PRELIMINARY AGENDA

The 17th Annual Review of Progress in Applied Computational Electromagnetics
Naval Postgraduate School
19-23 March 2001

Technical Program Chair – Leo Kempel,   Symposium Co-Chairs - Edward Rothwell and Douglas Werner
Electronic Publication Chair – Atef Elsherbeni,   Vendor Chair – Tim Holzheimer,   Symposium Administrator – Richard Adler
Short Course Chair – John Schaeffer,   Publicity Chair – Keith Lysiak,   Conference Secretary – Pat Adler

MONDAY MORNING 19 MARCH 2001

0700 – 0730	**CONTINENTAL BREAKFAST** – (For Short Course and Workshop attendees only)	**Glasgow Courtyard**
0730 – 0820	**SHORT COURSE/HANDS-ON-WORKSHOP REGISTRATION**	**Glasgow 103**

0830 - 1630   **SHORT COURSE #1 (FULL-DAY)** - "Computational Electromagnetic Methods in Mobile Wireless Communication Design"   **IN 122**
Ray Perez, Jet Propulsion Laboratory

0830 - 1630   **SHORT COURSE #2 (FULL-DAY)** - "The Finite Difference Time Domain Technique for Electromagnetic Application"   **GL 102**
Atef Z. Elsherbeni and Allen W. Glisson, University of Mississippi

0830 – 1630   **SHORT COURSE #3 (FULL-DAY)** - "EMI/EMC Computational Modeling for Real-World Engineering Problems"   **ME Aud**
Omar Ramahi, University of Maryland and Bruce Archambeault, IBM

0830 - 1630   **SHORT COURSE #4 (FULL-DAY)** - "Scripting Electromagnetics Simulators in PYTHON", Eric Jones, Duke University   **IN 366**

0830 -1630   **SHORT COURSE #5 (FULL-DAY)** - "Electromagnetic Visualization", John Shaeffer, Marietta Scientific   **SP 101A**

MONDAY AFTERNOON

1400 – 1700	**CONFERENCE REGISTRATION**	**Glasgow 103**
1730	**BOARD of DIRECTORS MEETING**	**101A Spanagel Hall**

MONDAY EVENING

1900	**PUBLICATIONS COMMITTEE DINNER**

TUESDAY MORNING 20 MARCH 2001

0715 – 0745	**CONTINENTAL BREAKFAST**		**Glasgow Courtyard**
0745	**ACES BUSINESS MEETING**	**President Perry Wheless**	**GL 102**
0800	**WELCOME**	**Leo Kempel**, Michigan State University	**GL 102**
0815	**PLENARY SPEAKER:**	**Dr. David Koo**, Phillips Research Lab	**GL 102**

"Computational Electromagnetics: What Do We Need for Tomorrow?"

SESSION 1: STUDENT PAPER COMPETITION   **(No Parallel Sessions)**   **GL 102**
    Chair: Perry Wheless

0920   "Adaptive Numerical Modeling of RF Structures Requiring the Coupling of Maxwell's, Mechanical, and Solid-State Equations", N. Bushyager, B. McGarvey, & M.M. Tentzeris

0940   "Numerical Boundary Conditions at Material Interfaces for High-Order FDTD Schemes" K-P Hwang & A.C. Cangellaris

1000   "Mixed-mode Parallel Computations Applied to Paraxial Optics Involving a Thermally Self-Induced Inhomogeneous Medium", J.S. Hammonds, F. Saied, & M.A. Shannon

1020   "Some Aspects of Dispersion Analysis of Multiresolution", C.D. Sarris & L.P.B. Katehi

1040   "Performance Estimation for Conformal Phased Array Antennas for Given Gain and Pattern Requirements", D. Löffler & W. Wiesbeck

1100   **BREAK**

1120   "Hybrid Finite Element-Boundary Integral Method for Conformal Antennas on Prolate Spheroids: Preliminary Results" C. Macon & L.C. Kempel

1140   "Optimized Frequency Selective Surface Designs as Artificial Substrates for Reconfigurable Arrays" Y.E. Erdemli, Z. Li, D.E. Wright, R.A. Gilbert, & J.L. Volakis

1200   "A Self-Similar Fractal Radiation Pattern Synthesis Technique for the Design of Multi-Band and Broad-Band Arrays" M.A. Gingrich, D.H. Werner, & P.L. Werner

TUESDAY 20 MARCH 2001

SESSION 1: STUDENT PAPER COMPETITION (cont) GL 102

1220 "A Radiation Pattern Synthesis Technique for Conformal Antenna Arrays Mounted on Truncated PEC Circular Cylinders" R.J. Allard, D.H. Werner, & PL. Werner

1240 "Hierarchical Finite Element Basis Function Spaces for Tetrahedral Element", Y. Zhu & A. Cangellaris

1300 **LUNCH**

TUESDAY AFTERNOON

SESSION 2: **INTERACTIVE POSTER SESSION, VENDOR EXHIBITS, WINE & CHEESE TASTING**

1400-1630	**INTERACTIVE POSTER SESSION**	**Ballroom, Herrmann Hall**
1400-1900	**VENDOR EXHIBITS**	**Ballroom, Herrmann Hall**
1500-1700	**WINE AND CHEESE TASTING**	**Ballroom, Herrmann Hall**

INTERACTIVE POSTER SESSION **Ballroom, Herrmann Hall**
        Chair: Timothy Holzheimer

"Straightforward and Accurate Non-Linear Device Model Parameter Estimation Method Based on Vectorial Large-Signal Measurements" D. Schreurs, A. Beyer, B. Neuhaus, & B. Nauwelaers

