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**Sixth International Conference on
Computational Electromagnetics
CEM 2006**

4 - 6 April 2006

Aachen, Germany

Organised by the VDE (German Association for Electric, Electronic and Information Technology), IEE Electromagnetics Professional Network jointly with the Antennas & Propagation PN and EMC PN and in association with the International Com-pumag Society.



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Professor Adel Razek
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Welcome

The 6th International Conference on Electromagnetics CEM 2006 takes place in Charlemagne's city, in Aachen, Germany on April 4 - 6, 2006. It is a carefully chosen place in the heart of Europe to bring again together the three communities of Electromagnetics, Antennas & Propagation and the colleagues from the EMC (Electromagnetic Compatibility) community. The attempt is to merge those groups to form a homogeneous society and of course that the delegates enjoy the relaxed atmosphere of the meeting and the nice facilities and ambience of the well equipped **** Dorint Novotel Hotel.

The main goal of this conference, "networking", is tried to achieve with emphasis on "interactive presentations" and the fact that no parallel sessions are organised. The idea behind the term "interactive presentation" is particularly based to stimulate the participants from the different areas of interest to follow up what is happening in the other scientific domain. Special introductory lectures introduce the particular scientific domain to the experts of the other disciplines. It is expected that this concept is bearing fruits, when synergetic effects between the three communities are inspired.

CEM 2006 will provide a forum for the presentation and discussion of research results from the various computational techniques nowadays available for solving problems in Electromagnetics.

The impressive scientific program of presentations coupled with enjoyable, informal social program and a location that will enable delegates to stay close to the meeting and facilitate interaction, makes CEM 2006 an event you should not miss.

Kay Hameyer
Chairman CEM 2006

Programme CEM 2006

Monday, April 3, 2006

16:00-18:30 **Registration**

17:30 **Welcome Reception**

Tuesday, April 4, 2006

8:00 **Registration**

8:45 **Conference Opening**

*K. Hameyer, RWTH Aachen University, Germany
(Conference Chairman)*

*J. Sykulski, University of Southampton, UK
(Chairman of IEE Professional Network)*

9:00 **Invited Lecture**

Numerical Methods for Static, Low-Frequency, High Frequency and Transient Applications

Th. Weiland, Technical University Darmstadt, Germany

**Technical Session I:
Methods and Techniques of CEM**

This session is dedicated to Professor Rolf Hanitsch, TU Berlin, Germany, to celebrate his 65th birthday and to acknowledge his scientific and educational contributions in the field of electrical machines

Chair: A. Razek, Laboratoire de Génie Electrique de Paris, France

Introductory Lectures

9:40 **Homogenisation**

A. Bossavit, Electricité de France, France

10:00 **Finite Element Discretization of Electromagnetic Problems**

F. Rapetti, Université de Nice et Sophia-Antipolis, France

10:20 **Meshless Methods Applied to Electromagnetics**

D. Rodger, University of Bath, UK

10:40 **Coffee and Exhibition Viewing**

11:00 **Interactive Presentations**

Paper ID 3 **Integral Equations Formulations to Linear Array Slots Antennas**

A. A. Mohammed , Ministry of Sciences and Technology, Baghdad; Z. A. Ahmed, Basrah University, Basrah; A. H. Abood, Basrah University, Missan, Iraq

6 **A Sliding Surface Technique Incorporating Radial Basis Functions for Movement Simulation in 2-D Models of Rotating Machines**

M. Jagiela, Technical University of Opole, Poland; J. Bumby, P. Tavner, University of Durham, UK

7 **Optimisation of a Multilevel Fast Multipole Code for the Modelling of Installed Antennas on Large Complex Platforms**

S. P. Benham, J. M. Burbage, T. J. Murphy, SELEX Communications Ltd., UK; J. A. Lord, BAE Systems, UK

16 **Future Challenges within Numerical Field Calculation in Industrial Machine Development in the Power Range from 200 kW to 2000 MW**

O. Drubel, Siemens AG, Nürnberg, Germany

22 **Waveguide Propagation Modes and Quadratic Eigenvalue Problems**

A. Nicolet, Université Paul Cézanne, Marseille, France; C. Geuzaine, Case Western Reserve University, Cleveland, USA

34 **Parallel Computations of 3 D Models of an Electromagnetic Device**

J. Kolota, S. Tepien, G. Szymanski, J. Wencel, Poznan University of Technology, Poland

37 **Geometrical Localization of the Degrees of Freedom for Whitney Elements of Higher Order**

