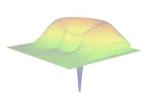# ACES
Applied Computational Electromagnetic Society

ACES Web Site: *http://aces.ee.olemiss.edu*

The 20th Annual Review of Progress in Applied Computational Electromagnetics, April 19-23, 2004

Sheraton Syracuse University Hotel and Conference Center Syracuse, New York

The 20th Annual Review of Progress in Applied Computational Electromagnetics Symposium will be held in the Sheraton Syracuse University Hotel and Conference Center in Syracuse, New York. The Sheraton hotel will accommodate all the technical sessions on the same floor and the lodgings for all the attendees. It is an ideal opportunity to participate in a large gathering of EM analysis enthusiasts. The purpose of the Symposium is to bring developers, analysts, and users together to share information and experience about the practical application of EM analysis using computational methods. The symposium offers more than 150 technical presentations of all aspects of electromagnetic computational analysis and applications. The technical presentations will be offered on Monday to Thursday in two parallel sessions in the morning and afternoon. Short courses will be offered on Sunday April 18, and on Friday April 23. A **$500** prize will be awarded to the authors of the best non-student paper presented (poster or oral) at the 20th Annual Review. Papers will be judged by the ACES prize-paper committee. Additionally, the best three (**3**) student papers presented at the 20th Annual Review will be announced at the symposium banquet. Student papers submitted for this competition will be judged by three (3) members of the ACES Board of Directors. The first, second, and third winners will be awarded cash prizes of **$300, $200**, and **$100**, respectively.

The Sheraton Hotel is located at 801 University Avenue, Syracuse, New York 13210. For reservation, call (315) 475-3000 and mention the **Meeting Code : 4162** . For any additional information, including travel and lodging, please contact the conference Chair: **Tapan K. Sarkar (tksarkar@syr.edu, Tel: 315-443-3775, Fax: 315-443-4441)**, or visit ACES web site at: http://aces.ee.olemiss.edu

The latest conference agenda is available at ACES site. It is recommended to check the site regularly for last minutes updates.

ACES 2004

The 20th Annual Review of Progress in Applied Computational Electromagnetics

PRELIMINARY AGENDA

Syracuse University
April 19-23, 2004

Symposium Chair: **Tapan K. Sarkar**

Symposium Co-Chair: **Atef Elsherbeni**

Symposium Administrator: **Richard W. Adler**

Short Course Chair: **John Shaeffer**

Exhibits Chair: **Andrew L. Drozd**

Publicity Chair: **Omar M. Ramahi**

Feb 11, 2004

Sessions

	Session Title	Papers	Chair
1	Applications of FEKO	8	
2	Electromagnetic Modeling	10	
3	Computational Techniques	10	
4	Advanced Computational Techniques for Antenna Design	10	
5	High-Speed Interconnects: modeling and simulation	6	
6	Black Box Modeling	5	
7	Optimization of Complex EM problems	9	
8	Electromagnetic Applications for the DoD	10	
9	FDTD and Applications	10	
10	Advances in CEM	8	
1	Advances in Finite-Difference Time Domain Modeling	10	
12	Recent Advances in Time Domain Modeling Techniques	10	
13	Smart Antennas and Computational Electromagnetics	10	
14	Bianisotropic and Metamaterial	10	
15	Higher Order Methods	10	
16	Electromagnetic Modeling Using WIPL-D Code(I)	10	
17	Electromagnetic Modeling Using WIPL-D Code(II)	8	