"Some Observations on the Simulation of Periodic Structures", B. Neuhaus, D. Schreurs, P. Waldow, & A. Beyer

"Relative Accuracy of the Locally-corrected Nyström Method and the Method of Moments", A.F. Peterson

"Resonant Frequency and Q-Factor of Axisymmetric Composite Microwave Cavities", A.A. Kishk, D. Kajfez, & S. Chebolu

"Dielectric Properties of Biological Tissues Based on Multi-Term Debye Expression", A.Z. Elsherbeni & M.A. Eleiwa

"Fine Resolution Calculations of Energy Absorption in the Human Voxel Model, NORMAN", P.J. Dimbylow

"Effects of Antenna Separation on Antenna Factors and Gain Measurements", V. Rodriguez-Pereyra

TUESDAY EVENING: **BOARD OF DIRECTORS DINNER**

WEDNESDAY MORNING 21 MARCH 2001

| 0715 – 0800 | **CONTINENTAL BREAKFAST** | **Glasgow Courtyard** |
| 0815 | **PLENARY SPEAKER Prof. John Volakis**, University of Michigan "Fast Hybrid Methods and Their Application to EM Design" | **102 Glasgow Hall** |

SESSION 3: TIME DOMAIN INTEGRAL EQUATIONS (Parallel with Sessions 4, 5 & 6) GL 102
        Chairs: Shanker Balasubramaniam

0920 "A Fast Time-Domain Finite Element-Boundary Integral Method for 3-D Scattering", D. Jiao, A.A. Ergin, S. Balasubramaniam E. Michielssen, and J-M. Jin

0940 "Transient Finite-Elements for Computational Electromagnetics: Hybridization with Finite Differences, Modeling Thin Wires and Thin Slots and Parallel Processing", D.J. Riley

1000 "2D-FDTD Point Value Multiresolution Analysis for Maxwell's Equations", G. Antonini & A. Orlandi

1020 **BREAK**

1040 "Stable Solution of the Retarded Potential Equations", T. Abboud, J-C Nédélec, & J. Volakis

1100 "Optimization of Resistively-Loaded Wire Antennas in the Time Domain Using GA", M. Fernández Pantoja, A. Monorchio, A. Rubio Bretones R. Gómez Martín

1120 "FFT-based Acceleration of Marching-on-in time Methods (FFT-MOT), A.E. Yilmaz, D.S. Weile, J-M. Jin, & E. Michielssen

1140 **LUNCH**

SESSION 4: COMPUTATIONAL BIOELECTROMAGNETICS   (Parallel with Sessions 3, 5 & 6)   IN 122
Chairs: Maria Stuchly

0920   "A Method of Creating Whole Body FEM Models of Humans Which Are Adjustable to Different Postures", A. Nott

0940   "Integral Equation and Finite Difference Hybrid Method for Low Frequency Electric Induction", T.W. Dawson
S. Velamparambil, M.A. Stuchly

1020   **BREAK**

SESSION 5: FAST METHODS   (Parallel with Sessions 3 & 6)   IN 122
Chair: Donald Pflug

1040   "Efficient Computation of Potential Distribution in Layered Media using an Optimized Complex Image Prediction Model", R.M. Shubair

1100   "Analytic Preconditioner for the EFIE", H.F. Contopanagos, J.J. Ottusch, V. Rokhlin, J.L. Visher, & S.M. Wandzura

1120   "Volume Integral Equation Formulation for Scattering Using Conformal Finite Elements", K. Sertel & J.L. Volakis

1140   "Fast Inhomogeneous Plane Wave Algorithm for Three Dimensional Buried Object Problems", B. Hu & W.C. Chew

1200   **LUNCH**

SESSION 6: MOMENT METHODS   (Parallel with Sessions 3, 4 & 5)   ME Aud
Chairs: Kueichien Hill and Donald Pflug

0920   "Development and Application of Adaptive Basis Functions to Generate a Diagonal Moment Matrix for Electromagnetic Problems", M.L. Waller & S.M. Rao

0940   "Computation of Scattering from Bodies of Revolution Using an Entire Domain Basis Implementation of the Moment Method"
A.P. Ford & P.J. Collins

1000   "An Efficient Parallel MoM to Analyze Microstrip Structures", F. Cabrera, C.N. Ojeda-Guerra, E. Jiménez, J.G. Cuevas del Río
E.M. Macias-López, & A. Suárez

1020   **BREAK**

1040   "A Fringe Dual-Surface Magnetic Field Integral Equation for Three-Dimensional Structures with Nearby Sources"
E. Jørgensen, P. Meincke, & O. Breinbjerg

1100   "GMRES Iterative Solution of MFIE for Simple Scattering Geometries", S. Makarov & R. Vendantham

1120   **LUNCH**

WEDNESDAY AFTERNOON

SESSION 7: CAD BY WIPL-D CODE   (Parallel with Sessions 8, 9, & 10)   ME Aud
Chairs: John Asvestas and Branko Kolundzija

1320   "Analysis of Composite Metallic and Dielectric Structures WIPL-D Code", B. Kolundzija, J. Ognjanovic, T. Sarkar

1340   "Differential GPS Ground Reference Antenna for Aircraft Precision Approach Operations – WIPL Design", A.R. Lopez

1400   "Commercial Antenna Designs Using WIPL-D Code", J.M. Seavey

1420   "Comparison of Results for the NEC4, WIPL-D, and EIGER Antenna Modeling Programs", M. Stamm & J.K. Breakall

1500   **BREAK**

1520   "WIPL-D Compared With Theory and Experiment", C.A. Fernandes, C. Salema, & M. Silveirinha

