Important announcement Concerning Security and Access to the Naval Postgraduate School

No access to the Naval Postgraduate School, "NPS" the ACES conference site, will be permitted unless a pre-registration is submitted and confirmed by ACES executive officer, Dr. Dick Adler. If you are planning to attend you should register on-line ASAP and no later than Wednesday March 13, 2003. All pre-registered persons will be included on the access list IF the additional information shown below is added to the registration form or is submitted by some other method.

All persons MUST carry a picture ID (Passport or Drivers License, etc.) and the name on the ID MUST match the name on the access list. Be sure to list all names exactly as they appear on the picture ID and include the name of the agency (company, university, private consultant, etc.) that you represent when you make the request for access.

On-site registration is possible, but will not be allowed unless you get permission from the ACES executive officer to gain access to the guarded gates of NPS. The last date for requesting for permission for the full week of March 23-28 is Thursday March 13, 2003 at 1400 PST (2200 GMT/UTC).

Short Courses will be offered on Thursday Afternoon (27th) and All-Day Friday (28th)

Wives/friends who are attending any of ACES activities with their husbands/friends, will also need to submit their names to be on the list to be permitted to enter.

ACES 2003 Program

The 19th Annual Review of Progress in Applied Computational Electromagnetics
Naval Post Graduate School
March 24-28, 2003

Symposium Chair: Atef Elsherbeni, Symposium Administrator: Richard Adler,
Short Course Chair: Bruce Archambeault, Exhibits Chair: Andrew Drozd, Publicity Chair: Keith Lysiak,
Administrative Assistant: Mattiew Inman, Conference Secretaries: Anthea Wilson

Sunday

Room: SP 101A

2:00-6:30 Conference Registration

Monday

Room: SP 101A

8:00-4:30 Conference Registration

Room : GL, Courtyard

7:30-7:55 Continental Breakfast

Room : GL 102

7:55-8:05 ACES Business Meeting Osama Mohamed, ACES President
8:05-8:15 Welcome Atef Elsherbeni, Conference Chair

8:15-10:15 Panel Session – 1
"**Challenges in Advanced Mixed-Signal Circuit Simulation and Design**"

8:15-8:20 **Introduction:**
Dr. John Rockway, Space and Naval Warfare Systems Command

Speakers:

8:20-8:35 "**CAD Strategies for Advanced Mixed-Signal System and Circuit Design**"
Dr. Peter Petre, HRL Laboratories, Malibu, CA

8:35-8:50 "**Fast Electromagnetic Simulation Techniques Applicable for Mixed-Signal Circuits**"
Prof. Stephen Gedney, University of Kentucky, Lexington, KY

8:50-9:05 "**Advanced Reduced Order Modeling Techniques**"
Prof. Madhavan Swaminathan, Georgia Institute of Technology, Atlanta, GA

9:05-9:20 "**Fast Parasitic Extraction Methods**"
Prof. Jacob White, MIT, Cambridge, MA

9:20-9:35 "**Fast Broadband Electromagnetic-Circuit Solvers for RF and Parasitic Simulation of Systems on Chip**"
Prof. Vikram Jandhyala, University of Washington, Seattle, WA

9:35-9:50 "**Electromagnetically Accurate Modeling of On-Chip Interconnects & Integrated Passives**"
Prof. Andreas Cangellaris, University of Illinois, Urbana, IL

9:50-10:15 Discussion

10:15-10:30 Break (Refreshments at GL, Courtyard)

10:30-12:30 Panel Session – 2

10:30- 10:40 "**Ship Propulsion System Utilizing Superconducting Components**"
Dr. Swarn S. Kalsi, American Superconductor Corporation

10:40-11:00 "**Ship Electrical System Architecture**"
Dr. Swarn S. Kalsi, American Superconductor Corporation

11:00-11:20 "**Superconducting motors and generators for ship propulsion**"
Dr. Bruce Gamble, American Superconductor Corporation

11:20-11:40 "**Transient Modeling of Magnetoelastic Problems in Electric Machinery**"
Prof. Osama Mohammed, Florida International University,
Mr. T.E. Calvert, ONR-Arlington, VA
Mr. L. Peterson, ONR-Arlington, VA
Mr. R. McConnell, NSWCCD-Philadelphia, PA

11:40-12:00 "**Dynamical Nature of Shipboard Electric Power Systems**"
Prof. John V. Amy Jr., MIT

12:00-12:20 "**CAPS Simulation as a Tool in Superconductivity Research**"
Dr. David Goodson, Syntek Technologies
Dr. Cyril F. Krolick, Syntek Technologies

12:20-12:30 Discussion

12:30-1:30 Lunch

Room: GL 102

1:30-3:45 Advanced Computational Techniques for System Design Session 1
Session Organizer: Dr. Ross Speciale
Session Chairs: Dr. Ross Speciale and Prof. Weng Cho Chew

1:30-1:50 "Broad-Band Fast Computational Electromagnetics Algorithm -- MFIPWA"
Lijun Jiang and Weng Cho Chew

1:50-2:10 "Three-Dimensional Material Optimization for Printed Antenna Bandwidth Enhancements"
Gullu Kiziltas, John L. Volakis, and Noboru Kikuchi

2:10-2:30 "A Novel Numerical Approach for the Analysis of 2D MEMS-Based Variable Capacitors with Arbitrary Motions"
Michiko Kuroda, Noriyuki Miura, and Manos M. Tentzeris

2:30-2:50 "Modelling of Surface Feature Scattering Through a Coherent Subtraction Process"
George R. Simpson and William D Wood

2:50-3:05 Break (Refreshments at GL, Courtyard)

3:05-3:25 "From Component to System Simulation"
Thomas Weiland, Irina Munteanu, and Martin Timm

3:25-3:45 "Error Convergence Process of the Multipole Expansion"
Shinichiro Ohnuki and Weng Cho Chew

Room : IN 130

1:30-3:45 Scattering by Complex Objects Session 1

Session Organizer: Prof. Michael Hamid
Session Chairs: Prof. Michael Hamid and Prof. Hashim A. Yousif

1:30-1:50 "The Mueller Matrix for the Scattering of Light by an Elliptic Cylinder"
Hashim A. Yousif

1:50-2:10 "Bistatic Cross Section of an Array of Dielectric Spheres Each Covered with a Dielectric Shell"
Mousa I. Hussein, Abdul-Kader Hamid, and Michael Hamid

2:10-2:30 "Radiation Characteristics of an Infinite Axially Slotted Elliptical Antenna Partly Embedded in a Ground Plane"
Mousa I. Hussein and A-K Hamid

2:30-2:50 "Estimation of Target Orientation from Scattering Data"
Ali Kabiri, Nima Sarshar, and Kasra Barkeshli

