

# **Progress in Electromagnetics Research Symposium 2007**

## **(PIERS 2007 Prague)**

**Prague, Czech Republic  
27-30 August 2007**

**ISBN: 978-1-61839-052-3  
ISSN: 1559-9450**

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2007) by the Electromagnetics Academy  
All rights reserved.

Printed by Curran Associates, Inc. (2011)

For permission requests, please contact the Electromagnetics Academy  
at the address below.

Electromagnetics Academy  
777 Concord Avenue, Suite 207  
Cambridge, MA 02138

Phone: (617) 258-8766  
Fax: (617) 258-8766

[tpc@piers.org](mailto:tpc@piers.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2634  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# Contents

A New Computer Aided LNA Design Approach Targeting Constant Noise-figure and Maximum Gain ..	9
EDA Designs of RFIC Inductors .....	14
CAD Models for Estimating the Capacitance of a Microstrip Interconnect: Comparison and Improvisation	18
Spacecraft Power Systems Design to Minimize Electro Magnetic Interference (EMI) Effects .....	24
Intertwined Two-section Dual-polarized Log Periodic Dipole Antenna .....	30
A Complete Simulation of a Radiated Emission Test according to IEC 61000-4-20 .....	34
Design and Modeling of Planar Power Switching Inductors for Monolithic and Single Chip DC-DC Power Converters .....	39
Study of Magnetic Field Distribution in Infant Incubators .....	43
Scientific Thematic Network “Electromagnetic Compatibility of Devices, Systems and Installations for IT Community EMC-Net” .....	47
Implanted Antenna for an Artificial Cardiac Pacemaker System .....	51
Extension of the Finite Network Method to Magnetic Materials and Its Application to Eddy-current Testing .....	55
Calculation of Electromagnetic Field with Integral Equation Based on Clifford Algebra .....	62
Wiener-Hopf Analysis of the Diffraction by a Terminated, Semi-infinite Parallel-plate Waveguide with Four-layer Material Loading .....	72
Combined Perturbation and Wiener-Hopf Analysis of the Diffraction by Two Parallel, Corrugated Half-planes .....	78
Polarization Evolution in Weakly Anisotropic Media: Quasi-Isotropic Approximation (QIA) of Geometrical Optics Method and Its Recent Generalizations .....	85
Field Propagation in Nanoporous Metal Waveguides .....	90
Metamaterial Comprising Plasmonic Nanolasers .....	95
Wave Interaction with Double-negative and Double-positive Plates .....	99
Mutual Coupling Effects on the Mean Capacity of MIMO Antenna Systems .....	103
Ultrashort Electromagnetic Pulse Dynamics in the Singular and Weak Dispersion Limits .....	107
Optimizing of System Partition and Software Architecture of Distributed Control Computer of Power Electronics Facility .....	112
EMI in Induction Motor Drive Fed from IGCT Voltage Source Inverter .....	117
PWM Strategy Applied to Realized Matrix Converter System .....	122
Technological Aspects of Noise-suppressing Filter Design .....	126
Testing of Robust Control Characteristics for Traction PMSM .....	131
Automated Passive Ground Remote Surveillance of Critical Oil & Gas Transport Infrastructures .....	136
Comparative Analysis of WLAN, WiMAX and UMTS Technologies .....	140
Research on Asymmetric Characteristics of Mobile Communications System Based on Electromagnetic Radiation .....	145
Reflectarray with Variable-patch-and-slot Size .....	150