1540   "Design and Analysis of Selected Antennas Using WIPL-D", R.H. Johnston & M. Okoniewski

1600   "Use of the WIPL-D and NEC4 Modeling Codes in the Design of a Specialized HF Antenna Feed for the 305 Meter Arecibo Radio Telescope"
M.W. Jacobs & J.K. Breakall

1620   "Analysis of a Hemispherical Dielectric Resonator Antenna With Very High Permittivity (ϵ_r=169) Using WIPL-D", S-M Jang, B. Kolundzija

SESSION 8: FINITE ELEMENT METHODS
Chairs: Jianming Jin and David Davidson

Parallel with Sessions 7, 9 & 10)   GL 102

1320   "A Higher-Order Time-Domain Finite Element-Boundary Integral Method for 3-D Scattering Analysis", D. Jiao, A.A. Ergin, B. Shanker
E. Michielssen, & J-M. Jin

1340   "Modeling Complex Waveguide Structures", P.R. Foster & S.M. Tun

1400   "LT/QN Vector Finite Elements for 3D Waveguide Analysis", D.B. Davidson

1420   "Hybrid Arbitrary Order Edge Based Finite Element Methods for Electromagnetic Scattering Problems"
M. Ainsworth, J. Coyle, O. Hassan, P.D. Ledger, K. Morgan, & N.P. Weatherill

1440   "Efficient Implementation of the Domain-Integrated Field Relations Method for Quasi-Static Magnetic Fields"
A.T. de Hoop, I.E. Lager, & G. Mur

1500   **BREAK**

1520   "Trefftz-Type Brick Finite Elements for Electromagnetics", Y. Shlepnev

1540   "Dissimilar Mesh Formulation for the Finite Element Boundary Integral Method", J. Meese & L.C. Kempel

1600   "A Block Solver for Parametric Studies with a Hybrid FE/BE Code", P. Soudais & P. Leca

1620   "Coupled Magnetoelastic FEM Formulation including Material Anisotropy and Magnetostriction Effects in Magnetostatic Problems"
O.A. Mohammed, T.E. Calvert, & R. McConnell

SESSION 9: EMC FOR REAL-WORLD APPLICATIONS
Chairs: Bruce Archambeault, Omar Ramahi, and Stanley Kubina

(Parallel with Sessions 7 & 8)   IN 122

1320   "Effects of Frequency and Scatterer's Shape on Heat Deposition: T-Matrix Approach", R.R. Canales, L.F. Fonseca, & F.R. Zypman

1340   "HEMCUVI: A Software Package for Electromagnetic Compatibility Analysis of On-Board Radiating Systems"
F. Obelleiro, J.L. Rodríguez, J.M. Taboada, J.M. Bértolo, & J. Revalderia

1400   "Improving Power/Ground Plane EMI Decoupling Performance above 400 MHz", B. Archambeault

1420   "Modeling the Characteristics of a CH-149 Helicopter Hybrid HF Antennas", S.J. Kubina, C.W. Trueman, & D. Gaudine

1440   "Simple and Efficient Full Wave Analysis of Electromagnetic Coupling in Realistic RF Multilayer PCB Layouts Using Cascaded Parallel Plate
Waveguide Model", M.R. Abdul-Gaffoor, H.K. Smith, A.W. Glisson, & A.A. Kishk

1500   **BREAK**

SESSION 10: NUMERICAL TECHNIQUES
Chairs: D.H. Werner and Stephen Schneider

(Parallel with Sessions 7 & 8)   IN 122

1520   "Computing Static Fields in 2.5-Dimensional Configurations based on Reduced Order Modeling", R.F. Remis & P.M. van den Berg

1540   "Accelerated Ray Tracing in Illuminated and Shadowed Areas on Discretized Structures", M. Sabielny, H-D. Brüns, & H. Singer

1600   "Comparison of Measured and Predicted Aircraft Patterns", T.M. Macnamara, C.M. Carnduff, & P.R. Foster

1620   "A Problem-Centric, User Oriented Approach To Computational Electromagnetics", G.F. Paynter, W.D. Burnside, & T.H. Lee

1640   "Modeling the Physical Optics Currents in a Hybrid Moment-Method-Physical-Optics Code"
J.M. Taboada, F. Obelleiro, J.L. Rodríguez, & J.O. Rubiños

WEDNESDAY EVENING

1830   **NO HOST BAR**   La Novia Terrace

1930   **AWARDS BANQUET**   La Novia Room

| 0715 – 0800 | CONTINENTAL BREAKFAST | Glasgow Courtyard |

0815   **PLENARY SPEAKER:**   Dr. Stephen Schneider and Dr. Kueichien Hill, AF Research Academy   Glasgow 102
"Validation with Measurements and CEM Requirements for Aerospace Applications"

SESSION 11: WAVELET AND TLM MODELING TECHNIQUES   (Parallel with Sessions 12, 13 & 14)   GL 102
Chairs: Manos Tentzeris and Zachi Baharav

0920   "Solution of Large Dense Complex Matrix Equations Using a Fast Fourier Transform (FFT) Based Wavelet-Like Methodology"
K. Kim & T. Sarkar

0940   "Direct Y-Parameters Estimation of Microwave Structures Using TLM Simulation and Prony's Method"
V. Chtchekatourov, F. Coccetti, & P. Russer

1000   "Design of a Planar Antenna for Millimetre-Wave Emitter Using TLM", K.P. Heppenheimer, L. Vietzorreck, & P. Russer

1020   **BREAK**

1040   "Acceleration Techniques for Time Domain TLM Algorithms", P.P.M. So & W.J.R. Hoefer