2:50-3:05 Break (Refreshments at GL, Courtyard)

3:05-3:25 "Electromagnetic Scattering from an Multilayered Domain via an Integral Equation Approach"
F. Seydou

3:25-3:45 "Profile reconstruction in Multilayered Media"
F. Seydou

Room: IN 122

1:30-4:05 Recent Antenna Applications Session 1

Session Organizer: Prof. Samir Mahmoud
Session Chairs: Prof. Samir Mahmoud and Prof. Allen Glisson

1:30-1:50 "Wideband and Dual-Band Loaded Monopole Dielectric Resonator Antenna"
Swee Huat Ong, Ahmed A. Kishk, and Allen W. Glisson

1:50-2:10 "On the Significance of Current Vector Alignment in Lowering the Resonant Frequency of Fractal and Small Wire Antennas"
Steven R. Best and Jarrett D. Morrow

2:10-2:30 "Study of Reduced Size Circular Microstrip Patch Antenna with Two-Pin Loading. "
Samir F. Mahmoud

2:50-3:05 Break (Refreshments at GL, Courtyard)

3:05-3:25 "Multi-Slot Antenna for Radar Systems"
Cuthbert M. Allen, Abdelnasser A. Eldek, Atef Elsherbeni, and Charles E. Smith

3:25-3:45 "Modeling, Synthesis and Broadband Matching of a Panel Crossed-Dipole Antenna for FM Broadcasting Applications"
Mehdi Hosseini and Keyvan Forooraghi

3:45-4:05 "Numerical Characterization of Cavity-Backed Aperture-Coupled Antenna Problem using Hybrid Finite Element Method (FEM) / Method of Moment (MoM) technique"
Donghoon Chun and Kazem Sabet

Room: SP 101A
3:00-5:00 **Poster Session 1**
Session Chair: Prof. M. Hamid

"New Small Size 3 dB $0^o/180^o$ Microstrip Coupler Configurations"
Ashraf Mohra, Hoda Baghdady, Abdel Fattah Sheta, and Samir F. Mahmoud

"A Survey of the Eigenvalues of Pyramidal Waveguides"
Michael Hamid and A. K. Hamid

"Mueller Matrix Elements for Subsurface Sensing Applications of Targets Buried Beneath 2-D Randomly Rough Ground"
Magda El-Shenawee

"Multimode Hybrid Junctions"
M. Hamid

"Where Does the Radiation Come From?"
Steve R. Inge

Room: HH, La Novia Terrace
6:30-8:00 Conference Reception

Tuesday

Room: SP 101A
8:00-4:30 Conference Registration

Room : GL, Courtyard
7:30-8:30 Continental Breakfast

Room: GL 102
8:30-9:30 Plenary Session 1
"**The Marvels of Electromagnetic Band Gap (EBG) Structures**"
Prof. Yahya Rahmat-Samii, UCLA, CA

9:30-9:45 Break (Refreshments at GL, Courtyard)

9:45-11:45 Plenary Session 2
"**Industry Applications of Numerical Modeling Tools to EMC and Signal Integrity Problems**"

Session Moderator:
9:45-9:55 Prof. Todd Hubing - University of Missouri-Rolla

Speakers:
9:5-10:20 "**Computational EM for High Speed Computer Design: Challenges, Successes and Future Directions**"
Dr. Bruce Archambeault, IBM, Research Triangle Park, NC

10:20-10:45 "**Numerical EM Modeling Tools at Sanmina**"
Dr. Franz Gisin, Sanmina Corporation

10:45-11:10 "**Useful Numerical Simulation Tools for EMC and SI at the Printed Circuit Board and System Levels**"
Dr. Cheung-Wei Lam, Apple Computer

11:10-11:35 "**Getting Useful EMC and SI Results from Numerical EM Modeling Tools**"
Dr. Larry Smith, Sun Microsystems

11:45-12:00 Break

12:00-12:30 Invited Speaker 1
"**Maxwell Without Mathematics**"
Mr. Alan Nott, Antuition Enterprises

12:30-1:30 Lunch

Room: IN 267

1:30-4:25 FDTD Methods and Applications **Session 1**
Session Organizer: Dr. John H. Beggs
Session Chairs: Dr. John H. Beggs and Prof. Christopher Trueman

1:30-1:50 "Z-diagonalized Planewave/FD Approach for Analyzing TE Polarized Waves in 2D Photonic Crystals"
Karri VARIS and Alireza Baghai-Wadji

1:50-2:10 "Numerical Solution of Time-dependent Maxwell's Equations in Spherical Coordinates"
Eugene Kashdan and Eli Turkel

2:10-2:30 "Application of a High Accuracy Nonstandard Finite Difference Time Domain Method in the Analysis of Subwavelength Optical Gratings"
Saswatee Banerjee, James B.Cole, and Toyohiko Yatagai

2:30-2:50 "A Fast Graphical User Interface (GUI) Based FD-TD Algorithm for Simulation of EMF Interaction with Biological Media "
Sachin Singh, Sevaiyan Balaguru, Sarita Kapoor, Suketu Bhatt, and B. P. Kumar

2:50-3:05 Break (Refreshment at GL, Courtyard)

3:05-3:25 "Numerical Dispersion in the Alternate-Direction-Implicit Finite-Difference Time-Domain Method"
Guilin Sun and Christopher W Trueman

3:25-3:45 "FDTD Model of Electrically Thick Material Coatings Based on a Higher-Order Surface Impedance Boundary Condition"
Mikko Kärkkäinen

3:45-4:05 "Broadband Modeling of Waveguide Antennas by a Combined FDTD and Modal-N2F Method"
Gaetano Marrocco and Matteo Ciattaglia

4:25-4:30 Break

4:30-5:50 Finite Element Method and Applications **Session 1**
Session Organizer: Prof. Leo Kempel
Session Chairs: Prof. Leo Kempel and Dr. Matthys Botha

4:30-4:50 "Subdividing Distorted Prisms into Tetrahedra"
Leo Kempel, Jeffery Meese, and Stephen Schneider

4:50-5:10 "Comparison Between Two a posteriori Error Indicators for Adaptive Microwave FE Analysis"
Matthys M. Botha and David B. Davidson

5:10-5:30 "Finite Element Time Domain Method Using Laguerre Polynomials"
Young-seek Chung, Tapan K. Sarkar, Sergio L. Romano, and Magdalena Salazar Palma

5:30-5:50 "Using Mixed Elements with the Finite Element-Boundary Integral Technique"
Jeffery Meese and Leo Kempel

Room: IN 122

1:30-4:25 Electromagnetic Modeling by WIPL-D Code **Session 1**

Session Organizer: Prof. Branko Kolundzija
Session Chairs: Prof. Branko Kolundzija and Prof. Tapan K. Sarkar