Regular Sessions Overview By Day

Date	AM		PM	
	Session I	Session II	Session I	Session II
Mon	8:05 opening Remarks 8:10-9:50 (4) break 10:20-12:00 (4) **Application of FEKO (8)**	8:05 opening Remarks 8:10-9:50 (4) break 10:20-12:20 (6) **Electromagnetic Modeling (10)**	1:25 opening Remarks 1:30-2:50 (4) break 3:20-5:20 (6) **Bianisotropic and Metamaterial (10)**	11:25 opening Remarks 1:30-2:50 (4) break 3:20-5:20 (6) **Advances in Finite-Difference Time Domain Modeling (10)**
Tue	8:05 opening Remarks 8:10-9:50 (4) break 10:20-12:20 (6) Computational Techniques (10)	8:05 opening Remarks 8:10-9:50 (4) break 10:20-12:20 (6) **Advanced Computational Techniques for Antenna Design (10)**	1:25 opening Remarks 1:30-2:50 (4) break 3:20-5:40 (7) **Black Box Modeling (5)** **High-Speed Interconnects: modeling and simulation (6)**	1:25 opening Remarks 1:30-2:50 (4) break 3:20-5:20 (6) **Smart Antennas and Computational Electromagnetics (10)**
Wed	8:05 opening Remarks 8:10-9:50 (4) break 10:20-12:20 (6) **Electromagnetic Modeling Using WIPL-D Code(I) (10)**	8:05 opening Remarks 8:10-9:50 (4) break 10:20-12:20 (6) **Recent Advances in Time Domain Modeling Techniques (10)**	1:25 opening Remarks 1:30-2:50 (4) break 3:20-5:20 (4) **Electromagnetic Modeling Using WIPL-D Code(II) (8)**	1:25 opening Remarks 1:30-2:50 (4) break 3:20-5:20 (4) **Advances in CEM(8)**
Thu	8:05 opening Remarks 8:10-9:50 (4) break 10:20-12:20 (6) **Higher Order Methods (10)**	8:05 opening Remarks 8:10-9:50 (4) break 10:20-12:20 (6) **Electromagnetic Applications for the DoD (10)**	1:25 opening Remarks 1:30-2:50 (4) break 3:20-5:20 (6) **FDTD and Applications (10)**	1:25 opening Remarks 1:30-2:50 (4) break 3:20-5:00 (5) **Optimization of Complex EM problems (9)**

List of Papers by Session

1. Applications of FEKO (8)

Paper #	Author	Title
904175	Ulrich Jakobus	Overview of Recent Extensions in the Electromagnetics Computer Code FEKO and their Application
92004100477	James S. Turner	Modeling the New Arecibo Dual Band High Frequency (HF) Facility
904136	Averty Florent	Characterization of focusing properties of a homogeneous lens and design of its primary source with software
904162	Masanobu Hirose	Antenna Pattern Comparison of a Microstrip Antenna on a Finite Substrate Using Near-Field Measurement and FEKO
904269	FJC Meyer	Introducing the Finite Element Method into the Commercially Available
904177	C. Babu Ravipati	Analysis and Design of Broad-band and Multi-frequency Antennas using FEKO
904252	Mazen K. Alsliety	A Comparative Study of Different Methods for Computing Circular Polarization Gain
904182	Nickolai Zhelev Kolev	Design of a Microstrip Conform GPS Patch Antenna

2. Electromagnetic Modeling (10)

Paper #	Author	Title
92004100465	Surendra Singh	Application of an iterative method for the solution of electromagnetic scattering from wire antennas
904284	Ehab K. I. Hamad	A Proposed pi-Structure RF MEMS Switch for Wide Bandwidth and High Isolation Applications
904295	Giuseppe Conciauro	Planar Model of RF MEMS Shunt-Capacitive Switches
904301	Alexander B. Yakovlev	Electric Dyadic Green's Function for an Ideal Hard Surface Circular Waveguide
904166	BAGHAI-WADJI, Alireza	On the Factorization of Potential Functions without Utilizing the Addition Theorem
904171	BAGHAI-WADJI, Alireza	Analysis of Electromagnetic Waves in Axially-periodic Structures in Cylindrical Co-ordinates
904272	M. T. Buber	Non-constant speeds of light in vacuum
904248	Steven R. Best	A Comparison of the Quality Factors of Impedance Matched
904223	Steven R. Best	Modeling a Slotted Multiband Gasket Monopole Antenna Using NEC
904312	Magdy F. Iskander	New Ray-Tracing Techniques and Propagation Modeling for Challenging Communication Environments