1100   "Application of Biorthogonal Interpolating Wavelets to Time-Domain Electromagnetic Filed Simulation", M. Fujii & W.J.R. Hoefer

1120   "Efficient Wavelet-Packet Transforms by Sorting Moment Method Matrices", J. von Hagen & W. Wiesbeck

1140   "Hybrid Modeling of Thermal Behavior of Metallic and Dielectric Objects Exposed to Waveguide Cavity Fields"
W. Liu, P.P.M. So, & W.J.R. Hoefer

1200   **LUNCH**

SESSION 12: APPLICATION OF FD-TD   (Parallel with Sessions 11, 13 & 14)   IN 122
Chair: Wenhua Yu and Michiko Kuroda

0920   "Numerical Investigation of the Performance of Unconditionally Stable ADI-FDTD Algorithm", E. Hu, P.P.M. So, M. Fujii, W.J.R. Hoefer

0940   "FDTD Studies of Waveguides in Photonic Crystal Slabs", M.M. Siglas, L. Mirkarimi A. Grot, E. Chow, C. Flory, & V. Wilson

1000   "An Application of Body Fitted Grid Generation Method with Moving Boundaries to Solve the Electromagnetic Field in a Moving Boundary"
M. Kuroda & S. Kuroda

1020   **BREAK** '

1040   "A Novel Dispersive FDTD Method for Modeling Chiral Media", A. Akyurtlu & D.H. Werner

1100   **LUNCH**

SESSION 13: OPTIMIZATION   (Parallel with Sessions 11 & 12)   ME Aud
Chairs: Dan Weile and Randy Haupt

0920   "Optimizing the Backscattering from Arrays of Perfectly Conducting Strips", R. Haupt & T.C. Chung

0940   "A Global Optimization Technique in the Synthesis of Reflector Antennas", O.M. Bucci, A. Capossoli, & G. D'Elia

1000   "Visual Confirmation Method of Convergence Using Improved Objective Function for GA-ICT Applied to Sector Antenna
Downsizing Optimization", T. Maruyama & T. Hori

1020   **BREAK**

SESSION 14: ANTENNA ARRAYS   (Parallel with Sessions 11 & 12)   ME Aud
Chair: Ross Speciale

1040   "Renormalization of the Scattering Matrix", R.A. Speciale

1100   "Suppression of Reflection and Cross-talk", R.A. Speciale

1120   "Pattern Synthesis of Onboard Array Antenna Using a Method of Moments Based Formulation"
F. Obelleiro, L. Landesa, J.M. Taboada, & J.L. Rodriguez

1140   "Optimization of Thinned Aperiodic Linear Phased Arrays Using Genetic Algorithms to Reduce Grating Lobes During Scanning"
M.G. Bray, D.H. Werner, D.W. Boeringer, & D.W. Machuga

1200   **LUNCH**

SESSION 15: H-INFINITY FOR ANTENNAS   **(Parallel with Sessions 16 & 17)**   **IN 122**
            Chairs: W. Stachnik and R. Malek-Madani

1320   "To Be Announced"

1340   "To Be Announced"

1400   "Optimal Impedance Matching by Lossless 2-Ports of Specified Degree Independent of Circuit Topology", J.C. Allen & D.F. Schwartz

1420   "Computing Performance Bounds for Wideband Impedance Matching", D.F. Schwartz & J.C. Allen

1440   "Design of Dual-Band Microstrip Antennas Using the Genetic Algorithm", H. Choo & H. Ling

1500   **BREAK**

1520   "Simultaneous Extrapolation in Time and Frequency Domains of Responses from Electromagnetic Systems", T.K. Sarkar

1540   "Fast Analysis of Microstrip Antennas and Arrays", J-M. Jin, F. Ling, & D. Jiao

1600   "H˙ Broadband Antenna Matching: Case Studies", J.C. Allen, L. Koyama, & D.F. Schwartz

SESSION 16: TIME DOMAIN METHODS   **(Parallel with Sessions 15 & 17)**   **GL 102**
            Chair: Joseph Shang

1320   "Time-Domain Finite-Element Beam Propagation Method with Perfectly Matched Layer Boundary Conditions for Photonic Crystal Waveguide Simulations", M. Koshiba

1340   "Test of Nonstandard Finite Difference Time Domain Technique: Near Fields for Three-Dimensional Mie Scattering" M. I. Haftel, & J.B. Cole

1400   "Extension of Large Scale FVTD Code for Treatment of Antenna Radiation", M.D. White

1420   "A Finite-Volume, Time-Domain CEM Code for Unstructured Grids on Massively Parallel Computers", J.A. Camberos

1440   "Convergence, Stability and Dispersion Analysis of Higher Order Leap-Frog Schemes for Maxwell's Equations" H. Spachmann, R. Schuhmann, & T. Weiland

1500   **BREAK**

1520   "Compact-Difference Based Schemes for Time-Domain Computational Electromagnetics", J.S. Shang

1540   "A Distributed Implementation of the Finite-Difference Time Domain (FDTD) Method", T. Baehr-Jones, M. Hochberg, & A. Scherer

SESSION 17: NEC MODELING   **(Parallel with Sessions 15 & 16)**   **ME Aud**
            Chair: Keith Lysiak

1320   "Automatic Wire-Grid Modeling of Complex Bodies to be Analyzed with NEC", J.M. Taboada, J.L. Rodríguez, & F. Obelleiro

1340   "The Effects of Rotor Modulation on a Sikorsky HH-60J Helicopter HF Communication Antenna", T. Firestone, K.J. Cybert D.D. Reuster, & M.E. McKaughan