1:30-1:50 "Is it Diffraction of Electromagnetic Waves or Gravitation?"
Seongman Jang, Tapan K. Sarkar, and Branko Kolundjiza

1:50-2:10 "Assessing the Effect of Finite Conductivity on the Performance of Microstrip-Fed Patch Antennas"
James W. Stewart, William D Wood, and Michael Harvey

2:10-2:30 "Parallel Scene Generation – Why Parallelize WIPL-DP?"
Ralph L. Kohler, Jr., Alan George, and Tapan Sarkar

2:30-2:50 "Single-Fed Circularly Polarized Dielectric Resonator Antenna"
Ahmed A. Kishk

2:50-3:05 Break (Refreshment at GL, Courtyard)

3:05-3:25 "WIPL Code Validation for Metallic Structures"
Antonije R. Djordjeviæ, Branko M. Kolundzija, Alenka G. Zajic, Marija M. Nikolic, Toma H. Stirovic, and Aleksandra S. Stekovic

3:25-3:45 "WIPL-D Compared to Other EM Codes for the Analysis of Printed Antennas"
Carlos A. Fernandes and Custódio O. Peixeiro

3:45-4:05 "Broadband Analysis in WIPL-D Using the Cauchy Approach"
Raviraj Adve

4:05-4:25 "Numerical Analysis of Inverted-F Antenna on Side of Small Rectangular Conducting Plate in Vicinity of B5-sized Conducting Plate"
Mitsuo Taguchi, Yoshifumi Yanagisako, and Kazumasa Tanaka

4:25-4:30 Break

4:30-5:50 Time Domain Numerical Modeling Beyond FDTD **Session 1**

Session Organizer: Prof. Pascal Leuchtmann
Session Chair: Prof. Pascal Leuchtmann

4:30-4:50 "Boundary Conditions Simulation in a FDTD/FVTD Hybrid Code"
Pierre Bonnet

4:50-5:10 "Finite-Volume Time-Domain Modeling of Antennas"
Christophe Fumeaux, Dirk Baumann, Pascal Leuchtmann, and Rüdiger Vahldieck

5:10-5:30 "Triangular Grids: A Review of Waveguide Analysis with Classical FIT and Some Reflections on Yee-like FIT- and FEM-Schemes"
Ursula van Rienen

5:30-5:50 "Errors in FDTD, FIT and FVTD"
Pascal Leuchtmann and Ruediger Vahldieck

Room: IN 265

1:30-4:25 Advances in Integral Equation Techniques **Session 1**

Session Organizer: Prof. Raed Shubair

Session Chairs: Prof. Raed Shubair and Prof. Alireza B-Wadji

1:30-1:50 "Efficient Computation of Sommerfeld Integrals"
Surendra Singh and Ritu Singh

1:50-2:10 "Analysis of Vertical Dipoles Above a Semi-Infinite Ground Using The Induced EMF Method and Simulated Image Technique"
R. M. Shubair

2:10-2:30 "Universal Functions in Computational Electromagnetics"
Alireza Baghai-Wadji

2:30-2:50 "High-Order Integral Equation Solution Based On a Hybrid Volume/Surface Formulation"
Stephen D. Gedney and Caicheng Lu

2:50-3:05 Break (Refreshment at GL, Courtyard)

3:05-3:25 "Solution of Vertical Antennas in Contiguous Dielectric Half-Spaces Using MPIE Formulation and Simulated Image Green's Functions"
R. M. Shubair

3:25-3:45 "On the Discretization of Fredholm Integral Equations of First Kind Using Compactly Supported Wavelets"
Robert Kolm and Alireza Baghai-Wadji

3:45-4:05 "Robust Preconditioning Techniques for Electromagnetic Wave Scattering Problems"
Jun Zhang, Jeonghwa Lee, and Cai-Cheng Lu

4:05-4:25 "Analysis of PEC Objects in Layered Media Using Higher-Order Hierarchical Basis Functions"
Oleksiy S. Kim, Erik Joergensen, Peter Meincke, and Olav Breinbjerg

4:25-4:30 Break

4:30-5:10 Wavelets in Electromagnetics **Session 1**

Session Organizer: Prof. Nathan Ida

Session Chairs: Prof. Nathan Ida and Prof. Richard Gordon

4:30-4:50 "Analysis of Scattering Problems by MOM with Intervallic Wavelets and Operators"
Sami Barmada and Marco Raugi

4:50-5:10 "Generation and Use of Two-Dimensional Wavelet-Like Basis Functions"
W. Elliott Hutchcraft and Richard K. Gordon

Room: GL 102

1:30-4:25 Hybrid and Coupled Time Domain Solution Methods **Session 1**

Session Organizer: Prof. Wolfgang J.R. Hoefer

Session Chairs: Prof. Wolfgang J.R. Hoefer and Dr. Poman So

1:30-1:50 "Reduced Order Modeling in TLM"
Dzianis Lukashevich, Andreas Cangellaris, and Peter Russer

1:50-2:10 "Simulation of Scattering Problems in Time Domain Using a Hybrid FDTD-UTD Formulation"
Anastassios Skarlatos, Rolf Schuhmann, and Thomas Weiland

2:10-2:30 "Generalized and Numerically Robust Singularity Correction in TLM Models of Electromagnetic Fields"
Huilian Du, Poman So, and Wolfgang Hoefer

2:30-2:50 "A Hybrid Time Domain Method To Calculate Electromagnetic Induction Scattering From Targets with Arbitrary Skin Depths"
C. D. Moss, K. O'Neill, T. M. Grzegorczykf and J. A. Kong

2:50-3:05 Break (Refreshment at GL, Courtyard)

3:05-3:25 "The Use of Surface Impedance Boundary Conditions in Time Domain Problems: Numerical and Experimental Validation"
Sami Barmada, Luca Di Rienzo, Nathan Ida, and Sergey Yuferev

3:25-3:45 "Intracell Modeling of Metal/Dielectric Interfaces for EBG/MEMS RF Structures Using the Multiresolution Time-Domain Method"
Nathan Bushyager and Manos Tentzeris

3:45-4:05 "A Hybrid FDTD and ADI-FDTD Scheme for Efficient RF/Microwave Structure Simulation"
Iftikhar Ahmed and Zhizhang Chen

4:05-4:25 "Finite Difference Time Domain Modeling of General Dispersive Bi-isotropic Media."
Ana Grande, Ismael Barba, Jose Represa, Ana C. L. Cabeceira, Poman P.M. So, and Wolfgang J. R. Hoefer

4:25-4:30 Break

4:30-5:50 Hybrid Techniques in Computational Electromagnetics Session 1
Session Organizer: Dr. Kazem F. Sabet
Session Chairs: Dr. Kazem F. Sabet and Prof. Ercument Arvas