F. Rapetti, Université de Nice et Sophia-Antipolis, France

- Paper ID 39 **Metamaterials, a Challenge for Homogenization Theory**
A. Bossavit, LGEP, Gif-sur-Yvette, France
- 52 **Parallel Computing for Eddy Current Testing Simulation**
L. Santandrea, G. Savel, Y. Le Bihan, A. Razek, Laboratoire de Génie Electrique de Paris, France
- 54 **Maxwell's Equations in Accelerated Frames - How do they relate to Computational Electromagnetics**
S. Kurz, Robert Bosch GmbH, Frankfurt; B. Flemisch, B. Wohlmuth, University of Stuttgart, Germany
- 57 **Monostatic RCS Computation of Reflector Antennas Using Parabolic Equation**
A.R. Mallazadeh, M. Soleimani, Iran University of Science and Technology; J. Rashed-Mohassel, University of Tehran, Iran
- 58 **Application of Fast Multipole Method to Biot-Savart Law Computations**
W. Hafila, A. Buchau, W. M. Rucker, University of Stuttgart, Germany
- 61 **Multipoint Arnoldi Model Order Reduction for Electromagnetic Wave Scattering Computation**
P. Bradley, C. Brennan, Dublin City University, Ireland
- 62 **A Reduced Forward Operator for Electromagnetic Wave Scattering Problems**
K. Van Dongen, W. Wright, University College Cork; C. Brennan, Dublin City University, Ireland
- 75 **Embedded Runge-Kutta Methods for the Numerical Solution of an Integrated Model including Converter, Nonlinear Inductance and Current Control Loop**
K. Geldhof, T. Vyncke, F. De Belie, L. Vandeveldel, J. Melkebeek, Ghent University, Belgium
- 89 **The Electromagnetic Field Evolution within an Ellipsoid Shell**
I. Tuleasca, The Open Polytechnic of New Zealand; D. Kacorzak, The University of Auckland, New Zealand

- Paper ID 99 **General Approach for Homogenisation of Multi-turn Windings in Three-dimensional Finite Element Models**
J. Gyselinck, Université Libre de Bruxelles; R. Sabariego, P. Dular, Université de Liège, Belgium
- 102 **An Optimized Electromagnetic 3D Field Solver for Frequencies below the First Resonance**
B. Doliwa, H. De Gersem, T. Weiland, Technical University of Darmstadt, Germany; T. Boonen, Katholieke Universiteit Leuven, Belgium
- 103 **A Perturbation Technique for the Finite Element Modelling of Differential Probes in Nondestructive Eddy Current Testing**
R. Sabariego, P. Dular, University of Liège, Belgium
- 104 **Meshless Radial Basis Functions**
S. Viana, D. Rodger, H. Cheng Lai, University of Bath, UK
- 12:30 **Lunch and Exhibition Viewing**
- Technical Session II: Finite Elements, Boundary Elements and related Techniques**
Chair: O. Drubel, Siemens AG, Nürnberg, Germany
- Introductory Lectures**
- 14:00 **FE Modelling of Wave Guides**
A. Nicolet, Université Paul Cézanne, Marseille, France
- 14:20 **Utilisation of Incidences Matrixes to Formalize Electromagnetic Problems with Imposed Global Quantities**
F. Piriou, USTL, Villeneuve d'Ascq, France
- 14:40 **Modelling of Higher Harmonics in Quasistatic Models**
H. De Gersem, Technical University of Darmstadt, Germany
- 15:00 **Coffee and Exhibition Viewing**

- Paper ID 13 **Determination of the 3D-interaction between HTSC and Magnetic Field**
R. Palka, Technical University of Szczecin, Poland
- 14 **Impedance Evaluation of Integrated Circular Spiral Inductors**
M. Andrade Martins, L. Gomes Oiveira, V. Maló Macahdo, Universidade Técnica de Lisboa, Portugal
- 15 **Modelling Printed Circuit Antennas by Boundary Method**
N. El Alami, ECIME, Cergy-Pontoise; B. Kebaili, B. Bandelier, F. Rioux-Damidau, Université Paris, France
- 20 **A Hybrid Picard-Newton Acceleration Scheme for Non-Linear Time-Harmonic Problems**
H. Vande Sande, Atlas Copco Airpower, Wilrijk; T. Boonen, KU Leuven, Belgium; H. De Gersem, Technical University of Darmstadt, F. Henrotte, K. Hameyer, RWTH Aachen, Germany
- 24 **Surface Wave Impedance Modelling with 2D Finite Elements**
J. Simpson, BAE Systems, Bristol, UK
- 25 **Teaching and Learning the Finite-Element Method - Experiences with a Diverse Graduate Student Body**
A. Muetze, University of Wisconsin-Madison, USA; K. Hameyer, RWTH Aachen, Germany
- 40 **Time and Frequency Domain Modelling of a Normally Incident Plane Wave at a Periodic Structure**
Y. Cai, C. Mias, Warwick University, UK
- 53 **Adaptive Mesh Refinement for Eddy Current Testing Finite Element Computations**
L. Santandrea, Y. Choua, Y. Le Bihan, C. Marchand, Laboratoire de Génie Electrique de Paris, France