1400   "USCG Aircraft – HF Antenna Study", K.J. Cybert, D.D. Reuster, R.B. Mead, & M.E. McKaughan

1420   "Numerical Modeling of an AS-145 Direction Finding Antenna", K. Lysiak & J. Signorotti

1440   **BREAK**

0700 – 0730	**CONTINENTAL BREAKFAST** (For Short Course and workshop attendees only)	**GLASGOW COURTYARD**
0730 – 0820	**SHORT COURSE/HANDS-ON-WORKSHOP REGISTRATION**	**GLASGOW 103**
0830 – 1130	**WORKSHOP #6 (HALF-DAY, MORNING) - "Basic Antenna Modeling Using NEC2 ('The ABC's of NEC')"** Mike Jacobs, PSU, for L. B. Cebik, (assisted by J. Breakall, PSU, J. Burke, LLNL, and R. Adler, NPS)	**RO 204**
1330 – 1630	**WORKSHOP #7 (HALF-DAY, AFTERNOON)** **"Advanced Antenna Modeling Using NEC-WIN PRO and GNEC: ('The Rest of the NEC Alphabet')"** J. Breakall and J. Burke (assisted by M. Jacobs and R. Adler)	**RO 204**
0830 – 1130	**SHORT COURSES #8 (HALF-DAY, MORNING) - "Frequency Selective Structures and Their Characterization Using Hybrid Finite Element Methods"**, J. Volakis, Y. Erdemili, H. Syed, U of Mich. R.Gilbert, BAE Syst.	**GL 102**
0830 - 1130	**SHORT COURSES #9 (HALF-DAY, MORNING) - "Overview of Numerical Computational Methods in Electromagnetics"**, J. Karty, The Boeing Co.	**IN 122**
0830 – 1130	**SHORT COURSES #10 (HALF-DAY, MORNING) - "Wavelets in Electromagnetics"** N. Ida, U of Akron, (with M. Raugi and S. Barmada)	**ME Aud**

Monday, 19 March 2001

0830 – 1630 **SHORT COURSE #1** (Full Day)

"Computational Electromagnetic Methods in Mobile Wireless Communication Design", Ray Perez, Jet Propulsion Laboratory

The basis of this course is to illustrate the different computational electromagnetic methods that can be used in designing and analyzing mobile wireless communication hardware and problems respectively. The objective of this course is threefold: a) provide students with the most salient research topics in the constantly evolving field of mobile wireless communications, b) to equip prospective students with a knowledge of what types of mobile wireless design are feasible to address using electromagnetic computational techniques, c) provide detail examples on the usage of electromagnetic computational methods (CEM) in the design of wireless communications components.

Major Topics.

1. Brief Review of the strengths and deficiencies of CEM techniques such as MOM, FDTD, FEM, and GTD/UTD in addressing different types of problems.
2. The use of CEM in addressing interference in wireless mobile systems.
3. The use of CEM in smart antennas design (base stations, mobile, PCS, bluetooth, and satellite antennas)
4. Design techniques for RF components assisted with CEM methodologies
5. Design techniques for Digital components assisted with CEM methodologies
6. The role of CEM in propagation models
7. Bioelectromagnetics
8. System level designs and CEM.
9. Present Business Opportunities

0830 – 1630 **SHORT COURSE #2** (Full Day)

"The Finite Difference Time Domain Technique for Electromagnetic Applications", Atef Z. Elsherbeni and Allen W. Glisson, University of Mississippi

This course will provide an overview of the finite difference time domain technique (FDTD) as applied to antennas and microwave devices. The first half of the course will be dedicated to the basic theories for developing a working algorithm. Among the topics to be covered are: Maxwell's equations in Cartesian coordinates, difference approximations, Yee algorithm, total vs. scattered field formulation, numerical stability, numerical dispersion, plane wave representation, types of sources, types of waveforms, absorbing boundary conditions, thin wire approximation, near to far field transformation, dispersive media, and modeling of lumped elements. The second half of the course will be dedicated to presenting examples of how to apply the FDTD technique for analyzing antennas, cross talk in digital circuits, and biological effects of handheld communication antennas. The attendee will receive 1D, 2D, and 3D educational codes with graphical user interfaces.

Monday, 19 March 2001

0830 – 1630 **SHORT COURSE #3** (Full Day)

"EMI/EMC Computational Modeling for Real-World Engineering Problems", Omar M. Ramahi, University of Maryland and Bruce Archambeault, IBM

The world of EMI/EMC compliance has become more important than ever before due to several technological advances such as high-speed processors and low cost packaging. The 'old ways' of using design rules and then fixing the EMI problems after the product is built, are not acceptable in today's highly competitive development environment. Designs must be cost effective, and must pass regulatory requirements the first time through the design cycle. All this makes modern electromagnetic analysis tools highly indispensable to EMI/EMC engineers.

There are several electromagnetic tools available to EMI/EMC engineers. These tools, which are based on the FDTD method, the MoM, or the Finite Elements method (or even other techniques) allow a better and more accurate estimation of the EMI/EMC effects of a system before it is built. These tools were conceived and developed, for the most part, by electromagnetic engineers working in the areas of radar cross section studies and scattering. Adapting these tools to solve real-world EMI/EMC engineering design problems takes a different perspective. For instance, modeling aspects that were irrelevant in other areas, such as the essence of radiating sources, become highly crucial in EMI/EMC studies.

In this course, we present a summary of the most popular numerical modeling techniques. However, we depart from the classical, and mostly academic, presentations and emphasize the modeling aspects that have direct relevance on practical and meaningful modeling. The discussion will be focused on how to use the available tools to obtain meaningful results rather than on how to develop or advance the tools.

