circuit Board with Gapped Power Plane ........................................ 449
Yuichi Sasaki, Chiharu Miyazaki, Naoto Oka, Yoshihiko Konishi

Special Session - EMC History

Establishing EMC Education: The Ten-Year Contribution of the University Grant Program ........................................... 453
Thomas A. Jerse, Mark A. Steffka

A Historical Perspective of System-Level TDFD EME Simulation ................................................................. 457
R. A. Perala, G. J. Rigden, J. R. Elliott

EMC Absorbers through the Years with Respect to the New Site VSWR Validation Procedure in the Frequency Range from 1 to 18 GHz - a Practical Approach ......................................................... 461
Friedrich-Wilhelm Trautnitz

Fifty Years of EMC Research At Georgia Tech ........................................................................................................ 467
Hugh W. Denny

EMC of Integrated Circuits : A Historical Review ....................................................................................................... 474
E. Sicard, S. Ben Dhia, M. Ramdani, T. Hubing

Military Aircraft Electromagnetic Compatibility: Release to Service Testing in the United Kingdom, Past, Present and Future ........................................................................................................... 478
T. J. Duggan

Special Session - Power Integrity / Signal Integrity for Next Generation Systems Session
Chairs: Jun Fan, Jim Knighten, Zhiping Yang

Broadband Noise Suppression Using a Hybrid Photonic Crystal Power/Ground Plane Substrate ........................................ 485
Yi-Che Chen, Ting-Kuang Wang, Shao-Min Lan, Chi-Hsu Lu, Tzong-Lin Wu

Load Current Funneling Examination for Power Distribution in High Performance Multi-Core Silicon Devices ......................................................... 489
J. Ted DiBene II

Power Delivery for High Performance Processor Packages - Part I .............................................................................. 493
David M. Hockanson, J. Ted DiBene II

Multi-Gigabit I/O Link Circuit Design Challenges and Techniques ............................................................................. 499
Zuoguo Wu, Evelina Yeung, Peng Zou, Fenardi Thenus, J. Ted DiBene II

Early Time Charge Replenishment of the Power Delivery Network in Multi-Layer PCBs ................................................. 504

EMC Test Facilities and Antennas

A Critique on Traceability in Site Validation Measurements ............................................................................................ 510
Zhong Chen, Achim Enders

Extracting Useful Information from Radiated Emission Test Site NSA and VNSA Data Sets .......................................... 516
Ed Blankenship, David Arnett, Gary Town, Derick Skouby, Henry Benitez

Verification of an EMC Facility Retrofit by Time-Domain and Field Uniformity Measurements ..................................... 522
Dennis Camell, Robert T. Johnk, Ben N. Davis, Michael Taylor

Uncertainty Analysis and Novel Test Procedures Performed with a Realtime Time-Domain EMI Measurement System ...................................................................................................................... 527
Stephan Braun, Peter Russer
Table of Contents

Free-Space Antenna Factors through the Use of Time-Domain Signal Processing ........................................ 531
Dennis Camell, Robert T. Johnk, David Novotny, Chriss Grosvenor

Computational Electromagnetic Modeling I

An Extended-Hybrid-Method a Combination of MOM, GMT and UTD ........................................................ 536
Stefan Balling, Dirk Plettemeier, Karl-Heinz Gonschorek

Razor Blade Functions in the PEEC Method .................................................................................................. 542
Volker Vahrenholt, Heinz-Dietrich Brüns, Hermann Singer

Extended MagPEEC Model Including Dispersive Medium .......................................................................... 548
Xiao Zhang, Haibo Long, Wenhua Chen, Yaqin Chen, Zhenghe Feng

The Error Reduced ADI-CPML Method for EMC Simulation ....................................................................... 552
Iftikhar Ahmed, Er-Ping Li

Efficient 3D Simulation of Thin Conducting Layers of Arbitrary Thickness ............................................... 556
Göran Eriksson

Wide-Band Hybrid MM-PO Computational Electromagnetics Technique Using [Z] Matrix Interpolation and Adaptive Frequency Sampling .............................................................. 562
Artur Noga, Andrzej Karwowski

Printed Circuit Board EMC I

A Study on Correlation Between the PCB Layout and EMI from Chassis ...................................................... 566
Hiroki Funato, Takashi Suga

EMI Resulting from Interconnected Printed Circuit Boards by a Coaxial Cable ........................................... 571
Yoshiki Kayano, Hiroshi Inoue

Power and Ground Bounce Effects on Component Performance Based on Printed Circuit Board Edge Termination Methodologies ..................................................................................... 576
Mark I. Montrose, En-Xiao Liu