3. Computational Techniques (10)

Paper #	Author	Title
904207	Jason D Morsey	A broadband, low storage preconditioning scheme based on reduced coupling for full-wave method of moments solvers
92004100466	Guowei Wei	A wavelet-collocation approach for computational electromagnetics
92004100467	Guowei Wei	A wavelet-collocation method for solving the Helmholtz equation with high wavenumbers
904233	Debalina Ghosh	Hybrid Method for the Generation of Wideband Electromagnetic Response for Composite Bodies
904228	YUNHUI CHU	Large-Scale Computation for Low-Frequency Problems
904193	Keli Sun	Fundamental Mode Approach to Forward Problem Solutions in EMI Scattering ---- Inferring fundamental solutions from training data
904183	Branislav M. Notaros	Higher Order Geometrical Modeling and Higher Order Field/Current Modeling in FEM, MoM, and PO Simulations
904285	Ayan Kumar Bandyopadhyay	Improving the Numerical Efficiency of Generalized Multipole Technique by Non-redundant Multipole Choices
904238	B. Shanker	Fast multipole augmented analysis of scattering from dielectric objects using the single integral equation
904299	Baek Ho Jung	Analysis of Scattering from Three-Dimensional Conducting Bodies Coated with a Dielectric Material

4. Advanced Computational Techniques for Antenna Design (10)

Paper #	Author	Title
904114	Andreas Rennings	A compact single/dual-band printed inverted-F type antenna structure
92004100469	Antonije Djordjevic	Rigorous analysis of coaxially-fed collinear arrays
904201	Atef Elsherbeni	Wideband Bow-Tie Slot Antennas with Tapered Tuning Stubs
904106	Kazuhiro Hirasawa	A Broadband Flat Dipole Antenna with an Asymmetrical Feed
92004100463	LI Long	A Progressive Numerical Method Combined with MoM for a Fast Analysis of Slot Antenna Array
904108	Manju Paulson	Computer-Aided Design of Dual Frequency Arrow shaped Microstrip Antenna
904105	Pasi Ylä-Oijala	Analysis of Microstrip and Patch Antennas by the Method of Moments and RWG Basis Functions
904203	Vicente Rodriguez	DESIGN OF A NEW BROADBAND DOUBLE RIDGE GUIDE HORN FOR ELECTROMAGNETIC COMPATABILITY TESTING HAVING A SINGLE MAIN LOBE
904273	Serhend Arvas	GROUP VELOCITY FOR AN IDEAL DIPOLE
92004100470	Antonije Djordjevic	Multiband modem antenna for cellular networks

5. High-Speed Interconnects: modeling and simulation (6)

Paper #	Author	Title
904213	Dharmendra Saraswat	Fast Passive Macromodeling of S-parameter based Interconnect Subnetworks
904214	Emad Gad	Analysis of Frequency Dependent Transmission Lines Using Integrated Congruence Transform
904245	Hideki Asai	A Model Order Reduction Technique for Hybrid Systems Composed of Electromagnetic Systems and Lumped RLC Circuits
904222	JIFENG MAO	Electromagnetic Modeling of On-chip Power Distribution Networks
904271	Kausik Chatterjee	A Novel Stochastic Algorithm For The Extraction Of Frequency-Independent Partial Inductances In Digital IC Interconnect Structures And A Frequency-Dependent Generalization
904244	Q.J. Zhang	Application of Neural Networks for High-Speed VLSI Interconnects Modeling and Design

6. Black Box Modeling (5)

Paper #	Author	Title
904231	Bhyrav Mutnury	Black-Box Modeling of Non-Linear I/O Drivers
904293	Jilin Tan	Via Modeling in Multi-Gbits/s Signal Analysis
904216	Shahrooz Shahparnia	Ultra Wide-Band Electromagnetic Interference (EMI) Reduction from Printed Circuit Boards (PCB)
904239	Stefano Grivet-Talocia	Passive time-domain macromodeling of large complex interconnects
904287	Yidnekachew S. Mekonnen	Improved High-Order Rational Approximation by Combining Rational Interpolation with the Vector Fitting Method

7. Optimization and Solution of Complex EM problems (9)

Paper #	Author	Title
904296	Atef Elsherbeni	Bayesian Optimization Techniques For Antenna Design
904235	Jie Yang	Reconstructing of a Non-Minimum Phase Response from Far-Field Power Pattern of an Electromagnetic System
904261	Mohamed Bakr	Efficient Adjoint Sensitivity Estimation for Time-Domain Techniques with Structured Grids
904274	NATALIA K. NIKOLOVA	Response Sensitivity Analysis with Frequency-Domain Full-Wave Electromagnetic Solvers
904243	Q.J. Zhang	Automatic Neural Network Model Generation for EM Modeling of Embedded Passives in Multi-layer Printed Circuits
904217	Shahrooz Shahparnia	Design Considerations for High-Impedance Surfaces Embedded in Printed Circuit Boards
904208	Deb Chatterjee	Optimization Studies for Single-Layer, Wideband, U-Slot Antennas on Microwave Substrates Using the IE3D Code
92004100474	Senglee Foo	On solving method-of-moments matrix using sparse matrix technique
92004100460	Mehmet K. Ozdemir	Realistic Head Modeling for the Inverse Problem of Electromagnetic Source Imaging of Brain Using FEM