EMI/EMC analyses typically involve a very wide band of frequency. This creates the immense challenge of developing numerical models that remain reasonably accurate over a relatively wide frequency band. These challenges will be discussed and practical remedies will be suggested.

Several detailed examples will be presented showing how to create real-world models. Radiated emissions, radiated susceptibility and ESD are all discussed and demonstrated with *real-world* problems. We conclude this course with a discussion of model validation techniques and present standard modeling problems that allow engineers to evaluate commercial software packages.

0830 – 1630 **SHORT COURSE #4** (Full Day)

"Scripting Electromagnetics Simulators in PYTHON", Eric Jones, Duke University

PYTHON is an open source, platform independent scripting language that has a wealth of general-purpose libraries. It is elegant, easy to use, and possesses numeric features similar to those of MATLAB. These traits, along with its ability to "wrap" legacy FORTRAN and C routines, make PYTHON perfect as an electromagnetic simulation environment. The first half of this tutorial will cover the PYTHON language and several libraries highlighting its numeric, plotting, and 3D visualization capabilities. The second half will introduce a new open source MoM code for dielectric and PEC targets in a half-space media from Duke University. Interfaces to NEC and an advanced MLFMA code are also discussed. Examples illustrating genetic antenna design and web integration are presented.

Morning:
1. Demo of EM codes and their PYTHON interface -
2. Installation help for those who wish
3. Introduction to interpreter environment
4. Basic PYTHON data types
5. PYTHON Control Structures
6. Built-in Libraries
7. Plotting and Visualization
8. Wrapping C/FORTRAN code

Afternoon
1. Introduction to NEC interface
2. Halfspace MoM/MLFMA interface
3. GA optimization of Antennas in PYTHON

Monday, 19 March 2001

0830 – 1630 **SHORT COURSE #5** (Full Day)

"Electromagnetic Visualization" John Shaeffer, Marietta Scientific

Visualization in electromagnetics is required if we are to truly understand the specific physics which govern our designs and thus enable us to optimize system performance. Just because we can solve Maxwell does not mean that we understand Maxwell. Typically we just compute an antenna or scattering plot for comparison to measurement. This is unfortunate because within our computational models is a treasure trove of physical information that can significantly help our physical understanding.

This course will focus on frequency domain visualization applications with OpenGL graphical approaches for geometries, currents, near fields, and far field patterns.

The afternoon session will focus on Bistatic k-Space Imaging for the frequency domain which enables us to compute radiation / scattering centers without doing a frequency sweep. This provides a significant amount of diagnostic / physical information without having to re-compute a solution over a bandwidth of frequencies (which for most MOM code applications would become prohibitive).

Friday, 23 March 2001

0830 – 1130 **WORK SHOP - 1 #6** (Half Day – Morning)

"Basic Antenna Modeling Using NEC2 ('The ABC's of NEC')", Mike W. Jacobs (for L. B. Cebik) assisted by Jim Breakall, Jerry Burke and Richard Adler

The mastery of NEC-2, the most-used method-of-moments antenna modeling code, begins with a command of modeling language and familiarity with the elements of a "thin-wire" model. Students will learn how to develop antenna models by instruction and hands-on experience, using their workstations. Topics include: creating antenna geometry; segmenting wire models; placing sources loads and transmission lines; selecting proper ground systems; specifying azimuth and elevation pattern plots, frequency sweeps; determining source impedance and VSWR; testing antenna models via convergence and average gain tests and using the extensive tabular data produced by NEC-2. Using NEC-Win Plus to design antennas via the use of equations completes the list of topics. Students will have an opportunity to purchase NEC-Win Plus, NEC-Win Pro or GNEC at reduced prices.

1330 – 1630 **WORK SHOP - 2 #7** (Half Day - Afternoon)

"Advanced Antenna Modeling Using NEC-WIN PRO and GNEC - ('The Rest of the NEC Alphabet')", Jim Breakall and Jerry Burke assisted by M. Jacobs and Richard Adler.

This workshop introduces the full set of features in NEC2 and in NEC4. It follows the BASIC ANTENNA MODELING USING NEC2 workshop and is intended for users who need to fully exploit the Windows-based graphical user interface (GUI) shells of NEC-Win Pro and GNEC. Students will be guided through this family of codes using a hands-on approach that employs many example problems. They will also be given additional antenna modeling projects to complete on their own and in team settings. Students will have the opportunity to interact with instructors in one-on-one situations, and are encouraged to bring their own problems to present to the instructors and the class. Attendees may purchase NEC-Win Plus, NEC-Win Pro or GNEC at reduced prices.

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Friday, 23 March 2001

0830 – 1130 **SHORT COURSE #8** (Half Day)

"Frequency Selective Structures and Their Characterization Using Hybrid Finite Elements Methods"
J. L. Volakis*, R. Gilbert++, Y. Erdemli*, H. Syed*, *University of Michigan, ++BAE Systems

Frequency selective surfaces (FSS) are periodic structures widely used as filters for antenna radomes, either in planar or non-planar form. FSS have also been used to construct artificial substrates to enhance antenna performance. More recently, frequency selective volumes as is the case with Periodic Bandgap (PBG) structures have gained interest for various antenna and microwave applications.

This half-day short will focus on the characteristics, properties and analysis of frequency selective structures. A survey of the various FSS elements will be presented and their characteristics will be discussed. We will also cover equivalent circuits, multilayer configurations and applications of frequency selective surfaces (as superstrates and substrates) to enhance antenna performance. The analysis of periodic structures requires adaptable and robust computational tools such as the hybrid finite element method. We will present the basics of this approach for periodic structures and antenna array characterizations (formulations and modeling approaches). In addition, w
e will present optimization approaches in connection with fast O(N) hybrid finite element algorithms for design purposes.