Analysis of Emission from Printed Circuit Board with a Conducting Wire Directed to Various Directions ...... 582
Masahiro Takashima, Teruo Tobana, Takayuki Sasamori, Kohshi Abe

Radiated Emissions from Proximity Coupled Oversized Heat-Sinks ............................................................. 588
Dheena Moongilan

Modeling & Measurement of Mutual Coupling Resulting from via Structures Within Printed Circuit Boards...... 594
Leigh Cornock, Ian Dilworth

Shielding

Shielding Specification Techniques and Measurement Methods for Aircraft ................................................. 599
William D. Prather

RF Electromagnetic Penetration of the Nasa Space Shuttle Endeavour Performed with an Ultra-Wideband System ..................................................................................................................... 605
Robert T. Johnk, David R. Novotny, Chriss A. Grosvenor, Nino Canales, Dennis G. Camell, Galen H. Koepke, Robert C. Scully

Engineering of Absorbing Gaskets Between Metal Plates ............................................................................. 611
Marina Y. Koledintseva, Sandeep K. R. Chandra, James L. Drewniak, James A. Lenn
# Table of Contents

**Protective Properties of a Generic Missile Enclosure to Different Electromagnetic Influences** ................................................................. 616  
*Sven Fisahn, Heyno Garbe, Frank Sabath*

**Rethinking Shielding Theory** ........................................................................................................................................................................ 622  
*David A. Larrabee*

**Electromagnetic Coupling Inside Enclosures with Closely Coupled Electric Monopoles and Conducting Planes** ................................. 628  
*Leonardo Sandrolini, Ugo Reggiani, David W. P. Thomas, Christos Christopoulos*

**System Level EMC**

**The Role of EMC Standards in Product Quality** ........................................................................................................................................ 634  
*Wayne A. Hunter*

**Electromagnetic Topology: a Modular Junction Approach for a System Level Interaction Problem** ......................................................... 640  
*Phumin Kirawanich, Justin Wilson, N. E. Islam, Christos Christodoulou, S. J. Yakura*

**A Hierarchical Model for Prescribing EMC Design Targets to the Components of a System** ................................................................. 647  
*Hirayr M. Kudyan*

**Design Philosophy for a Satellite with Extremely Low Radiated Emissions Requirements** ................................................................. 653  
*William R. Elkman, Gregory L. Tetterme, Steven R. Hungate*

**Reduction of Radiated Emission from PLC Systems by Studying Electrical Unbalance of the PLC Device and T-ISN** ................................................. 658  
*Naoto Oka, Mitsuhiko Kanda, Yoshihiko Konishi, Atsushi Morita, Masataka Kato, Shuichi Nitta*

**Simulation of an Indoor Power Cable Network for PLC Applications** ........................................................................................................ 663  
*Concettina Buccella, Valerio De Santis, Mauro Feliziani*

**Poster Session 02 - Power Line Communications, Safety and Biological Effects**

**Terminal Condition Dependency of Transmission Characteristics for High-speed Power Line Communication** ............................. 668  
*S. Sakuta, Y. Watanabe, M. Tokuda, T. Higuma*

**LCL Characteristics of Power Line for Power Line Communication Using Four Port Network Theory** ......................................................... 674  
*J. Karino, Y. Watanabe, A. Mori, M. Tokuda*

**Transmission Characteristics of an OFDM Signal for Power Line Communication System with High Bit Rate** ................................. 680  
*A. Mori, Y. Watanabe, M. Tokuda, K. Kawamoto*

**EMC Analysis of a Wind Turbine Blade’s Lightning Protection System** ........................................................................................................ 686  
*B. Lesvke, S. Krämer, J. Kindersberger, F. Puente León, J. Kirchhof, Y. Méndez Hernández*

**Evaluation of Genotoxic Potential of Microwave Electromagnetic Field in Onion (Allium Cepa)** ............................................................ 690  
*Mirta Tkalec, Zeljka Vidakovic-Cifrek, Branka Pevalek-Kozlina, Kresimir Malaric, Roman Malaric*

**Analysis on Propagation of Wideband EM Waves Emitted from Partial Discharge Using the Constrained Interpolation Profile (CIP) Method** ........................................................................................................ 694  
*Masatake Kawada, Katsuo Isaka*

**Special Session - Emerging EMC Technologies in Japan Session**

**Time-Domain Simulation of CMOS Output Buffer with LECCS-I/O Model and Time-Variant Linear Switches** .......................... 698  
*Takashi Hisakado, Atsushi Koyama, Osami Wada*
Table of Contents