4:30-4:50 "Accelerating Computations with a MoM-Based Computer Program using a Model Based Parameter Estimation Algorithm"
Markus Schick and Friedirch M. Landstorfer

4:50-5:10 "Generalized Network Formulation of Electromagnetic Fields -- Tableau Analysis of Waveguide Discontinuities"
Tian Jan Ong, M. Fujii, M. Mongiardo, and P. Russer

5:10-5:30 "Use of Model-Based Parameter Estimation in Electromagnetic Scattering Problems of a Conducting Body of Revolution"
Hyunwung Son, Joseph R. Mautz, and Ercument Arvas

5:30-5:50 "A Decompose-Solve-Recompose (DSR) Technique For Large Phased Array Analysis"
K. Y. Sze, K. F. Sabet , and D. Chun

6:00-8:30 ACES Board of Directors Meeting

Wednesday

Room: SP 101A

8:00-4:30 Conference Registration

Room : GL, Courtyard

7:30-8:00 Continental Breakfast

Room: GL 102

8:00-9:00 Plenary Session 1

"**EM Modeling of Surfaces with STOP or GO Characteristics - Artificial Magnetic Conductors and Soft and Hard Surfaces**"

Prof. Per-Simon Kildal, Chalmers University of Technology and Prof. Ahmed Kishk, University of Mississippi

9:00-9:10 Break

9:10-10:10 Invited Talk 1

"**Envelope-Finite Element Techniques for Microwave Component and Antenna Design**"

Prof. Tatsuo Itoh, UCLA and Dr. Yuanxun Wang, UCLA

10:10-10:20 Break (Refreshment at GL, Courtyard)

10:20-11:20 Invited Talk 2

"**Solution to the General Helmholtz Equation Starting From Laplace Equation**"

Prof. Tapan K. Sarkar, Syracuse University

11:20-11:30 Break

11:30-12:30 Invited Talk 3

"**Integration of Different Numerical Algorithms for the Electromagnetic Modeling of Complex Geometries**"

Prof. A.S. Omar, University of Magdeburg

12:30-1:30 Lunch

Room: IN 265

1:30-3:30 Advanced Computational Techniques for System Design Session 2

Session Organizer: Dr. Ross Speciale

Session Chairs: Dr. Ross Speciale

1:30-1:50 "Accurate Wide-band De-embedding of Port Discontinuities in Full-wave Models of Integrated Circuits"
Vladimir Okhmatovski, Jason Morsey, and Andreas Cangellaris

1:50-2:10 "Efficient Hybrid MM/FE/MoM Analysis of Horn and Slot Arrays"
Prof. Dr. Fritz Arndt, V. Catina, A. Enneking, I. Rullhusen, and J. Brandt

2:10-2:30 "A “Cycle-Harvesting” Framework for Problems in Computational Electromagnetics"
Christopher B. Smith

2:30-2:50 "Performance Analysis of MoM Patch Antenna Simulations – RWG Basis Functions"
Shashank Kulkarni, Anuja Apte, and Sergey Makarov

2:50-3:10 "A Uniaxial Time-Domain Wave Potential Analysis of the Electromagnetic Field in Nonuniform Media"
Natalia K. Nikolova

3:10-3:30 "Computer Simulation of Scattering Parameter Measurements"
Dr. Ross A. Speciale

Room: GL 102

1:30-2:50 Modeling Tools for EMC and Signal Integrity Problems **Session 1**
Session Chair: Dr. Bruce Archambeault

1:30-1:50 "Full-Wave Analysis of Transmission Line Structures in Damascene Technology"
Dzianis Lukashevich and Petter Russer

1:50-2:10 "Description of the Magnetic Field Distribution in a Non-linear Breaker Relay"
Jean Clovis, Njeumeni Siango, Brigit Neuhaus, Eva Vargaf, and Adalbert Beyer

2:10-2:30 "Application of Prolate Spheroid Solutions in Simulation of EMI Scattering with Realistic Sensors and Objects"
Keli Sun, Ko'Neill, I. Shamatava, and F. Shubitidze

Room: IN 122

1:30-2:50 FDTD Methods and Applications **Session 2**
Session Organizer: Dr. John H. Beggs
Session Chairs: Dr. John H. Beggs and Dr. James B. Cole

1:30-1:50 "Design of Slot Antennas and Arrays Using the FDTD Technique and a Parallel Supercomputer"
Manabu Omiya, Kosuke Munakata, and Takashi Hikage

1:50-2:10 "A New FDTD Solution Method Without The Time Variable"
Tapan K. Sarkar, Young-seek Chung, and Baek Ho Jung

2:10-2:30 "High Accuracy FDTD Algorithm for the Conducting Maxwell's Equations Using a Nonstandard Finite Difference Model"
James B. Cole and Saswatee Banerjee

2:30-2:50 "FDTD Models of Small Microwave Devices"
Qing-Xin Chu and Xiao-Juan Hu

Room: IN 267

1:30-3:10 Hybrid Techniques in Computational Electromagnetics **Session 2**
Session Organizer: Dr. Kazem F .Sabet
Session Chair: Dr. Kazem F .Sabet

1:30-1:50 "Fast Modeling and Design of HF Loop Antennas on Aircraft by a Combined FDTD and MTL Method"
Piero Tognolatti and Gaetano Marrocco

1:50-2:10 "A Combined MAS-TSA Algorithm for Broadband Electromagnetic Induction Problems"
Fridon Shubitidze, Ko'Neill, K. Sun, I. Shamatava, and K. O. Paulsn

2:10-2:30 "A Hybrid MoM/FDTD Technique for the Modeling of Multi-antenna Systems on Vehicular Platforms for Wireless Communication Systems"
Werner Thiel and Kazem Sabet

2:30-2:50 "Coupling of Electromagnetic Time-Domain Simulators with DSP/Multigridding Techniques for the Adaptive Modeling of Multilayer Wireless Packaging Structures"
Jong Hoon Lee, E.T.K. Dalton, N. Bushyager, M. Kunze, and W. Heinrich, M.M. Tentzeris

2:50-3:10 "A Hybrid Nonlinear Antenna Analysis Technique"
Eray Yasan and Kazem F. Sabet

Room: HH, Ballroom

1:30-5:00 Vendor Exhibits

Room: HH, Ballroom
2:00-5:00 Wine & Cheese Tasting

Room: HH, Ballroom

2:00-5:00 Posters Session 2
Session Chair: Dr. Reinaldo Perez

"An XML Schema for NEC Input Files"
Daniel D Reuster, Glen L. Harris, Mary L. Fricke, Tat Fung, and Jeffrey T. Hoppe

"A Novel Dirichlet-Neumann Random-Walk Algorithm for Electromagnetic Analysis of IC Interconnects Beyond Quarter-Wavelength Length Scales"
Kausik Chatterjee and Yannick L. Le Coz