0830 – 1130 **SHORT COURSE #9** (Half Day)

"Overview of Numerical Computational Methods in Electromagnetics ", Janice Karty, The Boeing Company

There are several Computational Electromagnetics (CEM) tools available to the Radar Cross Section (RCS) engineer for the evaluation and reduction of target signatures. This summary course of popular numerical modeling techniques is designed for both the beginning and intermediate audience. Emphasis will be on fundamental concepts and physical mechanisms. The objective of this course is twofold: to summarize methods applicable to RCS analysis and design, and to provide guidelines for use of the various CEM techniques. It is expected that after taking this course, participants will be better able to identify appropriate algorithms and codes for meaningful analysis of air, land and sea vehicles. Several examples will be discussed for real world models, including applications to both scattering and radiation. Among the topics to be covered are: physical optics, edge diffraction, method of moments, finite element methods, hybrid techniques, and model preparation/gridding issues.

Friday, 23 March 2001

0830 – 1130 **SHORT COURSE #10** (Half Day)

"Wavelets in Electromagnetics", Nathan Ida, University of Akron, with Marco Raugi, Sami Barmada

Part I Theory 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 giving special attention to the properties that 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 modelling 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 equation, pointing out the advantages and drawbacks they provide, in contrast to the more traditional numerical methods.

CONFERENCE - SHORT COURSES - WORKSHOPS REGISTRATION

17TH ANNUAL REVIEW OF PROGRESS IN APPLIED COMPUTATIONAL ELECTROMAGNETICS
March 19-23, 2001 - Naval Postgraduate School, Monterey, CA

I. CONFERENCE PRE-REGISTRATION FORM

Please print (Black ink)   (NOTE: CONFERENCE REGISTRATION FEE DOES NOT INCLUDE ACES MEMBERSHIP FEE OR SHORT COURSE FEE)

Last Name   First Name   Middle Initial

Company/Organization/University   Department - Mail Station

Mailing Address: Street Address - P.O. Box # - Apartment #. etc.

City   Province/State   Country   Zip/Postal Code

Telephone   Fax   E-mail   Amateur Radio Call Sign

		BY 3/1/01		3/2/01 - 3/13/01		3/14-3/23/01
ACES MEMBER	☐	$310	☐	$325	☐	$340
NON-MEMBER	☐	$365	☐	$380	☐	$395
STUDENT/RETIRED/UNEMPLOYED	☐	$130 (no proceedings)	☐	$130	☐	$130
STUDENT/RETIRED/UNEMPLOYED	☐	$165 (includes proceedings)	☐	$165	☐	$165
BANQUET ☐ Meat ☐ Fish	☐	$ 35	☐	$ 35	☐	$ 35

Total for Section I - _____

II.   ACES '2001 SHORT COURSES AND HANDS-on-WORKSHOPS REGISTRATION

		by 3/1		3/2-3/13		3/14-3/23
1.	Computational Electromagnetic Methods in Mobile Wireless Communications Design (full-day) Monday, March 19, R. Perez	☐ $160	☐	$175	☐	$190
2.	The Finite Difference Time Domain Technique for Electromagnetic Applications (full-day) Monday, March 19, A.Z. Elsherbeni and A.W. Glisson	☐ $160	☐	$175	☐	$190
3.	EMI/EMC Computational Modeling for Real-World Engineering Problems (full-day) Monday March 19 O.M. Ramahi and B. Archambeault	☐ $160	☐	$175	☐	$190
4.	Scripting Electromagnetics Simulators in PYTHON (full-day) Monday, March 19, E. Jones	☐ $160	☐	$175	☐	$190
5.	Electromagnetic Visualization, (full-day) Monday March 19, J. Shaeffer	☐ $160	☐	$175	☐	$190

6.	Basic Antenna Modeling Using NEC2 (The ABC's of NEC) **Workshop** (half-day - Friday morning), March 23, Mike Jacobs, (for L.B. Cebik) assisted by J. Breakall, J. Burke, and R.W. Adler	☐	$120	☐	$135	☐ $150
7.	Advanced Antenna Modeling Using NEC-WIN PRO and GNEC (The Rest of the NEC Alphabet) **Workshop**, (half-day - Friday afternoon) March 23 J. Breakall, J. Burke, assisted by Mike Jacobs and R.W. Adler	☐	$120	☐	$135	☐ $150
8.	Frequency Selective Structures and their Characterization Using Hybrid Finite Elements Methods, (half-day - Friday morning) March 23 J.L. Volakis, R. Gilbert, Y. Erdemli, H. Syed	☐	$100	☐	$115	☐ $130
9.	Overview of Numerical Computational Methods in Electromagnetics, (half-day-Friday morning) March 23 J. Karty,	☐	$100	☐	$115	☐ $130
10.	Wavelets in Electromagnetics - (half-day-Friday morning) March 23 N. Ida and M. Raugi	☐	$100	☐	$115	☐ $130

Total for Section II-_____

TOTAL PAYMENT

Include all Applicable Fees Here

Section I   _____
Section II   _____
Total Remittance Submitted (U.S. Dollars Only): _____

Non-USA participants: Prices are in U.S. dollars. All currencies must be converted to U.S. dollars payable by banks with U.S. affiliates. (1) **Bank Checks**, if (a) drawn on a U.S. Bank, (b) Have U.S. Bank address, (c) contain series of (9) digit mandatory routing numbers: (2) **Traveler's Checks** (in U.S. $$): (3) **International Money Order** drawn in U.S. funds, payable in U.S.: (4) **Credit Cards:** Visa, MasterCard, Discover and AmEx. **Send Payment to**: Richard W. Adler, Code EC/AB, Naval Postgraduate School, 833 Dyer Road, Room 437, Monterey, CA 93943-5121.