Fast and Accurate Estimation of Radiated Emission from Printed Circuit Board Using Common-mode Antenna Model Based on Common-Mode Potential Distribution .......................................................... 702
Yoshitaka Toyota, Youhei Sakai, Makoto Torigoe, Ryuji Koga, Tetsushi Watanabe, Osami Wada

Electromagnetic Field Distribution Measurements Using an Optically Scanning Probe System .................. 708
Masanori Takahashi, Katsumi Kawasaki, Hiroyuki Ohba, Hiroyasu Ota, Tatsuru Orikasa, Kazushi Ishiyama, Nobuyasu Adachi, Ken Ichi Arai

Novel Metamaterial Based on the Concept of Autonomous Control System of Living Cell and its EMC Applications .......................................................... 714
Youji Kotsuka, Chikara Kawamura

New Radiated Immunity/Susceptibility Test Method Using Four-Septum TEM Cell: Measurements and Field Analysis ............................................................. 719
Kimitoshi Murano, Hiroko Kawahara, Majid Tayarani, Fengchao Xiao, Yoshio Kami

Methods of Evaluating Information Leakage from PC Displays .......................................................... 725
Toshihide Tosaka, Kaori Fukunaga, Yukio Yamanaka, Ryo Ishikawa, Mitsuo Hattori

Correlation Between Absorption Cross Section and Body Surface Area of Human for Far-Field Exposure at GHz Bands .......................................................... 729
Akimasa Hirata, Yoshio Nagaya, Fujiwara Osamu, Tomoaki Nagaoka, Soichi Watanabe

Signal Integrity III

Transmission Line Model for the Gapped Power Bus Structure .......................................................... 733
Joe Trinkle, Antonio Cantoni

Nonlinear Identification of Complex Systems Using Radial Basis Function Networks and Model Order Reduction .......................................................... 737

Fast Macromodel-based Signal Integrity Assessment for RF and Mixed-Signal Modules .......................................................... 743
S. Grivet-Talocia, P. Brenner, F. G. Canavero

Stripline Simulation Model with Tapered Cross Section and Conductor Surface Profile .......................................................... 749
A. Ciccomancini Scogna, M. Schauer

Improvements of Time-Domain Transmission Waveform in Serpentine Delay Line with Guard Traces .......................................................... 754
Guang-Hwa Shiue, Chia-Ying Chao, Wei-Da Guo, Ruey-Beei Wu

Multimodal Analysis of Guard Traces .......................................................... 759
Pablo Rodriguez-Cepeda, Miquel Ribó, Francisco-Javier Pajares, Joan-Ramon Reguér, Albert-Miquel Sánchez, Antonio Pérez

Singular Value Based Model Order Reduction for Interconnect ARX Modelling .......................................................... 764
Lj. Radić-Weissenfeld, C. Wiegand, C. Hedayat, W. Mathis, W. John

Computational Electromagnetic Modeling II

Fast FDTD Simulation Using Laguerre Polynomials in MNA Framework .......................................................... 769
K. Srinivasan, E. Engin, M. Swaminathan

Application of a Hierarchical SVD/ACA Compression Technique to Near-Field Calculations of Monopole Antennas .......................................................... 775
Miguel Astner, Heinz-D. Brüns, Guido Bürger, Hermann Singer

Efficient Evaluation of Equivalent-Principle Sources in MoM-FDTD Hybrid Method by Employing Spatial Interpolation and Adaptive Sampling .......................................................... 781
Tomasz Topa, Andrzej Karwowski

xxii
# Table of Contents

Near Field - Far Field Conversion Based on Genetic Algorithm for Predicting Radiation from PCBs ........................................ 785
     Hongmei Fan, Franz Schlagenhauffer

Use of Genetic Algorithms to Solve Inverse Scattering Problems a Contribution to the Experiment CONSENT onboard the Spacecraft Rosetta ................................................................. 791
     D. Plettemeier, S. Balling, D. Landmann, K.-H. Gonschorek

An Efficient Shielding Effectiveness Calculation (A Rectangular Enclosure with Numerous Square Apertures) .... 797
     Parisa Dehkhoda, Ahad Tavakoli, Rouzbeh Moini

TLM Simulation of RF Emissions and Confirmation of Results through Testing ................................................................. 801
     David Johns, Federico Centola, Boris Shusterman

Integrated Circuit EMC

Thermal Influence on 16-Bits Microcontroller Emission .......................................................................................... 805
     S. Ben Dhia, E. Sicard, Y. Mequignon, A. Boyer, J. M. Dienot