"A View of Avionics Design of Spacecraft, Past, Present and Future"
Reinaldo Perez

"Dielectric Polarizability of a Homogeneous Cube"
Ari Sihvola, Pasi Yla-Oijala, Seppo Jarvenpaa, and Juha Avelin

"Field Theoretical Investigations on Dielectric Image Line Isolators in I-Line Technique"
D. Koether, P. Waldow, B. Neuhaus, D. Schreurs, and A. Beyer

"Numerical Modeling of Electromagnetic Fields in Strongly Heterogeneous Anisotropic Media"
P. Jorna and P.M. van den Berg

"Interaction Between Highly Conducting and Permeable Metallic Objects in the EMI Frequency Range"
Fridon Shubitidze, KoNeill, K. Sun, and I. Shamatava

"Electromagnetic Modelling of Helmholtz Coils "
Ashley Bocking

"Computation of SAR in Cell Culture Flasks Exposed to 900 MHz GSM Type Signals in a Modified TEM Cell"
Dr Robert L McIntosh, Raymond J McKenzie, Steve Iskra, Amico Carratelli, and Paul Standaert

"Evaluation and Comparative Analysis of Radio-Wave Propagation Model Predictions and Measurements"
Nicholas DeMinco and Paul M. McKenna

"Slotted Waveguide Transitions for Spatial Power Combining"
Chris W. Hicks, Alexander B. Yakovlev, and Michael B. Steer

"Scattering of a Scalar Plane Wave from a Circularly Symmetric Random Dirichlet Surface"
T. A. Leskova, A. A. Maradudin, E. R. Mendez, and S. Silverman

"Design and Simulation of Microwave Filters for Improving Out-of-Band Characteristics"
Kouji Wada, Tomohide Kamiyama, Yoshiyuki Aihara, and Osamu Hashimoto

"An Improved Arbitrary Resolution MRTD Method"
Qunsheng Cao and Kumar K. Tamma

"Multiresolution Time Domain for Studies of Planar Stratified Media"
Qunsheng Cao and Kumar K. Tamma

"Inclusion of Flaking Effects Inside a Pressed Layer Structure in the Electromechanical Analysis with the Aid of Static Condensation and Floating Potentials"
Christian Grabner and Erich Schmidt

"Antenna Design and Radiation Pattern Visualization"
Atef Z. Elsherbeni, Matthew J. Inman, and R. Christopher-Lee Riley

"Capacity Estimation of HF Ionospheric Channel"
Abderrazak Abdaoui, Claude Goutelard, Han Vu-thien, and Ammar Bouallegue

"Fast Converging Graded Meshes for Bodies of Revolution with Tip Singularities"
Kueichien Hill and Tri Van

Room: HH, Ballroom
2:00-5:00 Computer Modeling and Simulation
Session Organizer: Dr. Andrew Drozd
Session Chair: Dr. Andrew Drozd

"High Accuracy FDTD Simulation and Visualization of Electromagnetic ropagation and Scattering on a Laptop"
James B. Cole

"A Method for Building CEM Models of Complex Platforms"
Gerald J. Burke, Nathan J. Champagne, and Robert M. Sharpe

"System-Level EMC Antenna Coupling Analysis for Large, Complex Structure Topologies Using a Multi-Fidelity Modeling and Simulation Approach"
Andrew L. Drozd and Irina P. Kasperovich

"Using FDTD for EMC Applications"
Bruce Archambeault

"Comprehensive and Practical Electromagnetic Simulations Using FEKO" by
C. J. Reddy

"CEM Code Validation Using Thermal Imaging Techniques"
John Norgard

"Antenna Modeling and Analysis Using WIPL-D"
Saad Tabet

"Degradation of EMI Shielding in the Presence of Extraneous Conductors"
Colin Brench

EMPiCASSO: An Advanced Design Tool for Multilayer Printed Microwave
Circuits and Antennas"
Kazem Sabet

Room: HH, Ballroom
6:30 No Host Bar

7:30 Awards Banquet

Thursday

Room: SP 101A

8:00-11:00 Conference Registration

Room : GL, Courtyard

7:30-8:00 Continental Breakfast

Room: IN 122

8:00-9:40 EMC Design **Session 1**

Session Organizer: Dr. Bruce Archambeault
Session Chairs: Dr. Bruce Archambeault and Dr. Andrew L. Drozd

8:00-8:20 "Effect of Distance between Noise Source and Decoupling Capacitor on the EMI Performance of Power and Ground-Reference Planes"
Bruce Archambeault, Sam Connor, and Juan Wang

8:20-8:40 "A Novel EMC Testing Technique based on Time Domain Methods"
Florian Krug, Tobias Hermann, and Peter Russer

8:40-9:00 "Analysis of Antenna-Coupled EMI For Large Resonant Structures Using Hybrid Multi-Resolution Modeling"
Andrew L. Drozd, Irina P. Kasperovich, Clifford E. Carroll Jr., and Sharon C. Hall

9:00-9:20 "The Effects of PCB Split Reference Planes on High Speed Signals: Analysis and Mitigation"
J. Alan Roden , Bruce Archambeault, and Ruthie Lyle

9:40-10:00 Break (Refreshment at GL, Courtyard)

10:00-11:00 Time Domain Numerical Modeling Beyond FDTD **Session 2**

Session Organizer: Prof. Pascal Leuchtmann
Session Chairs: Prof. Pascal Leuchtmann and Prof. J. B. Cole

10:00-10:20 "Efficient High-Spatial-Order FDTD Analysis of 3D Optical Ring Resonator Filters"
Masafumi Fujii, Wolfgang Freude, and Peter Russer

10:20-10:40 "Grid Construction and Boundary Condition Implementation for the Isotropic Vector Field Decomposition Methodology"
J.F. Nystrom

10:40-11:00 "Parametric Model Generation Algorithm for Planar Microwave Structures based on Full-Wave analysis and Design of Experiment"
Mahmoud Al--Ahmad, Fabio Coccetti, Manos Tentzeris, and Peter Russer

Room: GL 102

8:00-10:20 Japanese Research in Electromagnetic Field Computations **Session 1**

Session Organizer: Prof. Yasushi Kanai
Session Chair: Prof. Yasushi Kanai

8:00-8:20 "Optimization Analysis in an Induction Heating Problem using GA on a Parallel Computer"
Takeshi Iwashita, Tasuku Kirikoshi, and Masaaki Shimasaki

8:20-8:40 "Electromagnetic Field Analysis of Inductors with Various Lamination Method for High Frequency Circuits"
T. Tsukamoto, K. Torigoe, M. Hasu, M. Mizumoto, H. Saeki, and Y. Kanai