8. Electromagnetic Applications for the DoD (10)

Paper #	Author	Title
904102	Andrew D. Greenwood	Hybrid Modeling of Electromagnetic Plasmas
904186	Fridon Shubitidze	A new numerical procedure for efficient and accurate representation of low frequency EM responses for a heterogeneous object
904194	Jonathan E. Luminati	Fourier Transform and Back-Projection Methods of SAR/ISAR Imaging Using Circumscribed Processing Regions
904242	Leo Kempel	Calibrated Modeling of Material Measurements
904240	Ray Ko	Modeling eddy current crack detection in multi-layer airframe structures using the volume-integral method
904200	Stanley Kubina	Modeling Multiple HF Antennas on the C-130/Hercules Aircraft - Part I
904178	Stephen Gedney	High-Order Locally Corrected Nyström Solution with Mixed-Order Basis Functions for Electromagnetic Scattering
904204	Michael E. McKaughan	USCG 270' Cutter - NVIS Antenna Study
904282	Daniel Faircloth	A Finite Element Method for the Electromagnetic Characterization of Quasi-Magnetostatic Problems Found in UXO Detection and Discrimination
904246	Andre BARKA	Modal expansion functions combined with EFIE applied to Air Intake / Engine RCS applications

9. FDTD and Applications (10)

Paper #	Author	Title
904294	Ahmed A. Kishk	ASYMPTOTIC STRIP BOUNDARY CONDITION IN THE FINITE DIFFERENCE TIME DOMAIN METHOD
904286	Atef Elsherbeni	FDTD Formulations for Scattering from Three Dimensional Chiral Objects
904173	Chen Wu	Computing Far Field Impulse Response of a 54-Element Waveguide Slot Array Using FDTD Method
92004100475	Edward Lule	Analysis using the FDTD method of the Properties of Koch Island Fractal on an Ultra Wideband Bowtie Dipole Antenna
904156	Hossam A Abdallah	An Optimized high-order implicit FDTD solver with One-sided TF/SF for simulation of photonic devices
92004100476	Michiko Kuroda	Numerical Analysis of MEMS-Based Variable Capacitors Involving the Combined Effect of Mechanical and Electrical Forces
92004100464	Ming Zhang	Analysis of Portable Radios (850 &1900MHz) with Hand-Free Kits FDTD and Applications
904195	Qiubo Ye	Investigation of Feed Gaps of UWB Microstrip Dipole Antennas and FDTD Simulation
904163	Yotka Rickard	Off-Grid Perfect BCs for the FDTD Method
904170	P. Mohanan	Time Domain Analysis of a Microstrip Line Excited Compact Rectangular Dielectric Resonator Antenna

10. Advances in CEM (8)

Paper #	Author	Title	
904297	Osama Mohammed	Wavelet Analysis of Permanent Magnet Synchronous Machine Flux Density Harmonic Content With Different Pole Number Designs	
904107	Rensheng Sun	Electromagnetic Modeling of an Adaptable Multimode Microwave Applicator for Polymer Processing	S
904151	Ross A. Speciale	The Tilted-Ellipse Representation of Standing-Wave Patterns.	
904303	Luis E. Garcia-Castillo	A Novel 3D Hybrid FEM-PO Technique for the Analysis of Scattering Problems	
904197	Robert J. Bonneau	B-Spline Wavelet Basis Models For Improved Radar Detection	
904122	Randy L. Haupt	Selecting Genetic Algorithm Operators for CEM Problems	
904289	Deb Chatterjee	Effect of Substrate Permittivity and Thickness on Performance of Single-Layer, Wideband, U-Slot Antennas on Microwave Substrates	
904298	Baek Ho Jung	Transient Electromagnetic Scattering from Dielectric Objects Using Time-Domain Integral Equation	