Comparison of Radiation from Two Microprocessor Test Packages ................................................................................. 809
     Xiaopeng Dong, Kevin Daniel, Kevin Slattery

Assessment of the DPI Standard for Immunity Simulation of Integrated Circuits .............................................................. 813
     Johan Loeckx, Georges Gielen

Efficiency of Embedded On-Chip EMI Protections to Continuous Harmonic and Fast Transient Pulses with Respect to Substrate Injection .................................................................................... 818
     Ali Alaeldine, Nicolas Lacrampe, Jean-Luc Levant, Richard Perdriau, Mohamed Ramdani, Fabrice Caignet, Marise Bafleur, Etienne Sicard, M'hamed Drissi

Investigation on ESD Transient Immunity of Integrated Circuits ....................................................................................... 823
     Nicolas Lacrampe, Ali Alaeldine, Fabrice Caignet, Richard Perdriau, Marise Bafleur, Nicolas Nolhier, Mohamed Ramdani

Latchup-Like Failure of Power-Rail ESD Clamp Circuits in CMOS Integrated Circuits Under System-Level ESD Test ................................................................................................................................. 828
     Ming-Dou Ker, Cheng-Cheng Yen

Printed Circuit Board EMC II

PPW Noise Mitigation in Multilayer PCBs by Means of Virtual Island And/or Array of Shorting Vias .................... 832
     A. Ciccomancini Scogna

Suppression Effect of Emission from Printed Circuit Board Using Conducting Plate ...................................................... 837
     Teruo Tobana, Takayuki Sasamori, Kohshi Abe

Numerical and Experimental Investigation of Power Supply Noise Decoupling Strategies on Single-Sided Printed Circuit Boards .................................................................................................................. 843
     Cyrus Rostamzadeh, Samuel Connor, Bruce Archambeault

Automotive EMC Measurements

Vehicle Active Antennas Face "EMC"- and "RF-Reception"-Challenges .............................................................................. 848
     Jean-Roger K. Kuvedu-Libla

Automotive EMC: Key Concepts for Immunity Testing ..................................................................................................... 854
     Heri Rakouth, Clare Cammin, Luke Comstock, Joseph Ruiz
Table of Contents

Development and Evaluation of a Realtime Time-Domain EMI Measurement System for Automotive Testing .......................... 861
Stephan Braun, Martin Aidam, Peter Russer

Improving Automotive Radiated Emissions Repeatability When Using Optic Link Bus Converters .............................. 865
Ferran Silva, Marc Aragon

Evaluation of Falling Time Restriction of ESD Immunity Test Current Waveform: The Result of IEC 61000-4-2 Round Robin Test in Japan ................................................................. 870
Masayuki Hirata, Takehiro Takahashi, Noboru Schibuya

The Effects of ESD in Multiple Testing Environments on Adhesive-Label RFID Tags ........................................ 874
C. Bauer-Reich, R. M. Nelson, D. Vaselaar

Experimental Investigation of the ESD Sensitivity of an 8-Bit Microcontroller .................................................. 880
Lijun Han, Jayong Koo, David Pommerenke, Daryl Beetner, Ross Carlton

Interference in Shielded Foil Twisted Pair (SFTP) Cables Due to ESD .......................................................... 886
Spartaco Caniggia, Francescaromana Maradei

Susceptibility of Electronic Devices to Variable Transient Spectra .......................................................... 891
Sven Korte, Heyno Garbe

Methodology for the HEMP Clearance of a Modern Air Fighter ........................................................................ 897
Frank Sabath, Anthony Wraight, Alfred Brenner, Chris C. Jones

Systematic Description of the Protection Capability of Protection Elements .................................................. 903
Roland Krzikalla, Jan Luiken ter Haseborg, Frank Sabath

Poster Session 03 - System EMC

EMC Management in a High Power Pulse Laser ................................................................. 907
J. Raimbourg

EMI Sub-System Emission Limits Based on Statistic Analysis ........................................................................ 912
Q. Yu, Z. Zhang

Development of Apparatus for Measuring Electromagnetic Shielding Effectiveness at GHz Frequency Band ................................................................. 918
Hwa Jong Kwon, Hyung Do Choi, Jae Ik Choi, Jong Gwan Yook

Analysis of Shielding Effectiveness of Rectangular Cavity with Apertures to ESD Radiated Field by Transmission Line Method ................................................................. 922
Liuping Wang

Distribution and Characteristic of the Disturbances in the Driving System of a Fuel Cell Bus ................................................................. 926
Bo Zhang, Jinhang He, Shaofeng Yu, Wei Li, Rong Zeng, Yong Huang, Jae-bok Lee, Sug-hun Chang