8:40-9:00 "Application of a Fast Multigrid Solver for High Frequency Electromagnetic Simulation"
David Dibben and Takashi Yamada

9:00-9:20 "Convergence of Multigrid Finite Element Method in Eddy Current Analysis"
Kota Watanabe, Hajime Igarashi, and Toshihisa Honma

9:20-9:40 "Spectra of Finite Element Matrix for Magnetostatic and Quasi-static Electromagnetic Fields"
Hajime Igarashi and Toshihisa Honma

9:40-10:00 Break (Refreshment at GL, Courtyard)

10:00-10:20 "Analytical Study on Change of Temperature and Absorption Characteristics of Single-layer Radiowave Absorber to Irradiation Electric Power"
Masanori KATO, Osamu Hashimoto, Takayuki Nakamura, and Kouji WADA

10:20-10:40 "Estimation of Complex Permittivity Using Rectangular Waveguide with Flange at 10GHz"
Kouji Shibata, Osamu Hashimoto, and Kouji Wada

10:40-11:00 Break

11:00-11:40 Electromagnetic Nondestructive Testing
Session Organizer: Prof. Nathan Ida
Session Chairs: Prof. Nathan Ida and Prof. Sami Barmada

11:00-11:20 "Simulation of Non Contact Ultrasound NDT Methods via Electromagnetic Modelling"
Sami Barmada and Marco Raugi

11:20-11:40 "Transmission Line Matrix Model for Microwave Scanning Microscopy"
Razvan Ciocan and Nathan Ida

Room: IN 322

8:00-9:40 **Partial Differential Equations Techniques** **Session 1**
Session Organizer: Prof. Richard K. Gordon
Session Chairs: Prof. Richard K. Gordon and Dr. Vicente Rodriguez

8:00-8:20 "Complementary Basis Functions and the Vector Magnetic Potential"
William A. Davis, and K. Sitapati

8:20-8:40 "A Study of the Effect of Placing Microwave Pyramidal Absorber on Top of Ferrite Tile Absorber on the Performance of the Ferrite Absorption"
Vicente Rodriguez

8:40-9:00 "Design of a New Type of Absorber for EMC Chambers Using the Finite Elements Technique and Ray Tracing Methods."
Vicente Rodriguez

9:00-9:20 "A Novel 2-Level IE-SVD Algorithm to Model Large Microstrip Antenna Arrays"
Kezhong Zhao and Jin-Fa Lee

9:20-9:40 "T-elements for 3-D Electromagnetic Problems"
Yuriy Shlepnev

9:40-10:00 Break (Refreshment at GL, Courtyard)

10:00-12:00 Practical Applications of Method of Moments Modeling **Session 1**

Session Organizer: Dr. Keith Lysiak
Session Chair: Dr. Keith Lysiak

10:00-10:20 "Modeling the Antenna Configuration of a Digital Very-High Frequency (VHF) Direction Finding System"
Michael E. McKaughan, Keith C. Gross, and Richard J. Hartnett

10:20-10:40 "Modeling Guidelines for the Computation of Electrode Grounding Resistance Using NEC"
J. Patrick Donohoe

10:40-11:00 "Model Validity Insights From Inter-Code Comparisons and Graphics Displays"
Stanley J. Kubina, Christopher W. Trueman, David Gaudine, and Thuy T. Tran

11:00-11:20 "USCG 270' Cutter - NVIS Study"
Kevin Cybert, Jim Potter, Richard Mead, and Michael E. McKaughan

11:20-11:40 "MH-53J/M Pave Low Helicopter, Shunt-Type HF Towel Bar Antenna Rotor Modulation Effects"
Jim Potter, Kevin Cybert, Terry Vogler, and Ricard Mead

11:40-12:00 "Numerical Study of Coupling between Coagulators and Electrodes of Cardiac Pacemakers under Consideration of the Human Body"
Markus Schick and Friedrich M. Landstorfer

Room: IN 321
8:30-11:30 **IEEE P1597 CEM Standards Committee Meeting**

12:30-1:30 Lunch

Short Courses

Thursday

1:30-5:30 Short Courses (Afternoon)

Room: GL 118

"E3EXPERT, A Multi-Fidelity Computer Modeling and Simulation Tool for the EMI/C Analysis of Large, Complex Systems", Dr. Andy Drozd

Room: GL 129

"**Introduction to Computational Simulation Techniques**", Dr. Bruce Archambeault

Room: GL 130

"**Wavelets in Electromagnetics**", Prof. Nathan Ida and Prof. Sami Barmada

Room: GL 203

"**The FDTD Technique for EM Applications**", Prof. Atef Elsherbeni and Prof. Allen Glisson

2:50-3:05 Break (Refreshment at GL, Courtyard)

Friday

Room : GL, Courtyard

7:30-8:30 Continental Breakfast at GL, Courtyard
10:15-10:30 Break (Refreshment at GL, Courtyard)
12:30-1:30 Lunch (on your own)
2:50-3:05 Break (Refreshment at GL, Courtyard)

8:30-5:30 Short Course (Full Day)

Room: GL 129

"**Time Domain EM Simulation with TLM" ,** Prof. Wolfgang J.R. Hoefer

Room: GL 130

"**Recent Advances in Finite Element Method for Computational Electromagnetics**" , Prof. Leo Kempel and Prof. Jian-Ming Jin

8:30-12:30 Short Courses (Morning)

Room: GL 203

"**Workshop on Antenna Analysis and Design Using The FDTD Technique**", Prof. Atef Elsherbeni and Prof. Allen Glisson

Room: GL 118

"**Basic Modeling with WIPL-D**", Prof. Tapan Sakar and Dr. Branko Kolundzija

1:30-5:30 Short Courses (Afternoon)

Room: GL 118

"**An Accessible Introduction to Fast Techniques in Computational Electromagnetics**", Dr. A. R. Baghai-Wadji

Room: GL 203

"**Workshop on Advanced Modeling with WIPL-D**", Prof. Tapan Sakar and Dr. Branko Kolundzija

Title: Wavelets in Electromagnetics

Instructors: Prof. Nathan Ida and Prof. Sami Barmada

Program

Part I Theory and Background

- Introduction to the basic theory of wavelets.
- The Continuous Wavelet Transform
- The concept of multiresolution
- Wavelet analysis - emphasis on the discrete time approach.
- Algorithmic aspects of the discrete time wavelet transform
  - Mallat algorithm
  - Implementation with filter banks
  - Design issues.
- Some applications of wavelets
  compression
  de-noising
  numerical solution of PDEs

By emphasizing the properties one can expect from wavelet methods, their advantages and limitations in diverse fields of application will be shown. This should enable the participants to develop a practical understanding and know - how of the wavelet techniques.

Part II Applications

- Application of the wavelet transform to computational electromagnetics.