- Paper ID 60 **Numerical Analysis of the Contribution of Magnetic Forces and Magnetostriction to the Vibrations in Induction Machines**
T. Hilgert, L. Vandeveldde, J. Melkeebek, Ghent University, Belgium
- 67 **Hierarchical Basis Functions and Efficient Multilevel Solvers**
P. Ingelström, V. Hill, R. Dyczij-Edlinger, University of Saarland, Saarbrücken, Germany
- 68 **Multi-Slice Finite Element Analysis of Induction Motor**
M. Baranski, Poznan University of Technology, Poland
- 70 **Scattering from the PEC Flat Strip by using the Method of Moments with SINC Type Basis Functions**
F. Kuyucuoglu, Z. Cay, Ege University; T. Oguzer, Dokuz Eylül University, Turkey
- 74 **Finite Element Analysis of Helicoidal Waveguides**
A. Nicolet, Université Paul Cézanne, Marseille; F. Zolla, Université de Provence, Marseille, France
- 80 **Visualising Finite Element Solution in Virtual Reality Environments**
M. Schöning, M. Asbach, D. van Riesen, K. Hameyer, RWTH Aachen University, Germany
- 82 **A New 3-D FE Procedure for the Analysis of TWT Gridded Electron Guns**
S. Coco, A. Laudani, G. Pollicino, University of Catania, Italy
- 83 **3-D Steady-State Electrodiffusion Model of Ionic Channels**
S. Coco, A. Laudani, G. Pollicino, University of Catania, Italy
- 87 **PM Generator No-Load Additional Loss Calculation Using FE Models with an Equivalent Current Layer**
X. Cui, B. Funieru, A. Binder, Technical University of Darmstadt, Germany

- Paper ID 90 **Implementation of Finite Element Method Modelling Tools in Education Programs**
D. Kacprzak, The University of Auckland, New Zealand
- 92 **Finite-Element Simulation of the Common-Mode Flux in Inverted-Fed Induction Machines**
H. De Gersem, T. Weiland, A. Binder; Technical University of Darmstadt, Germany; A. Muetze, University of Wisconsin-Madison, USA
- 97 **Calculation of Global Quantities Using Incidence Matrixes in the A-Formulation**
T. Henneron, S. Clenet, ENSAM, Lille Cedex; F. Piriou, USTL, Villeneuve d'Ascq, France
- 101 **Hybrid Finite-Element Method for Discretizing Cylindrically Symmetric Parts in Electrotechnical Models**
H. De Gersem, S. Koch, T. Weiland, Technical University of Darmstadt, Germany
- 17:00 **Close day 1**

Wednesday, April 5, 2006

Technical Session III: Optimisation and Coupled Problems

Chair: J. Sykulski, University of Southampton, UK

Introductory Lectures

- 9:00 **Sensitivity Analysis in Optimisation**
D. Lowther, McGill University, Montreal, Canada
- 9:20 **Coupled Problems: Maxwell, Mixed Formulations and Multiphysics**
M. Clemens, Helmut-Schmidt-University, Hamburg, Germany
- 9:40 **General Overview of Surrogate Modeling Techniques for Optimization in Electromagnetics**
G. Hawe, University of Southampton, UK
- 10:00 **Coffee and Exhibition Viewing**

10:30 Interactive Presentations

- Paper ID 5 **Voltage Amplitude Control of Electromagnetic Levitation Device**
S. Stepień, G. Szymanski, Poznan University of Technology, Poznan, Poland
- 17 **The Consideration of Surrogate Model Accuracy in Single-Objective Electromagnetic Design Optimization**
G. I. Hawe, J. K. Sykulski, University of Southampton, UK
- 21 **3D Coupled Field - Circuit Analysis of Non-linear System**
J. Smykowski, National University for Professional Education; S. Stepień, G. Szymanski, Poznan University of Technology, Poland
- 26 **An Optimization Framework Using Adaptive Kriging Method and Restricted Evolution Strategy**
H.-K. Kim, Korea Electrotechnology Research Institute, South Korea; D. A. Lowther, McGill University, Montreal, Canada
- 28 **Comparative Study between Kriging and Genetic Algorithms for Optimal Transmitter Location in an Indoor Environment using Transmission Line Modelling Method**
A. Dalla Rosa, A. Raizer, Universidade Federal de Santa Catarina, Brazil; L. Pichon, Laboratoire de Génie Electrique de Paris, France
- 33 **Nash Equilibrium and Pareto Front for the Optimal Shape Design in Electromechanics**
P. Di Barba, University of Pavia, Italy
- 38 **Mixed-Integer Simulation-Based Optimization for a Superconductive Magnet Design**
T. Hemker, M. Glocker, O. von Stryk, H. De Gersem, T. Weiland, Technical University of Darmstadt, Germany
- 46 **Genetic Algorithm with PDSS and Adaptive Parameters for Phased Array Synthesis**
S. Cooney Ekpo, E.-O. Ekpo, A. A. Sunday, Don Manuel & Associates, Nigeria