Electromagnetic Cross Coupling Between Ground Support Power Lines and Spacecraft Umbilical Cables ................. 931
J. C. Chai, E. Dressel, D. B. Taylor

Development of a Maritime Electronic Warfare and Sensor Systems EMI Mathematical Assessment Capability ................................................................. 936
Giuseppina Dall’ Armi-Stoks, Guy Morris, Annie Yau

Effective Technique for System Level Prediction of the Radiated Emissions of Electronic Devices and Cables inside Satellites from Unit Level Measurements ................................................................. 941
F. Saez de Adana, M. F. Cátedra, J. M. Gómez, R. Mittra
Table of Contents

Special Session - Electronic Packaging EMC and Signal Integrity Session  
Chairs: Erping Li, Joungho Kim

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise Isolation in LTCC-Based X/Ku-Band Transceiver SiP Using Double-Stacked Electromagnetic Bandgap Structure</td>
<td>946</td>
</tr>
<tr>
<td>Jongbae Park, Junchul Kim, Albert Chee W. Lu, Yujeong Shim, Joungho Kim</td>
<td></td>
</tr>
<tr>
<td>Design of UWB Transceiver SiP for Short Range Communication</td>
<td>952</td>
</tr>
<tr>
<td>Changwook Yoon, Hyeonjeong Park, Joungho Kim, Junwoo Lee, Youngjin Park</td>
<td></td>
</tr>
<tr>
<td>A Systematic Semi-Numerical Approach for Modeling of Signal and Power Integrity of Electronic Packages</td>
<td>958</td>
</tr>
<tr>
<td>Er-Ping Li, En-Xiao Liu, Zaw Zaw Oo, Xingchang Wei, Yaojiang Zhang, R. Vahldieck</td>
<td></td>
</tr>
<tr>
<td>Modeling of Signal and Power Integrity in System on Package Applications</td>
<td>964</td>
</tr>
<tr>
<td>Madhavan Swaminathan, A. Ege Engin</td>
<td></td>
</tr>
<tr>
<td>Accurate Characterization of Package and Board Components for Efficient System Level Signal Integrity Analysis</td>
<td>970</td>
</tr>
<tr>
<td>Ivan Ndip, Stephan Gutowski, Herbert Reichl</td>
<td></td>
</tr>
<tr>
<td>Modeling and Verification to Analyze Effect of Power/Ground Noises on CMOS Feedback Operational Amplifier</td>
<td>976</td>
</tr>
<tr>
<td>Yujeong Shim, Jongbae Park, Jongjoo Shim, Joungho Kim</td>
<td></td>
</tr>
</tbody>
</table>

Special Session - Algorithm and Techniques for Parallel Processing for EMI/EMC  
Session Chairs: Alan Roden, Albert Ruehli, Giulio Antonini

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parallel Implementations of the PEEC Method</td>
<td>983</td>
</tr>
<tr>
<td>Jonas Ekman, Peter Anttu</td>
<td></td>
</tr>
<tr>
<td>A Parallel Electromagnetic Simulation Approach for the Signal Integrity Analysis of IC Packages</td>
<td>989</td>
</tr>
<tr>
<td>Erion Gjonaj, Thomas Weiland, Irina Munteanu, Peter Thoma</td>
<td></td>
</tr>
<tr>
<td>Accelerated Integral Equation Solution Methods on Clusters and Multicore Processors Session Name: Algorithm and Techniques for Parallel Processing for EMI/EMC</td>
<td>994</td>
</tr>
<tr>
<td>Vikram Jandhyala, Xiren Wang</td>
<td></td>
</tr>
<tr>
<td>Waveform Relaxation for the Parallel Solution of Large PEEC Model Problems</td>
<td>999</td>
</tr>
<tr>
<td>Giulio Antonini, Jonas Ekman, Albert E. Ruehli</td>
<td></td>
</tr>
<tr>
<td>Stephen D. Gedney, Chong Luo, Bryan Guernsey, J. Alan Roden, Robert Crawford, Jeffrey A. Miller</td>
<td></td>
</tr>
<tr>
<td>An Efficient Implementation of Parallel FDTD</td>
<td>1008</td>
</tr>
<tr>
<td>Xiaoke Chen, Michael Cracraft, Yaojiang Zhang, Jianmin Zhang, James L. Drewniak, Bruce Archambeault, Samuel Connor</td>
<td></td>
</tr>
</tbody>
</table>