11. Advances in Finite-Difference Time Domain Modeling (10)

Paper #	Author	Title
904147	Andreas Rennings	An efficient operator based implementation of a wavelet-transformed FDTD scheme
92004100468	Guowei Wei	High-order FDTD methods via derivative matching for electromagnetic computation involving material interfaces
904164	Hossam A Abdallah	Simple Dispersion Analysis of 2nd and 4th order FDTD Schemes
904110	Michal Wiktor	Discrete projection for Finite Difference methods
92004100481	Mikko Kärkkäinen	FDTD Implementation of Impedance Sheet Conditions for Parallel Wire Arrays
904113	Oliver Pertz	Improved EM Field Simulation with a Novel Wavelet-Based Method
904206	Qunsheng Cao	Studies of Bi-static Scattering of Arbitrary Targets using Multiresolution Time Domain
904112	Thomas Bolz	Consideration on the Mutual Coupling Impedance Network
92004100461	Zhou Weihong	Analysis of Time-Domain Scattering Field in Soil and Cube Underground With 2-D FDTD
92004100472	Kian Paran	FDTD Simulation of Electromagnetic Radiation from Monopoles on Spherical-Lossy Earth

12. Recent Advances in Time Domain Modeling Techniques (10)

Paper #	Author	Title
904104	Changning Ma	On the Complex Envelop FDTD Method
92004100473	Christophe Fumeaux	FVTD Simulation of a Probe-fed Hemispherical Dielectric Resonator Antenna with Finely Resolved Structural Details
904190	John Paul	Time-Domain Simulation of Chaotic Dynamics in Nonlinear Frequency-Dependent Dielectric Materials
904181	Dzianis Lukashevich	Shift-Inverse Technique in TLM-ROM
904209	Gaetano Marrocco	Combining data-fitting and signal processing for efficient time-domain characterization of aperture antennas
904300	José Represa	PML Absorbing Boundary Conditions For Multi-Resolution Time-Domain Techniques Based On The Discrete Wavelet Transform
904168	Luca Pierantoni	Full-Wave Analysis of Integrated Optical Components by the TLMIE Method
904198	Petr Lorenz	Definition of Radiation Field Boundary Conditions for Spherical Simulation Domain in Time-Domain Methods
904254	Q.J. Zhang	Time-Domain Neural Network Modeling Approaches for Embedded Passives in Multilayer Printed Circuits
904257	Zhong Ji	A Stable Solution of Time Domain Electric Field Integral Equation for Conducting Bodies Using the Laguerre Polynomials

13. Smart Antennas and Computational Electromagnetics (10)

Paper #	Author	Title
92004100479	FRANCESCO ZIRILLI	MATHEMATICAL MODELS OF SMART OBSTACLES IN ELECTROMAGNETIC SCATTERING
904165	Ramesh K. Pokharel	Analysis of DSRC Electromagnetic Environment on Express Highway Installed with Wave Absorbers
904236	Raul Fernandez-Recio	Estimation of DOA for Different Frequencies using an Interpolation Technique
904196	Raviraj Adve	Minimum Norm Mutual Coupling Compensation for MUSIC-based Direction of Arrival Estimation
904230	Santana Burintramart	Multiple Frequency Parametric Target Location using Matrix Pencil Method
904229	Santana Burintramart	Estimation of the Two-Dimensional Direction of Arrival by The Diagonal Matrix Pencil Method
904226	Seunghyeon Hwang	Error Bound due to the Random Position Errors in Adaptive Processing Using a Nonuniformly Spaced Array
904268	Shengchun Zhao	Interference Suppression via Frequency Domain Principal Component Analysis Method
904225	Wonsuk Choi	Amplitude-only Space–Time Adaptive Processing (STAP) based on Deterministic Least-Squares Approach
904221	Emmanuel H. Van Lil	Theoretical Investigations and Broadband Experimental Verification of the time-domain SAGE DOA algorithm