  Multiresolution techniques based on wavelets have demonstrated their capability to reduce computation time and computer memory requirements in the modeling of electromagnetic structures; the use of wavelets also provides a natural approach to adaptive refinement of the computational domain in those regions of space where the electromagnetic fields and their derivatives require improved accuracy.

  The purpose of this part of the tutorial is to provide insight into the wavelet framework and to show how it can be an efficient tool for numerical modeling.

  In particular, wavelet based techniques will be discussed for the solution of electromagnetics problems formulated by both differential and integral equations, pointing out the advantages and drawbacks they provide, in contrast to the more traditional numerical methods.

Title: Introduction to Computational Simulation Techniques

Instructor: Dr. Bruce Archambeault

The world of computational electromagnetics has become more important than ever before due to the higher speed electronics in lower cost packages. There is a new set of tools available to the engineer, which allows a more accurate estimation of the electromagnetic effects of a system before that system is built. The old rules-of-thumb cannot be relied upon to ensure success.

This course provides a complete assessment of the various modeling techniques available today. An introduction to the Method of Moments (MoM), the Finite Difference Time Domain (FDTD) technique, the Finite Element Method (FEM), the Partial Element Equivalent Circuit (PEEC) technique and the Transmission Line Matrix (TLM) method will be presented.

Title: Basic Electromagnetic Modeling using the WIPL-D Code (http://wipl-d.com) (Morning session)

Instructors: Branko Kolundzija, University of Belgrade and Tapan Sarkar, Syracuse University

Background: The objective of this course is to present the integral equation formulation for electromagnetic scattering from lossy composite material bodies (both dielectric and magnetic) for analysis of various electromagnetic structures including antennas, scattering and modeling of RF devices. The application will be demonstrated using the commercially available code WIPL-D (structures composed of *Wi*res, *PL*ates and *D*ielectric or finite lossy material bodies). Attendees of this course will receive a demo version of this code. Please bring your computer with you to the course so that you an run some examples that are of interest to you.

The following materials will be covered:

- Theoretical background (field equations particularly representing the integral form, geometrical modeling, approximation of currents, Galerkin method).
- Description of WIPL-D entities, menus, commands and toolbars.
- Basic steps in using WIPL-D: problem definition, editing input data, running the analysis, inspection and checking the input data, printing, and exporting of results (in the form of tables and 2D and 3D graphs).
- Examples of electromagnetic modeling (using all the basic steps):
  1. metallic structures
  2. wire structures (single wire, single and multiple wire junctions, generators, plane waves)
  3. plate structures (single plate, single and multiple plate junctions)
  4. composite wire and plate structures (simple and combined wire-to-plate junction)
  5. dielectric and/or magnetic structures (homogenous, inhomogeneous, multi-layered, with and without losses)
  6. composite metallic and dielectric structures (multiple metallic and dielectric junction, coated plate, wire protruding dielectric surface, plate protruding dielectric surface)
  7. loadings (distributed and concentrated, skin-effect losses)

Title: Advanced Electromagnetic Modeling by WIPL-D Code (Afternoon Session)

Instructors: Branko Kolundzija, University of Belgrade and Tapan Sarkar, Syracuse University

- Using symmetry (plane and rotational) for analysis of various structures.
- Efficient modeling by Custom codes (symbolic dimensioning, objects, manipulations, import).
- Improving (checking) the quality and speed of the solution (integration accuracy, approximation of currents, matrix inversion, power balance)
- Advanced modeling of wire structure (end effects, feed area, coaxial line excitation, plate model)
- Modeling of microstrip structures on finite lossy material (dielectric/magnetic) substrates (single and double "edging", finite thickness metalization, finite ground plane, "imaging")
- Easy creation of structures by using a mouse, creation of grids and patterns.
- S-parameters de-embedding technique for numerically analyzed microwave circuits.
- Analysis of antennas above real ground.

Title: Time Domain EM Simulation with TLM (Full day)

Instructor: Prof. Wolfgang J.R. Hoefer

Abstract:

This Workshop will empower participants to tackle electromagnetic field problems using Electromagnetic Field Simulation Tools that yield dynamic field solutions in space and time. Background information suitable for understanding the operating principles and basic features of such tools will be provided. Typical field problems arising in analog microwave and high-speed digital circuits, antennas, cross talk, signal integrity, and rf/microwave heating will be solved to demonstrate its wide range of powerful problem-solving capabilities. Simulation examples will be demonstrated using TLM simulator MEFiSTo-3D Pro by Faustus Scientific Corporation.

Presentation Outline

1 Introduction
- 1.1 Historical and Scientific Background
- 1.2 Time Domain Modeling Principles

2 How does a Time Domain Simulator work?
- 2.1 The Nature of Time Domain Algorithms
- 2.2 The Structure of a Time Domain Simulator
- 2.3 Input and Output Features

Refreshment Break

3 Two- and Three-Dimensional Time Domain Modeling
- 3.1 2D/3D Structure Geometrical Editor
- 3.2 Space and Time Discretization
- 3.3 Excitation and Parameter Extraction
- 3.4 Field Display and Animation

Lunch Break

4 Two- and Three-Dimensional Time Domain Modeling
- 4.1 Accuracy, Errors and Their Reduction
- 4.2 2D and 3D Simulation Examples

Refreshment Break

5 Advanced Modeling Techniques
- 5.1 Radiation in Frequency and Time Domain
- 5.2 Dispersive and Absorbing Boundaries
- 5.3 The SPICE-EM hybrid modeling
- 5.4 Structure Synthesis by Monochromatic Injection
- 5.5 Advanced Simulation Examples

Discussion and Closure

Title: E3EXPERT, A Multi-Fidelity Computer Modeling and Simulation Tool for the EMI/C Analysis of Large, Complex Systems

Instructor: Andrew L. Drozd

Description:
This workshop/short course will provide an overview of a new computer modeling and simulation tool developed for the Air Force Research Laboratory which is used to analyze the EMI/C properties of large, complex systems. The tool leverages sophisticated visualization utilities, expert system software technologies, and graphical pre/post processing tools to facilitate CEM modeling and simulation tasks. The tool, called E3EXPERT, can be used to model diverse multi-spectral EM environments and co-site or intersystem interactions involving air and space vehicles, and ground-based systems. E3EXPERT can be used to predict EM interference and antenna jamming, and can specify interference cancellation requirements for co-located mobile wireless communications (including spread spectrum systems) and on/off-board sensors (e.g., high power radars). E3EXPERT provides a capability to compute coupling involving RF communications, network, and multi-spectral surveillance systems as part of RF battlespace information warfare simulations. RF battlespace scenarios are imported as "CAD" models comprised of satellite or aerial imagery combined with system platform CAD descriptions, which are then converted into CEM models. The tool provides for multi-fidelity simulation to analyze complex EM systems and scenarios in a coarse, conservative manner using a discrete system-level modeling approach and then applying more refined methods to the problem using hybrid MoM/UTD/FD codes. This technique is used to identify worst-case problem areas involving many EM radiators and then selectively analyze them in a high-fidelity manner to verify coupling margins. The code can be readily extended to include other CEM modeling tools and methods within its framework.