- Paper ID 51 **Application of Evolutionary Algorithms for Optimisation of Electric Machines**
M. Dabrowski, Poznan University of Technology; A. Rudenski, Institute of Electrical Engineering, Warsaw, Poland
- 63 **Analysis of Coupled Phenomena in Magnetorheological Clutch**
C. Jedryczka, R. Wojciechowski, Poznan University of Technology, Poland
- 64 **Design Optimisation of Electromagnetic Devices using Continuum Design Sensitivity Analysis Combined with Commercial EM Software**
D.-H. Kim, Kyungpook National University, South Korea; J. Sykulski, University of Southampton, UK; D. Lowther, McGill University, Montreal, Canada
- 66 **Coupled Thermal-Electroquasistatic 3D Field Simulation of High-Voltage Surge Arrester Structures**
M. Clemens, T. Steinmetz, D. Weida, Helmut-Schmidt-University, Hamburg; V. Hinrichsen, Technical University of Darmstadt, Germany
- 69 **Precise Reconstruction of the Interface between two Conducting Fluids in a Simple Cylindrical Model**
M. Kuilekov, H. Brauer, M. Ziolkowski, Ilmenau University of Technology, Germany
- 72 **Dynamic Analysis of Highly Saturated Switched Reluctance Motors using Coupled Magnetic Equivalent Circuit and the Analytical Solution**
H. Gholizad, M. Mirsalim, M. Mirzayee, Amirkabir University of Technology, Tehran, Iran
- 81 **Fast Structure-Dynamic Simulation of Electrical Machines Using 2D-3D-Coupling**
C. Schlensok, D. Van Riesen, D. Seibert, K. Hameyer, RWTH Aachen University, Germany
- 85 **Applying Corba Technology to solve a Magnetostriction Problem**
L. Santandrea, K. Azoum, A. Razek, Laboratoire de Génie Electrique de Paris; G. Grasseau, D. Girou, IDRIS, France

- Paper ID 86 **Using FEM for Power Transformer Electromagnetic and Thermal Analysis**
J. da Silva, J. Bastos, N. Sadowski, Universidade Federal de Santa Catarina, Brazil

- 100 **Derivative Free Optimization Algorithms in the Electrical Machine Design**
L. Barbosa, L. Lebensztajn, Applied Electromagnetics Laboratory, Brazil

12:30 **Lunch and Exhibition Viewing**

14:00 **Panel Session: Challenges of the Future**

Chair: I. McDiarmid, BAE Systems, Bristol, UK

"CHALLENGES OF THE FUTURE"

The ability to perform useful analysis of practical electromagnetic systems has rapidly grown in the last twenty years. It is now practical to capture non-canonical geometry and more or less automatically mesh the problem into more than 100 million cells and perform an analysis on that problem. The majority of the growth in the capability has been as a result of affordable, powerful computing which can tackle problems such that a business benefit can be achieved which can return the investment in the machine and the team that use it. In addition, the universal adoption of computer aided design (CAD) systems coupled with interfaces with analysis packages has enabled the analysis of geometries that were previously impractical and uneconomic to accurately analyse.

Despite these developments, the adoption of computational electromagnetics (CEM) in industry has been slower than computational analysis in other disciplines, or in fact the growth in the capability to perform useful analysis. A number of factors could be responsible for this and these are some of the most urgent challenges faced. These include, in broad terms Cost, Accuracy, Verification, Post processing, Education and Benefits.

The outline above summarises some of the challenges, as perceived from an industrial perspective, facing the field of CEM. There are many

others, however, wide market adoption of CEM will not occur unless at least those above are addressed. The panel session will explore these issues and others as well.

15:00 **Coffee and Exhibition Viewing**

Technical Session IV: Applications of CEM

Chair: E. M. Davenport, BAE Systems, Bristol, UK

Introductory Lectures

- 15:20 **Finite Element Modelling of Eddy Current Fields**
O. Biro, Graz University of Technology, Austria
- 15:40 **Issues of Material Modelling in Computational Electromagnetics**
H. Vande Sande, Atlas Copco Airpower, Wilrijk, Belgium
- 16:00 **Challenge of Parasitic Extraction in Nano-Scale IC Design**
Z. Ren, Mentor Graphics, San Jose, USA

16:20 **Interactive Presentations**

- Paper ID 4 **Finite Element Analysis of Electromagnetic Field and Losses in a Turbogenerator Rotor**
M. G. Pantelyat, N. G. Shulzhenko, National Academy of Sciences of Ukraine, Kharkov, Ukraine
- 9 **High-Accuracy Target Range Estimation for HF Chirp Radars**
H. Zhou, B. Wen, S. Wu, Z. Ma, Wuhan University, Wuhan, China
- 10 **Integral Parameters Determination in the Magnetic Bearing using Finite Element Method**
B. Tomczuk, J. Zimon, Technical University of Opole; K. Zakrzewski; Technical University of Lodz, Poland

- Paper ID 18 **Magnetic Stimulation Prototype with Selective Technical Characteristics for long Bones Fractures Consolidation**
M. E. Moncada, C. R. Pinedo, H. Cadavid, A. Martinez, Universidad del Valle, Colombia; C. A. F. Sartori, Universidade de Sao Paulo, Brazil
- 27 **Computation of Parasitic Capacitances of an IC Cell in Accounting for Lithography Effect**
Z. Ren, W. Zhang, J. Falbo, Mentor Graphics, San Jose, USA
- 30 **Voltage Driven Finite Element Analysis of a Plunger Core Reactor with Parallel Winding Paths**
E. Schmidt, Vienna University of Technology; P. Hamberger, VA Tech EBG Transformatoren, Linz, Austria
- 31 **Dual Layer Electromagnetically Coupled, Stacked Rectangular Microstrip Patch Antenna**
M. A. Matin, B. S. Sharif, C. C. Tsimenidis, University of Newcastle, UK
- 35 **Impedance Calculation for Die-Cast Rotors**
M. Centner, R. Hanitsch, Technical University of Berlin, Germany
- 36 **Computational Technique for Modelling of Frequency Converters and Analysis of Generated Waveforms**
J. Sagarduy Ochoa de Erife, A. J. Moses, F. J. Anayi, Wolfson Centre for Magnetics, Cardiff; J. Clare, P. W. Wheeler, University of Nottingham, UK
- 42 **Permanent Magnet Levitation Stabilized by Diamagnetic Materials: a Case-Study**
E. Cazacu, Polytechnics University Bucharest, Romania
- 45 **Design of Transverse Flux Machines Using Analytical and Numerical Computing Methods**
N. Parspour, B. Orlik, University of Bremen, Germany