Reverberation Chamber Measurements I

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Properties of Fields in Reverberant Environments and its Implications</td>
<td>1013</td>
</tr>
<tr>
<td>Jose Perini, Patrick Perini</td>
<td></td>
</tr>
<tr>
<td>Comparison of Different Definitions of Field Strength Used in Reverberation Chamber Standards</td>
<td>1019</td>
</tr>
<tr>
<td>Luk R. Arnaut, Hans-Georg Krauthäuser, Magnus Höijer</td>
<td></td>
</tr>
<tr>
<td>Reverberation Chamber Calibration: Differences in Results When Using a Slot Instead of a Dipole Antenna</td>
<td>1024</td>
</tr>
<tr>
<td>Tobias Aurand, John F. Dawson, Andrew C. Marvin, Martin P. Robinson</td>
<td></td>
</tr>
</tbody>
</table>
Table of Contents

Enhanced Backscatter in a Reverberation Chamber: Inside Every Complex Problem is a Simple Solution
Struggling to Get Out ......................................................................................................................... 1028
John M. Ladbury, David A. Hill

Sensitivity Analysis of a Reverberation Chamber with Respect to Tuner Speeds .............................. 1033
Vignesh Rajamani, Charles F. Bunting, James C. West

Evaluation of Test Reproducibility of Calibration in Reverberation Chamber .................................. 1039
Jinliang He, Zhiyong Yuan, Rong Zeng, Shuiming Chen, Bo Zhang, Fan Wu

Printed Circuit Board Modeling

The Effects of Signal Trace’s Termination on Ground Bounce and Common-Mode Radiation ............ 1043
Eng-Kee Chua, Er-Ping Li, Kye-Yak See, Weng-Yew Chang

Capacitance of an Open Circuit Via Port .......................................................................................... 1048
Matthew Wood, Franz Schlagenhaufer

Coupling Analysis of PCB-Chassis Systems with Signal Lines and Via Structures using SPICE ........ 1054
Naoki Kobayashi, Ken Morishita, Manabu Kasumoto, Takashi Harada, Todd Hubing

High-Accuracy Emission Simulation Models for VLSI Chips including Package and Printed Circuit Board ...... 1060
Thomas Steinecke, Mehmet Goekcen, Dirk Hesidenz, Andreas Gstoettner

SPICE-Compatible Cavity and Transmission Line Model for Power Bus with Narrow Slots .............. 1066
Gang Feng, Yao Jiang Zhang, James L. Drewniak, Lin Zhang

Modelling of a Mixed Signal Processor Susceptibility to Near-Field Aggression .................................. 1071
A. Boyer, S. Bendhia, E. Sicard

EM Materials

Method of Measuring Permittivity of Composite Materials with Hexagonal Ferrite Inclusions .............. 1076
Alexander A. Kitaitsev, Gulnur N. Zhumabayeva, Marina Y. Koledintseva

A. Balzano, I. M. De Rosa, F. Sarasini, M. S. Sarto

Shielding Effectiveness of a Metamaterial Slab ................................................................................. 1088
Giampiero Lovat, Paolo Burghignoli

Development of Lightweight Solid Phantom Composed of Silicone Rubber and Carbon Nanotubes .......... 1093
Takashi Hikage, Yuki Sakaguchi, Tosho Nojima, Yuji Koyamashita

Broad Band Electromagnetic Absorption of Flexible Foils in the Microwave Range .......................... 1097
P. Görnert, P. Payer, O. Surzhenko, L. Michalowsky, H. Heegn, E. Madai, M. Langer

Resonance Suppression in Enclosures with a Metallic-Lossy Dielectric Layer by Means of Genetic Algorithms .......................................................................................................................... 1102
Antonio J. Lozano-Guerrero, Alejandro Diaz-Morcillo, Juan Vicente Balbastre-Tejedor

Shielding Performance Modeling

Numerical Modeling of Periodic Composite Media for Electromagnetic Shielding Application ............. 1107
Dagang Wu, Rui Qiang, Ji Chen, Ce Liu, Marina Koledintseva, James Drewniak, Bruce Archambeault

Modeling of the Reverberation Chamber Method for the Wire-mesh Shielding Performance Evaluation .......... 1112
Valter Mariani Primiani, Franco Moglie, Anna Pia Pastore, Sara Pistolesi
# Table of Contents

**Effects of Aperture Thickness on the Shielding Effectiveness of Metallic Enclosures** ................................................................. 1117  
*Rodolfo Araneo, Giampiero Lovat, Simone Paulotto*