14. Bianisotropic and Metamaterial (10)

Paper #	Author	Title
904232	Alkim Akyurtlu	Analysis of the Interaction of Electromagnetic Waves with a Chiral Cylinder using a Novel FDTD Approach
904184	Ana Grande	Analyzing the stability of the new FDTD technique for the non-dispersive bi-isotropic media using the von Neumann method
92004100480	Ari Sihvola	Modeling of metamaterials with classical homogenization principles
904202	Jay K. Lee	Dispersion Characteristics of Conductor-backed Coplanar Waveguide on an Anisotropic Substrate
904278	Mehmet Yuceer	Solution of RCS of a Chiral BOR
92004100482	Mikko Kärkkäinen	FDTD Simulations of Wave Propagation in Anisotropic Backward-Wave Slabs
904137	Mohammed M. Bait Suwailam	Simulation of Lorentzian DNG materials Using FDTD Method and Z-transform
904176	Rafael R. Boix	Full-wave spectral domain analysis of microstrip circuits and antennas fabricated on magnetized ferrites
904111	Natalya I. Manaenkova	ANALYSIS OF SOLITON PULSE ENVELOPE IN A NONLINEAR MEDIUM
92004100478	Nobel Mathew	Optimization of a Circularly Polarized Single-Feed UHF Patch Antenna on a Nanosatellite Metal Platform

15. Higher Order Methods (10)

Paper #	Author	Title
904291	Aly E Fathy	Circular Ring E-Plane Element Pattern Integral Representation and its Asymptotic Evaluation
904262	Elizabeth Bleszynski	Application of wavefront and ray tube evolution methods in the development of a high frequency algorithm with asymptotically frequency independent complexity
904174	Fernando Reitich	A new high-order high-frequency integral equation method for the solution of scattering problems. II: Multiple-scattering configurations
904224	Mengtao Yuan	The analysis of transient scattering for rectangular incident waves using the discrete Laguerre transforms
904152	Oscar P. Bruno	A new high-order high-frequency integral equation method for the solution of scattering problems I: Single-scattering configurations
904146	Paul Hussar	High Frequency Radiation Pattern Analysis for Antennas Mounted on Material-Coated Conducting Platforms of General Shape
904263	Shinichiro Ohnuki	Monte Carlo Simulation of Rough Surface Scattering Problems on Comparison among Various Methods
904218	Kausik Chatterjee	A Floating Random-Walk Solution for the Transverse Magnetic Electromagnetic Problem: A Homogeneous Benchmark
904247	Luca Perregrini	A Perturbational Technique for the Fast Modeling of Printed Reflectarray Elements
904260	Yuriy Shlepnev	Scattering matrix descriptors of Trefftz finite elements

16. Electromagnetic Modeling Using WIPL-D Code(I) (10)

Paper #	Author	Title
904270	Atef Elsherbeni	Design of Wideband Printed Monopole Antenna Using WIPL-D
904280	DENIAU Virginie	Optimization of Three-dimensional TEM cell for Electromagnetic Compatibility Testing
904249	Dragan I. Olcan	Precise and Efficient EM modeling of Trees with WIPL-D Code
904304	Wayne Kim	Novel High Performance Low Cost Phase Shifters Design Based on the Ferroelectric Materials Technology Using the WIPL-D Code
904256	Hossam Ahmed Abdallah	Comparison of return loss calculations with measurements of narrow-band microstrip patch antennas
904250	Mitsuo Taguchi	Numerical analysis of microstrip antenna by using electromagnetic simulators
904279	Ralf Klukas	Dual State Resonator Design for Plasma Ignition by Means of Microwave Energy
904227	Reddy Vangala	Modeling of Ceramic Filters Using WIPL-D
904259	Ronald H Johnston	MICROSTRIP LINE JUNCTIONS -A Comparison of WIPL-D Simulations and Measured Data
904253	Tasic Miodrag	Full 3D EM Modeling of Yagi Antenna for WLAN

17. Electromagnetic Modeling Using WIPL-D Code(II) (7)

Paper #	Author	Title
904275	Christopher Card	Development of a Parallel Scene Generation Electromagnetic Modeling Tool
904220	Eric Mokole	Preliminary Calculated Scatter from Trihedral Corner Reflector with WIPL-D
904288	Harvey K. Schuman	Array Antenna Design with WIPL-D
904267	Robert W. McMillan	Comparison of WIPL-D to Other EM Computation Methods
904276	Saad Tabet	Alpha Test Analysis of WIPL-DP
904241	Hany E. Yacoub	Investigation of a Forward Looking Conformal Broadband Antenna for Airborne Wide Area Surveillance
904311	Mary Cannella Taylor	Metallic vs. Dielectric Modeling in WIPL-D
904313	Michael Simcoe	Low-frequency Synthetic Aperture Radar Imaging of Complex Scenes using Numerical Electromagnetic Analysis