- Paper ID 50 **Determination of Exploitation Parameters of Permanent Magnet Synchronous Machine following the Finite Element Solutions**
P. Witczak, B. Wawrzyniak, Technical University of Lodz, Poland
- 59 **Prediction of Magnetizing Current Waveform in a Single Phase Power Transformer under DC Bias**
O. Biro, S. Außerhofer, K. Preis, Technical University of Graz; G. Buchgraber, W. Seitlinger, VA Tech Elin Transformatoren, Austria
- 71 **Determination of Magnetic Field Changes in Single-Phase Shaded Pole Induction Motors due to Slotting of the Rotor**
K. Makowski, Wroclaw University of Technology, Poland
- 72 **Dynamic Analysis of Highly Saturated Switched Reluctance Motors using Coupled Magnetic Equivalent Circuit and the Analytical Solution**
H. Gholizad, M. Mirsalim, M. Mirzayee, Amirkabir University of Technology, Tehran, Iran
- 91 **FE-Based Physical Phase Variable Model of PM Synchronous Machines with Stator Winding Short Circuit Fault**
O. Mohammed, S. Liu, Z. Liu, Florida International University, Miami, USA
- 93 **Brushless DC Motor for Battery-electric Trucks**
B. Slusarek, Tele&Radio Research Institute Warsaw; W. Szelag, Technical University of Poznan, Poland
- 94 **Combined 3D Numerical and Analytical Computation for Analysis and Design of High Speed Solid Iron Rotor Induction Machines**
M. Mirzayee, M. Mirslaim, H. Gholizad, S. Javadi Arani, Amirkabir University of Technology, Tehran, Iran
- 98 **Design of an Outer-Rotor Permanent-Magnet Brushless DC Motor for Light Traction through Transient Finite Element Analysis**
X. López-Fernández, University of Vigo, Spain; J. Gyselinck, Université Libre de Bruxelles, Belgium

17:50 **Close day 2**

19:30 **Conference Dinner at Aachener Brauhaus**

Thursday, April 6, 2006

9:00 **Invited Lecture**

High Performance Computing, State of the Art and its Limitations
Ch. Bischof, RWTH Aachen University, Germany

**Technical Session V:
Finite Differences and TLM Techniques**

Chair: J. Flint, Loughborough University, UK

**Technical Session VI:
Bio-Electromagnetics and EMC**

Chair: St. Porter, University of York, UK

Introductory Lectures

9:40 **FDTD Basics and Simulations of PCBs**
K. Hollaus, Graz University of Technology, Austria

10:00 **Modelling Challenges in Bio-Electromagnetics**
U. van Rienen, University of Rostock, Germany

10:20 **CEM in the Automotive Industry: Applications and Challenges**
A. Ruddle, MIRA, Warwickshire, UK

10:40 **Coffee and Exhibition Viewing**

11:00 **Interactive Presentations Sessions V & VI**

Paper ID 8 **Analyzing Induced Voltage inside a LPS**
F. Zago, H. M. Mesa, J. F. Pissolato, State University of Campinas; G. P. Caixeta, Sao Francisco University, Brazil

11 **A TLM Approach to Analyze Grounding Grids**
H. Marin Mesa, F. Zago, J. Pissolato Filho, G.P. Caixeta, Cidade Universitário Zeferino Vaz, Brazil

- Paper ID 32 **Local Discretisation in 3D Electromagnetic Fields Calculation Using FDM Method**
A. Turkot, Poznan University of Technology, Poland
- 43 **Validation of Predicted 3D Field Distributions due to Vehicle-Mounted Antennas against Measured 2D Field Mapping**
A. Ruddle, MIRA, Warwickshire, UK
- 48 **Low Frequency Surface Impedance Modelling of the Earth**
D. V. Thiel, Y. O'Keefe, Griffith University, Australia
- 56 **FDTD Method Applied to Radar Testing of Concrete Structures**
L. Travassos, C. Vollaire, A. Nicolas, Ecole Centrale Lyon, France
- 77 **Winding Modelling Including Eddy Currents and Capacitances**
M. Klocke, University of Dortmund, Germany
- 84 **Comparison of FETD and FDTD to Simulate Micro-Strip Structures on PCBs**
K. Hollaus, O. Bíró, G. Matzenauer, K. Preis, C. Stockreiter, B. Weiß, Graz University of Technology, Austria
- 12 **Computational Electromagnetics: "Plenty of Room at the Bottom"**
I. Tsukermann, F. Cajko, J. Dai, The University of Akron, USA
- 1 **The Virtual Conductor**
I. Darney, J. S. Chinn Project Engineering Ltd., Bristol, UK
- 19 **Full-wave Simulation of a Vehicle Test in a Reverberation-chamber**
M. B. Perotoni, UNIFEO, Osasco; C. Sartori, J. Cardoso, Escola Politécnica da Universidade, Sao Paulo, Brazil