**Evaluation of Frequency Characteristics of Absorbing Materials Using Time-Domain Single Antenna Method at Standard Site** ................................................................................................. 1123  
*Satoru Kurokawa, Masanobu Hirose, Koji Komiyama*

**Shielding Effectiveness of Rectangular Enclosures with Aperture Using Multiresolution Method of Moments** ............................. 1126  
*Fatemeh Hodjat, Rouzbeh Moini, Masood Shafiee*

**An Investigation on ILCMS for Coupling of Fields Into a Generic Missile Body through Apertures** ................................................. 1129  
*L. C. Chirwa, J. F. Dawson, M. P. Robinson*

**Poster Session 04 - EM Measurements**

**Low Cost Noise Sources** .................................................................................................................................................. 1132  
*Lukás Vojtech*

**3D Radiated Spurious Emission Test System** ............................................................................................................................... 1135  
*Guo Lin, Xiao Li, Wang Nan, Zhou Beiqi*

**Understanding and Selecting Antennas for Measuring in Congested Electromagnetic Environments** ........................................ 1139  
*Philip F. Keebler, Kermit O. Phipps*

**Investigation of Wave Propagation Using Smart Antenna for Indoor Wireless Communication** .................................................. 1145  
*Junwei Lu, Zhaohui Sun*

**Circuit Specifications for Radio-Noise Reduction Vehicle-mounted Communication Network: Specification Development using Inverse Calculation** ............................................................... 1150  
*Youichirou Suzuki, Noboru Maeda, Nobuyuki Iwasaki*

**Investigation of the Coupling Paths of a Galvanically Isolated AC/AC Converter** ........................................................................ 1156  
*Anne Roc’h, Dongsheng Zhao, Frank Leferink, Henk Polinder, Braham Ferreira*

**Using Nested Reverberation Chambers to Determine the Shielding Effectiveness of a Material: Getting Back to the Basics With a "Lei"-Person’s Approach** ...................................................... 1162  
*Jason B. Coder, John M. Ladbury, Christopher L. Holloway*

**Measurement of Shielding Effectiveness in the Microwave Frequency Range using a Dual Focus Flat Cavity** ............................... 1168  
*Toshihide Tosaka, Atsuhiro Nishikata, Kaori Fukunaga, Yukio Yamanaka*

**Special Session - Industry Standard Cables and Shielding Performance Session Chairs: Bruce Archambeault, Dana J. Bergey**

**EMI Design of Shielded Cable Assemblies** ............................................................................................................................... 1172  
*Jim Nadolny*

**Cable Shielding Test Methods: A Comparison of Different Test Methods** ..................................................................................... 1178  
*Joachim Mueller*

**The Shielding Performance of Industry Standard Cable Assemblies** .......................................................................................... 1184  
*Dana J. Bergey, Nathan Altland*

**EMI Emissions from mismatches in High Speed Differential Signal Traces and Cables** .............................................................. 1190  
*Bruce Archambeault, Joseph C. Diepenbrock, Samuel Connor*

**Predictive Modeling of the Effects of Skew and Imbalance on Radiated EMI from Cables** ........................................................... 1196  
*J. Chen, J. L. Drewniak, R. E. DuBrow, J. L. Knighten, J. Fan, J. Flavin*
# Table of Contents

Special Session - Advanced EMI Measurements Session  
Chairs: Hiroshi Yamane, H.R. Hofman

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigation of Radiated Emission Measurement Method above 1 GHz</td>
<td>1201</td>
</tr>
<tr>
<td>Chiharu Miyazaki, Yoichi Igarashi, Kiyoshi Endo, Shozo Satake, Jiro</td>
<td></td>
</tr>
<tr>
<td>Kawano</td>
<td></td>
</tr>
<tr>
<td>Development and Evaluation of a Prototype Multichannel APD Measuring</td>
<td>1206</td>
</tr>
<tr>
<td>Receiver</td>
<td></td>
</tr>
<tr>
<td>K. Gotoh, Y. Matsumoto, S. Ishigami, T. Shinozuka, M. Uchino</td>
<td></td>
</tr>
<tr>
<td>Adjacent Electromagnetic Field APD Measurement for Analyzing</td>
<td>1212</td>
</tr>
<tr>
<td>Autojamming Issue on Wireless Communication System</td>
<td></td>
</tr>
<tr>
<td>Satoshi Kazama, Hiroshi Tutagaya</td>
<td></td>
</tr>
<tr>
<td>Common Mode Voltage Evaluation for choosing Quiet MCU and</td>
<td>1218</td>
</tr>
<tr>
<td>Optimizing PCB Design: Electromagnetic Emissions Measurement for</td>
<td></td>
</tr>
<tr>
<td>Integrated Circuits</td>
<td></td>
</tr>
<tr>
<td>Atsushi Nakamura, Yuichi Mabuchi</td>
<td></td>
</tr>
<tr>
<td>Inter-laboratory Comparison Result as the Proficiency Testing Program</td>
<td></td>
</tr>
<tr>
<td>of EMI Test Sites in Japan</td>
<td>1224</td>
</tr>
<tr>
<td>Kunihiro Osabe, Rikio Watanabe, Atsuya Maeda, Masanori Yamaguchi</td>
<td></td>
</tr>
</tbody>
</table>