Design of an UWB Antenna with Band-rejection Characteristic .....	155
A Novel Antenna Design for UHF RFID Tag on Metallic Objects .....	158
A Neural Network Approach to the Prediction of the Propagation Path-loss for Mobile Communications Systems in Urban Environments .....	162
Calculation of EM Characteristics of a Cellular Phone Handset by Time-domain MoM .....	167
Topology Finite Element Method for Field Calculation Problems .....	173
Design of Conformal Tapered Leaky Wave Antenna .....	177
Design of an Internal Wideband Antenna for DTV Laptop Application .....	182
Compact Representation of the Inductance Coefficients in Presence of Uncertain Parameters .....	187
Balancing the Interference Probability between Systems for Sharing Frequency Spectrum .....	193
Impulse Response of Seafloor Hydrocarbon Reservoir Model .....	198
Generalized Approach for Phase Interferometric Measurements of Electromagnetic Field .....	204
Artificial Neural Network Employment in the Design of Multilayered Microstrip Antenna with Specified Frequency Operation .....	210
Electrical Vibrations of Yeast Cell Membrane .....	215
A New Spectral Method for Scattering by Impedance Polygons .....	220
A Finite Difference Frequency Domain Study of Curvature Lifted Modes Degeneration .....	222
Optimization of a Microwave Amplifier Using Neural Performance Data Sheets with a Memetic Algorithm .....	227
A Simple and Accurate Model for Wire Diagnosis Using Reflectometry .....	232
Effect of Motion of the Scatterers on Localization: Quasi Localization and Quasi Mobility Edge .....	237
Multi-layered Fe Films for Microwave Applications .....	242
Modal Analysis of Extraordinary Transmission through Subwavelength Slits in a Silver Plate .....	246
Low Frequency Relaxation Oscillations in a Capacitive Discharge Chamber Connected to a Peripheral Grounded Chamber .....	250
RF-ID Tag Location Using RF-over-fibre Techniques .....	255
Design of New DGS Hairpin Microstrip Bandpass Filter Using Coupling Matrix Method .....	261
Inverse Problem of ECG for Different Equivalent Cardiac Sources .....	266
A Sensitivity Matrix Based Microwave Tomography Exploiting an Adjoint Network Theorem .....	272
Identification of Multiple Cylindrical Targets Located above Perfectly Conducting Flat Surface by Artificial Neural Networks .....	277
A Dynamic Simulation Approach for Electrostatic Force Microscopy on Inhomogeneous Sample Material .....	282
Controlled Approximation of the Coefficient Matrix of the Finite Network Method .....	287
Numerical Analysis of Cylindrical Cavities Used for Microwave Heating, Employing the Mode Matching Technique .....	292
Driving Characteristics for Hybrid Electric Drive with Super-capacitor as Energy Storage Unit .....	296
Steady-state Analysis of Salient Poles Synchronous Motor with Damper Based on Determination of the Magnetic Field Distribution .....	300
On the Influence of Slot Width of Field Shapers in Electromagnetic Metal Forming of Aluminum Sheets .....	305
Amplification of Acoustic-electromagnetic Waves in GaN Films .....	310
Energy Emission from Evanescent Wave and Interference of Opposite Wave Streams: Near Field Coherent Scattering by Random Medium .....	314
Near Field Effect in Microwave Radiation of Periodically Heated Plane-like Thermal Source .....	319
Operation of Evanescent Wave Intensity Using Metamaterials of Negative Permittivity and Permeability .....	324
Performance of a Folded Dipole with a Closed Loop for RFID Applications .....	329
Radiation Characteristics of Optimized Ultra Wideband Printed Dipoles for Different Impulse Excitations .....	332