Title :Recent Advances in Finite Element Method for Computational Electromagnetics

Instructors:
Jian-Ming Jin, Center for Computational Electromagnetics, Department of Electrical and Computer Engineering, University of Illinois, Urbana, Illinois 61801-2991

Leo Kempel, Fraunhofer Center for Coating and Laser Applications, Department of Electrical and Computer Engineering, Michigan State University, East Lansing, Michigan 48824-1226

Course Outline:

During the past decade, significant advances have been made in the finite element method for computational electromagnetics. As a result, large and complex problems of scattering, antenna, and microwave circuit, devices, and cavities can be analyzed accurately and efficiently using the finite element method. Problems involving millions of unknowns have been handled on workstations and devices consisting of inhomogeneous anisotropic material have been simulated successfully. The major advances include: (1) the development of higher-order vector finite elements, which make it possible to obtain highly accurate and efficient solutions of vector wave equations; (2) the development of perfectly matched layers as an absorbing boundary condition; (3) the development of hybrid techniques that combine the finite element and asymptotic methods for the analysis of large and complex problems that were unsolvable in the past; (4) the development of fast integral solvers, such as the fast multipole method, and their integration with the finite element method; and finally (5) the development of the finite element method in time domain for transient analysis. The objective of this full-day short course is to summarize these advances and demonstrate the increased capabilities of the finite element methods to solve complex computational electromagnetics problems.

Topics will include: (1) introduction to the finite element method for electromagnetic analysis; (2) absorbing boundary conditions and perfectly matched layers; (3) adaptive ABC and hybrid finite element–fast boundary integral method; (4) novel hybridization of the finite element and boundary integral methods and a highly effective preconditioner; (5) fast finite element analysis of deep-cavity scattering; (6) fast finite element analysis of microwave devices; (7) higher-order vector finite elements for higher-order accuracy; (8) asymptotic waveform evaluation for broadband calculations; and (9) time-domain finite element analysis. Many numerical examples will be presented to demonstrate the finite element analysis of scattering, antennas as well as microwave devices and cavities.

The textbook is *The Finite Element Method in Electromagnetics, Second Edition,* by Jian-Ming Jin (John Wiley, NY, 2002).

Title: An Accessible Introduction to Fast Techniques in Computational Electromagnetics

Instructor: A. R. Baghai-Wadji Vienna University of Technology, Accelerated Computational Technology Group alireza.baghai-wadji@tuwien.ac.at

Based on illustrative examples the standard-, the fast- and the accelerated techniques in applied computational electromagnetics will be explained. The finite difference-, the conservative finite difference-, the finite element-, and the finite integral methods will be briefly reviewed. Our focus, however, will be on the multipole-, the multilevel multipole-, the multigrid-, and the wavelets-based analysis methods, and, even in much greater detail, the instructor's Fast-MoM.

We start with standard methods which will be introduced by carefully designed examples. The chosen examples will also serve to define the involved terms and notions, to identify the methods' shortcomings, and to demonstrate the urgent need for high performance computing techniques. The examples include problems in the electrostatic- and magnetostatic applications, the EM scattering on perfectly conducting objects with arbitrary shapes, the EM scattering on dielectric bodies, antenna radiation problems, RF-MEMS, EM cross-talk, electronic packaging, and photonic crystals.

In order to design fast techniques it is first necessary to have an adequate understanding of the underlying philosophy. The second part of our discussion is devoted to this end. First we develop concepts and tools to measure the complexity of computations, and then we discuss four fast algorithms for calculating (i) the product of integers, (ii) the multiplication of matrices, (iii) the discrete Fourier transform of signals, and (iv) the discrete convolution integrals. The course attendees will be then in a position to appreciate several novel and intriguing fast algorithms in the wavelet theory and, more generally, in the multiresolution analysis. This part of our presentation will be communicated entirely by diagrams, charts, and networks and, therefore, it will be most easily accessible to EM engineers.

In the third and final part of our discussion, we start with the multipole-, the multilevel multipole-, and the multigrid techniques, and then delve into the Fast-MoM. The analysis technique Fast-MoM uses moments of the Green's functions and their derivatives rather in a sophisticated manner and generates functions which are universal. The attribute *universal* is meant in the sense that these functions do not depend on the operating frequency, problems' geometrical features, and material parameters. The universal functions are, in addition, astonishingly smooth and, therefore, digitally easy to process. After introducing and constructing several universal functions, their smoothness property will be explained. We will present three alternative techniques for the construction of Green's functions and develop a library of universal functions for the applications mentioned above. Thereby, wavelets will be used not only to create universal

functions but also to store them. The formulations and computations will be explained in Matlab.

The FDTD Technique For EM Applications

Dr. Atef Z. Elsherbeni atef@olemiss.edu
Dr. Allen W. Glisson aglisson@olemiss.edu

This course will provide an overview of the finite difference time domain technique (FDTD) as applied in the electromagnetic and microwave arena.

Course Outline:

Basic formulation of time domain techniques
    Maxwell's equations in Cartesian coordinates
Difference approximations and Yee algorithm
Total vs. scattered field formulation
Numerical stability and dispersion
Types of sources and waveforms
Absorbing boundary conditions
Thin wire approximation
Near to far field transformation
Modeling of lumped elements
Non-uniform grid and sub-cell FDTD formulations
    Applications (microstrip antennas, crosstalk analysis in digital circuits, coplanar waveguide analysis, biological effects of hand held communication antennas)

Workshop on Antenna Analysis and Design Using The FDTD Technique

Dr. Atef Z. Elsherbeni atef@olemiss.edu
Dr. Allen W. Glisson aglisson@olemiss.edu

This workshop will start with demonstrations of 1D, 2D and 3D FDTD codes, followed by detailed examples for the analysis of printed microstrip and aperture antennas excited by either a microstrip transmission line or a coplanar waveguide feed. Attendee will be trained on using a 3D code for the analysis and design of printed antennas, coplanar waveguide structures, and radiation from thin wire structures. The 3D code is developed using Matlab release 13 running on PCs and consisting of many files that fits on a single floppy. Some of these files will be distributed in regular Matlab m-files format, and the others will be in the Matlab p-coded format. No imposed limitations on the distributed version of this 3D code, other than the memory size limitation of the machine that will be used to execute the code. Other 2D and 1D executable codes will be available for distribution if requested.

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