Reverberation Chamber Measurements II

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>An Investigation of the Shielding Performance of PCB-level Enclosures</td>
<td>1230</td>
</tr>
<tr>
<td>He Yuhui, Andy Marvin</td>
<td></td>
</tr>
<tr>
<td>Measuring the Shielding Effectiveness of Small Enclosures/Cavities</td>
<td>1236</td>
</tr>
<tr>
<td>C. L. Holloway, J. Ladbury, J. Coder, G. Koepke, D. A. Hill</td>
<td></td>
</tr>
<tr>
<td>Pulsed Power 3 GHz Feasibility Study for a 36.7 m³ Mode Stirred</td>
<td>1241</td>
</tr>
<tr>
<td>Reverberation Chamber ................................................................</td>
<td></td>
</tr>
<tr>
<td>Olof Lundén, Mats Bäckström</td>
<td></td>
</tr>
<tr>
<td>Hybrid Mode-Stirring Technique for Shielding Effectiveness</td>
<td>1247</td>
</tr>
<tr>
<td>Sandra Greco, Maria Sabrina Sarto</td>
<td></td>
</tr>
<tr>
<td>How to Avoid Unstirred High Frequency Components in Mode Stirred</td>
<td>1253</td>
</tr>
<tr>
<td>Reverberation Chambers</td>
<td></td>
</tr>
<tr>
<td>Olof Lundén, Mats Bäckström</td>
<td></td>
</tr>
</tbody>
</table>

Cables and Transmission Lines

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>On Eliminating Crosstalk in a Multiconductor Telecommunication Cable</td>
<td>1257</td>
</tr>
<tr>
<td>Sandrine Roblot, Ahmed Zeddam, Alain Reineix</td>
<td></td>
</tr>
<tr>
<td>A Study on Suppression of Crosstalk between Parallel Transmission</td>
<td>1263</td>
</tr>
<tr>
<td>Lines at High Frequency Band</td>
<td></td>
</tr>
<tr>
<td>Takashi Kasuga, Hiroshi Inoue</td>
<td></td>
</tr>
</tbody>
</table>

High-Voltage EMC

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corona Onset Voltage at High Frequency for an Isolated, Cylindrical</td>
<td>1269</td>
</tr>
<tr>
<td>Electrode</td>
<td></td>
</tr>
<tr>
<td>William O. Price, John Drapala, David V. Thiel, Robert G. Olsen</td>
<td></td>
</tr>
<tr>
<td>HPM Testing and Transmission Measurements on Optical Sensors</td>
<td>1273</td>
</tr>
<tr>
<td>Patrik Svensén</td>
<td></td>
</tr>
<tr>
<td>Comparative Study of Electrode Geometry Affects on Corona Onset and</td>
<td>1279</td>
</tr>
<tr>
<td>Schottky Diode Breakdown</td>
<td></td>
</tr>
<tr>
<td>Mark Barlow, Frank X. Li, Tom N. Oder, Salvatore Pansino</td>
<td></td>
</tr>
</tbody>
</table>
# Table of Contents

Computational Electromagnetic Modeling III

Analytical HF Model of a Low Voltage DC Motor Armature Including Parasitic Properties................................. 1284  
*Jens Benecke, Stefan Dickmann*

Simulation Analysis on EMI of ±800-kV UHVDC Converter Station ................................................................. 1288  
*Zhanqing Yu, Jintang He, Rong Zeng, Bo Zhang, Shuiming Chen, Hong Rao, Jie Zhao, Xiaolin Li, Qi Wang*

Simulation and Analysis of EMC Chambers by Ray Tracing Method ................................................................. 1293  
*Ming-Shing Lin, Jia-Ming Ji, Chung-Wei Hsu, Han-Chang Hsieh*

Reduced Order Modeling for Transient Analysis of Carbon Nanotubes Interconnects ........................................... 1297  
*G. Antonini, A. Orlandi*