- Paper ID 23 **Improved Prediction of the Fields Induced in the Brain During Transcranial Magnetic Stimulation by the Incorporation of more Realistic Head Models**
D.-H. Kim, Kyungpook National University; C. Won, Kyungil University, South Korea; G. E. Georgiou, University of Southampton, UK
- 29 **On the Truncation of the Numerical SAM Phantom used in Mobile Phone Antenna Simulations**
A. Arkko, Nokia, Tampere, Finland
- 65 **Modelling of the Electric Potential Distribution in a Thorax Phantom for Electrical Impedance Tomography Using the Finite Element Method**
H. Luepschen, M. Steffen, S. Leonhardt, D. van Riesen, F. Henrotte, K. Hameyer, RWTH Aachen, Germany
- 73 **Verification of Magnetic Field Tomography Inverse Problem Solutions using Physical Phantoms**
H. Brauer, J. Haueisen, M. Ziolkowski, Technical University of Ilmenau, Germany
- 79 **Numerical Analysis of Electromagnetic Emission from Lighting Implement**
T. Morita, K. Hirata, University of Osaka; Y. Namba, Matsushita Electric Works Analysis Center, Japan
- 88 **Characterization of Electrodes for Deep Brain Stimulation**
U. Schreiber, U. Gimsa, U. van Rienen, University of Rostock, Germany
- 96 **Numerical Algorithm for the Accurate Evaluation of the Induced Voltages in a Pipeline**
D. Doru Micu, D. Micu, A. Ceclan, L. Cret, Technical University of Cluj-Napoca, Romania
- 12:30 **Closing of the conference**

Lunch

GENERAL INFORMATION

CEM 2006 CONFERENCE SECRETARIAT

For detailed information on CEM 2006 please contact:

VDE-Conference Services
Stresemannallee 15
60596 Frankfurt
Germany

Phone: +49-(0)69-63 08- 229/ -275
Fax: +49-(0)69-96 31-5213
E-mail: vde-conferences@vde.com
URL: www.vde.com

CEM 2006 CONFERENCE WEB SITE

A homepage presenting the latest information related to the conference can be found at: www.vde.com/cem2006

REGISTRATION FEES

		Registration after March 4, 2006
Member* (VDE, IEE, ICS) / Author	<input type="checkbox"/> EUR 590,--	<input type="checkbox"/> EUR 690,--
Non-member	<input type="checkbox"/> EUR 690,--	<input type="checkbox"/> EUR 790,--
Student * *	<input type="checkbox"/> EUR 450,--	<input type="checkbox"/> EUR 500,--
(excluding proceedings, including CD-ROM)		
Accompanying Person	<input type="checkbox"/> EUR 50,--	<input type="checkbox"/> EUR 50,--
(participation in social events only)		

* Participants applying for the membership fee must include a copy of their membership card to the registration form.

** A copy of the student's certification card has to be endorsed by a supervisor or head of department and must be included to the registration form.

Regular Conference Registration and Student Registration

Includes admission to all plenary and technical sessions and to the daily luncheons, the CEM 2006 welcome reception at the conference hotel, and the conference dinner on April 5 at the "Aachener Brauhaus ", Kapuzinergraben 4, one copy of the proceedings and a CD-ROM, except for the students who will receive a CD-ROM containing the accepted papers.

Additional Copy of the Proceedings

Additional copies may be purchased on-site on availability or ordered with the registration form.

Accompanying Persons

Accompanying persons may register in conjunction with a full delegate. The fee includes admission to the Welcome Reception on April 4, 2006 and the Conference Dinner on April 5, 2006, but not to the technical sessions.

REGISTRATION

To register for CEM 2006 please fill in the registration form attached to this programme and return it to the Conference Secretariat. To enjoy the "early-bird-discount", the CEM 2006 Secretariat must receive the form before March 4, 2006. Full payment by credit card information must accompany all registrations in order to be accepted. Completed registration forms may be sent by fax, surface mail or e-mail. For questions about the conference please contact the CEM 2006 Conference Secretariat at

VDE-Conference Services
Phone: +49-(0)69-63 08- 229/ -275
Fax: +49-(0)69-96 31-5213
E-mail: vde-conferences@vde.com

REGISTRATION ON-SITE

The registration desk on site will be open at the following office hours:

Monday, April 3	16.00 h - 18.30 h
Tuesday, April 4	07.00 h - 17.00 h
Wednesday, April 5	08.00 h - 18.00 h
Thursday, April 6	08.00 h - 13.00 h

BADGES

Delegates will receive badges for the conference showing their name, company and registration number. All participants are kindly requested to wear their badge throughout the conference, even at social events. **Lost badges will not be replaced. A new registration is mandatory.**

PAYMENT

Payment for registration, including bank charges and processing fees, must be made in Euro. The conference fee has to be fully paid in advance. **Confirmation of registration will be sent after full payment has been received at the VDE-Conference Services.**

The following **methods of payment** are accepted:

- **Cheque in EURO** (€) payable to VDE and sent together with the registration form by mail. Checks must be drawn on German based banks, otherwise a fee of (EURO) € 20.-- must be added.
- By **credit card authorisation** as per registration form. The 16 digit card number, expiry date, security No. (last 3 or 4 digits on rear side of credit card) and holder's name must be indicated on the registration form. **Signature of the card holder is mandatory.**
- **Cash payment on-site** in EURO (€)

CANCELLATION

In case of cancellation, provided that written notice is received at the VDE-Conference Services before March 4, 2006, the registration fee will be fully refunded less a handling fee of Euro 60.--. After March 4, 2006 no refund will be made. Proceedings and CD-ROM will then be sent to the registrant after the conference. Your registration may be transferred to another person free of charge.