Collinear and Coparallel Principles in Antenna Design .....	337
An Expression for the Intrinsic Coupling Unbalance of a Symmetrical 4 Port Directional Coupler in Terms of the Cross Ratio of Its 4 Eigenadmittances or 4 Eigenimpedances .....	342
Development of 60 GHz Band Fabry-Perot Resonator .....	345
MUSIC-type Imaging of Dielectric Spheres from Single-Frequency, Asymptotic and Exact Array Data ..	348
Propagation Characteristics of a Nonlinear TM Surface Wave in a Parallel Plate Superconductor/Antiferromagnet Waveguide .....	353
A New GL Method for Solving Differential Equation in Electromagnetic and Phys-Chemical and Financial Mathematics .....	357
Interference Calculation for ATSC System against Interference from ISDB-T System Using Computational Simulation .....	366
Feasibility of Defect Detection in Concrete Structures via Ultrasonic Investigation .....	371
Microwave Phase Interferometry for Nondestructive Testing in Industry .....	376
A Signal Explanation for the Electromagnetic Induction Law .....	379
Analytical Solutions to the Applicators for Microwave Textile Drying by Means of Zigzag Method ..	384
Modal Analysis of Miniature Microstrip Patch Antennas Based on Fractal Geometry .....	388
Algorithm for Noise Reduction in Output Signal of Race-track Core Fluxgate .....	393
Microwave Applicator for Treatment of Atherosclerosis .....	397
Antenna Rotation Aperture Synthesis for Short-range Personnel Scanning at mm-wavelengths .....	400
Printed Antennas Tuned by Transversely Magnetized Ferrite Operating at a Novel Resonant Mode ..	411
Neural Network — Based Design of EBG Surfaces for Effective Polarization Diversity of Wireless Communications Antenna Systems .....	415
Multiple Signal Direction of Arrival (DoA) Estimation for a Switched-Beam System Using Neural Networks .....	420
Design of Dual-band Reconfigurable Smart Antenna .....	425
Inversion Reconstruction of Signals Measured by the NMR Techniques .....	430
The Effect of Non-homogeneous Parts into Materials .....	434
Magnetic Field Approximation in MR Tomography .....	439
Progress in Gain Performance of Parametrically Amplifying Travelling-wave Antennas (PATA): PATA Analogous to Travelling-wave Tube Amplification and Negative Resistivity of Esaki Diodes .....	443
Design, Simulation and Realization the Specific Source of Light .....	447
Preemphasis Coreection of Gradient Magnetic Field in MR Thomograph .....	450
Optimization Method of EMI Power Filters .....	455
$T_1$ Relaxation Time of the Xenon 129 Influenced by Magnetic Susceptibility of the Laboratory Glasses ..	459
Experiments of Accuracy Air Ion Field Measurement .....	463
The Calculation of the V-shape Microstrip Line Impedance by the Conformal Mapping Method .....	467
Experimental Results of a Wave Guide Using a Photorefractive Material SBN:Ce .....	470
A Higher-order Accurate FDTD Solution to Scalar SHG Problems .....	475
Full-wave Solution of the Second Harmonic Generation Problem Using a Nonlinear FDTD Algorithm ..	479
Spectral Monte-Carlo Simulations of Photon Penetration in Biotissue in Visible and Near Infrared ..	483
Modeling and Analysis of Crosstalk between Differential Lines in High-speed Interconnects .....	488
A Novel Time-domain Approach Using TDR/TDT for Synthesizing SPICE-compatible Models of Power Delivery Networks with Resonance Effect .....	493
A Study of Layout Strategies in RF CMOS Design .....	497
Ultra-wide Band Noise-signal Radar Utilizing Microwave Chaotic Signals and Chaos Synchronization ..	503

High-dimensional Chaotic Regimes in Distributed Radiophysical Systems Operating near the Cutoff Frequency.....	507
Improving the Accuracy of PHEMT Models Using Corrective Artificial Neural Networks.....	512
A Dual Resonance Three Segment Rectangular Dielectric Resonator Antenna.....	516
Design and Comparison of Exposure Chambers for Verification of Microwave Influence on Biological Systems.....	521
The Effects of 884 MHz GSM Wireless Communication Signals on Spatial Memory Performance: An Experimental Provocation Study .....	526
EBG Substrate in Unilateral Fin Line Resonator .....	530
Time Reversal in Lossy Material: An Assessment .....	535
Eigenfunction Expansions of Source-excited Electromagnetic Fields on Open Cylindrical Guiding Structures in Unbounded Gyrotropic Media .....	540
<b>Author Index .....</b>	545