PAYMENT SHOULD ONLY BE MADE PAYABLE TO: "ACES"
Method of payment

☐ Bank Check for the total amount (payable to ACES).
☐ Traveler's Check for total amount (payable to ACES)
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☐ Credit Card: ☐ MasterCard   ☐ Visa   ☐ Discover   ☐ AMEX

Credit Card Number _____

Expiration Month ____ Year ____

Print name _____   Sign name _____

Address _____

City/State/Country/Zip/Postal Code _____

MOTELS / HOTEL LIST FOR MARCH 2001 ACES SYMPOSIUM

19-23 MARCH 2001

** (WITHIN WALKING DISTANCE OF NPS)

FIRESIDE LODGE (**)   (1 star)
1131 10th St. Monterey, CA 93940
Phone: (831) 373-4172 FAX: (831) 655-5640
Rates: **Govt.** $89.---**Conf.** $89 + tax

STAGECOACH MOTEL (**)   (1 Star)
1111 10th St. Monterey, CA 93940
Phone: (831) 373-3632 FAX: (831)-648-1734
Rates: **Govt.** $74.---**Conf.** $79 + tax

MONTEREY BAY LODGE (**)   (2 Star)
55 Camino Aguajito, Monterey, CA 93940
Phone: (831) 372-8057 FAX:(831) 655-2933
Rates: **Govt.** and Conf. $44.10 + tax

MONTEREY HILTON (**)   (3 Star)
1000 Aguajito Rd. Monterey, CA 93940
(831) 373-6141 FAX: (831)375-2367
Rates: **Conf.**$139. + tax (no govt. rates)

HYATT HOTEL & RESORT (**) (4 Star)
1 Old Golf Course Rd. Monterey, CA 93940
Phone: (831) 372-1234 FAX: (831)-375-6985
Rates: **Govt.** $75.- 146; **Conf.** $159 + tax

**Most motel/hotel rates apply
to Monday through Thursday!**

(1) MOTELS **WEEKEND RATES MAY BE HIGHER** THAN WEEKDAYS.   (2) **MENTION THAT YOU ARE ATTENDING THE "ACES" CONFERENCE** AT NPS WHEN BOOKING (3) CUT OFF DATE FOR CONFERENCE RATES IS USUALLY ONE MONTH PRIOR TO START OF CONFERENCE. (CHECK WITH THE HOTEL IF YOU NEED SPECIAL ARRANGEMENTS) (4) **ATTENDEES ON GOVT ORDERS DO NOT PAY TAX.** ATTENDEES PAYING CONF. RATE, PAY TAX. (5) **PRICES GIVEN ARE FOR ONE PERSON, ONE BED.**

IMPORTANT INFORMATION FOR ACES ATTENDEES, PLEASE READ.

Hotel room tax exemption requires all of the following documents: (1) Travel Orders, (2) Payment by government issued AMEX/VISA card; (3) Govt./Military identification. Regarding Govt orders: prevailing perdiem lodging rate at time of arrival will be honored. Attendees on Govt. orders do NOT pay city tax; every other attendee pays city tax!

When you book a room, mention that you are attending the **"ACES"** Conference, at NPS, and ask for either Government, or Conference rates.

There is NO Conference PARKING at the Naval Postgraduate School or on nearby streets, so we advise you to book a room within walking distance, or plan to use a taxi.

Third Street Gate is the closest "open" gate to the Conference Registration location . The Ninth Street gate is always open.

AIRLINE INFORMATION

The following airlines make connections from Los Angeles and San Francisco, CA. to Monterey: United. Express, and American Eagle, both fly a 30-34 passenger, Prop Jet airplanes. American Eagle, serves Los Angeles to Monterey, but not San Francisco to Monterey. There is no airline connection directly from San Jose, CA to Monterey, CA.

FLYING FROM SAN JOSE OR SAN FRANCISCO? MONTEREY/SALINAS AIRBUS

Departs every two hours from San Francisco for San Jose Airport, Salinas, and Monterey. Rate is $30.00 per person, one way. Reservations recommended. Cash/credit cards accepted. Departs SFO 7, 9, 11 AM; 1, 3, 5, 7, 9, and 11:15 PM. For more information, phone 831-883-2871. www.montereyairbus.com

THINGS TO DO AND SEE IN THE MONTEREY BAY AREA

There are many activities for children and adults not attending the Conference. The colorful blue Monterey Bay is a vision of historic Monterey, rich with natural beauty and many attractions from Fisherman's Wharf, (be sure to try the seafood cocktails), to Cannery Row, the Monterey Adobes and city parks, the Monterey Bay Aquarium, Maritime Museum of Monterey, and Pacific Grove Museum of Natural History. The "Artichoke Capital of the World" is only 15 miles from Monterey, in Castroville.

Other things to do include: driving the 17-Mile Drive in Pebble Beach; Whale watching, bicycle riding, roller blading, surfing, ocean kyaking, in Pacific Grove; taking a stroll on the white sandy beach in Carmel, a visit to Mission San Carlos Borromeo Del Rio Carmelo, in Carmel, etc. The Monterey Peninsula has 20 Golf Courses. Carmel has many Art Galleries. Wine tasting tours might be available. For more information, call the Monterey Peninsula Chamber of Commerce, Visitors and Convention Bureau at (831) 649-1770.