PROCEEDINGS

All papers accepted for presentation at the conference will be published in the proceedings and on a CD-ROM. The proceedings will be handed out on-site to all delegates attending the event.

Additional proceedings and CD-ROM are on sale during the conference (upon availability) at Euro 70.--.

HOTEL RESERVATION

Reservations may be made in the Dorint Novotel Aachen City (Conference Hotel) where a limited block reservation of rooms has been made. Rooms may be booked individually for 95,- EURO per room/night incl. breakfast.

Please contact:
Dorint Novotel
Petersstraße 66
52062 Aachen
Germany

Phone: +49(0)241-5159-100
Fax: +49(0)241-5159-599
E-Mail: h3557re@accor.com
Keyword: **VDE** (must be included in your request)

Delegates are responsible for all financial obligations arising from reservations made on their behalf, including charges for cancellation or no-show.

Deadline for Accomodation

Early registration preferably before February 18, 2005 at any hotel is recommended due to simultaneous events being held in Aachen at that time.

Accomodation in other hotels may be booked via the official Aachen Tourist Service **www.aachen-tourist.de**

Phone: +49 - (0) 241 - 18029-51
Fax: +49 - (0) 241 - 18029-30
E-mail: info@aachen-tourist.de

VENUE

CEM 2006 takes place at Dorint Novotel Aachen City, a 4-star hotel with 154 rooms. The hotel is located in the heart of Aachen in the triangle of the borders of Germany, Belgium and the Netherlands. The hotel is 35 kilometres away from Maastricht Airport. The convention centre, the casino and all the sights of Aachen are only a few steps away. The hotel features a restaurant, a bar and private parking. Additionally, the Novotel offers meeting rooms, facilities for disabled guests and a free steam sauna and gym.

Phone: +49-(0)241-51 59-0
Fax: +49-(0)241-51 59 599
E-Mail: h3557re@accor.com

OFFICIAL LANGUAGE

All sessions will be held in English, only.

MESSAGES

During the conference, messages for delegates may be sent to the registration counter on-site.

Phone/Fax:+49-(0)241-5159 431
or by e-mail: vde-conferences@vde.com

INTERACTIVE PRESENTATION

The posterroom for these sessions will be open for installing of the posters on all days 20 minutes prior to the session. The pin walls will be numbered according to the Paper ID no. given in the program.

TOOL DEMONSTRATION / EXHIBITION

An exhibition of CEM related equipment and applications is planned. The demonstration area is open to all interested parties free of charge. Alongside the conference sessions the demonstrations will be open Tuesday through Thursday to allow for extensive visit of the presenting companies.

The exhibition will be open:

Tuesday, April 4	09:00 h - 18:00 h
Wednesday, April 5	09:00 h - 17:00 h
Thursday, April 6	09:00 h - 13:00 h

SOCIAL PROGRAMME

- The Conference Welcome Reception will be held on April 3, 2006 in the Hotel Dorint starting at 17.30 h.
- The Conference Dinner takes place on April 5, 2006 in the famous Aachener Brauhaus.

The attendance to these events is included in the full conference fee. Additional tickets for accompanying persons may be ordered with the registration form within the given deadline.

The recommended dress for all social events is business casual.

INSURANCE

The organizers may not be held responsible for any injury to participants or damage, theft and loss of personal belongings. Participants should therefore make their own insurance arrangements.

EMERGENCY CALLS

Fire/Ambulance	112
Police	110

From some phones an additional "0" (0112 or 0110) might be required to place a call.

PASSPORT AND VISA REQUIREMENTS

Foreign visitors entering Germany have to present a valid Identity Card or Passport. Delegates who need a visa should

contact the German consular offices or embassies in their home countries for detailed requirements. Please note that VDE-Conference Services or the supporting bodies are not able to extend any "Invitation" for application of visa.

SHOPPING

Most shops in Aachen are located in the area around the Rathaus (City Hall). Usually, shops are open from Monday to Friday 9.00 h - 20:00 h, on Saturday 9:00 to 16:00 h. Shops are generally closed on Sunday.

TIPPING

Tipping is at your own discretion. In Germany all taxes and tips are included in hotel and restaurant bills. A good service may be rounded up by 5 to 10 %.

WEATHER / CLIMATE

In April the weather is moderate, with daily temperatures between 10° C and 20° C. However, evenings are cool. Rain is not uncommon, so be prepared!

TELEPHONES

There is an adequate number of public telephone cells for making national and international calls. You can make a call using either coins, a phone card (available at Post Offices) and sometimes a credit card. Some of the phones are also equipped for fax transmission.

INTERNET ACCESS

WLAN is available at Hotel Dorint. Access rate for 24 hours is 25,- €.

CURRENCY

The official currency in Germany is the Euro (€). Most credit cards (Mastercard, American Express, Visa) are accepted in hotels, department stores and restaurants. Currently (December 2005) the exchange rate is 1 Euro = 1.17 US Dollar and 1 US Dollar (USD) = 0.85 Euro (EUR)

ELECTRICITY / PHONE PATCH

The mains power supply is 230 V AC, 50 Hz. Authors presenting from their laptop are kindly asked to have connectors available for the mains and Texas or TAE 6 (German phone standard) to connect the phone grid.

Connectors are available at most international airports or department stores. Most hotels have TAE 6 or Texas plug-ins in the rooms or business centre.

ABOUT AACHEN

Aachen is situated directly on the border with Belgium and the Netherlands. It is Germany's most westerly city, with a population of nearly 260,000. Nearly 40,000 students attend Aachen's five major colleges and universities (Rhineland-Westphalian Technical University [RWTH], University of Applied Sciences, Catholic University of Applied Sciences, Academy of Music and Academy of Church Music). Aachen unites tradition with progress. Charlemagne has left his mark throughout the city. The cathedral - the first monument in Germany to be included in the UNESCO Cultural Heritage list - and the gothic City Hall in which 32 German kings celebrated their coronations still form the heart of Aachen's old city centre. And Charlemagne has lent his name to a prize awarded by Aachen's citizens to personalities who have rendered outstanding services to European unity: the International Charlemagne Prize of Aachen. This award has been presented on Ascension Day every year since 1950.

But Aachen is by no means just a museum; it is a modern city, open to the world, with political, economic and cultural contacts that reach far beyond Germany's borders. One example is Europe's first transnational industrial estate with the name Avantis, which was developed in cooperation with the Dutch town of Heerlen. At EXPO 2000 in Hanover, Aachen was presented as a European model region, as a fine example of successful structural change and a remarkable instance of a region's departure from mining and conventional industry to become one of Europe's major high-tech locations. This success story is a result of cooperation between the universities and the chambers of industry, research institutions, companies, business establishment centres and the city's administration. The scientific competence available in Aachen has attracted famous international enterprises and research institutions including Ericsson, Ford, Philips, Takeda Pharma and Microsoft, and enabled the successful placing of up-and-coming technology companies such as Aixtron and Parsytec on the stock exchange "Neuer Markt" in Frankfurt. Some 500 new, forward-looking companies providing over 10,000 jobs have grown up since

1985. Aachen's colleges and universities develop top technologies for the sunrise industries such as information and telecommunication engineering, plastics engineering, computer science, materials science and biotechnology.

But Aachen has much to offer in respect of quality of life, too. The city has a flair and atmosphere of its own. The attractive layout of the old city centre, the important historic monuments, the wells and baths over the hottest natural springs in Europe, the bustling activity in the streets and squares, the cultural diversity and quality (Ludwig Forum for International Art, Suermondt-Ludwig Museum, Couven Museum, Burg Frankenberg Museum, International Newspaper Museum) and the many recreational and leisure activities make Aachen an exciting and pleasing whole. The Carolus-Therme is one of the most modern and attractive thermal baths in Europe. Besides the presentation of the International Charlemagne Prize, the major annual events include the presentation of the Carnival Award "The Antidote to Deadly Earnest" and the presentation of the International UNESCO Music Prize, the Aachen Peace Prize, the Aachen Innovation Award and the Prize for Scientific Journalism of the RWTH Aachen. Nor should we forget the CHIO International Horse Show in the Soers region and the events of the Aachen Cultural Summer.

TRAVEL INFORMATION

The closest international airports are located in Cologne/Bonn, Düsseldorf, and Maastricht Airport

by train:

From Aachen main station: by taxi you will reach the Hotel Dorint Center within 10 minutes.

by bus: take line 3 or 13 from the main station, leave at station "Hansemann Platz".

by car:

From the A4 highway, take the exit Europaplatz. Leave the roundabout towards Zentrum. Go straight ahead at the traffic lights, heading slightly left into Jülicher Strasse. 600m along, you will see the hotel on your left hand side.

For more information see the plan on the last page of this program.

PARKING LOT

Public indoor parking at Hotel Dorint is available at 10,- € per day.

SITE PLAN

Dorint Novotel Aachen City, Peterstrasse 66, 52062 Aachen



(A4 / E314) from Cologne:

A4 direction Aachen → Cross Aachen direction A544 / Exit Aachen Europaplatz → follow direction Aachen-Zentrum → straight on find the Peterstrasse

(A44 / E40) from Düsseldorf:

A44 direction Mönchengladbach → follow A44 direction Aachen/Heerlen → Cross Aachen direction A544 / Exit Aachen-Europaplatz → follow the B1 direction Aachen-Zentrum → straight on find Peterstrasse

(A4 / E314) from Heerlen:

A4 direction Düsseldorf/Köln → Exit Aachen-Centrum-Würselen B57 Krefelder Strasse direction Aachen Zentrum → turn left into Monheimsallee → turn right into Peterstrasse