
**ELECTROMAGNETIC
WAVES PIERB 06**

Progress

In

Electromagnetics

Research B

© 2008 EMW Publishing. All rights reserved.

No part of this publication may be reproduced. Request for permission should be addressed to the Publisher.

All inquiries regarding copyrighted material from this publication, manuscript submission instructions, and subscription orders and price information should be directed to: EMW Publishing, P. O. Box 425517, Kendall Square, Cambridge, Massachusetts 02142, USA.

E-ISSN 1937-6472

**ELECTROMAGNETIC
WAVES PIERB 06**

Progress

In

Electromagnetics

Research B

Chief Editor: J. A. Kong

EMW Publishing

Cambridge, Massachusetts, USA

CONTENTS

**PLANE WAVE DIFFRACTION BY A FINITE
PARALLEL-PLATE WAVEGUIDE WITH FOUR-LAYER
MATERIAL LOADING:
PART 1 — THE CASE OF E POLARIZATION**

J. P. Zheng and K. Kobayashi

1	Introduction	1
2	Transformed Wave Equations	3
3	Simultaneous Wiener-Hopf Equations	7
4	Formal Solution	11
5	Approximate Solution	15
6	Scattered Field	18
7	Numerical Results and Discussion	21
8	Conclusions	29
	Appendix A. Analytical Properties of the Fourier Coefficients	29

**ELECTROMAGNETIC PULSE PROPAGATION OVER
NONUNIFORM EARTH SURFACE: NUMERICAL
SIMULATION**

A. Popov and V. Kopeikin

1	Introduction	37
2	Monochromatic Wave Propagation	39
3	Radio Pulse Propagation: Fourier Synthesis	42
4	Time-domain PE and Boundary Conditions	46
5	Hybrid TDPE and Short High-Frequency Pulse Propagation	53

**SWITCHABLE SPLIT-RING FREQUENCY SELECTIVE
SURFACES**

M. H. B. Ucar, A. Sondas, and Y. E. Erdemli

1	Introduction	65
2	Switchable FSS Designs	66
3	Measurements	73
4	Actual Switch Modeling	75
5	Conclusion	78

FSS COMPRISED OF ONE- AND TWO-TURN SQUARE SPIRAL SHAPED CONDUCTORS ON DIELECTRIC SLAB

K. Delihacioglu, S. Uckun, and T. Ege

1	Introduction	81
2	Formulation of the FSS Scattering Problem	82
3	Numerical Results and Discussions	88
4	Conclusions	91

ADAPTIVE NEURO-FUZZY MODELS FOR CONVENTIONAL COPLANAR WAVEGUIDES

M. Turkmen, S. Kaya, C. Yildiz, and K. Guney

1	Introduction	93
2	Determination of Characteristic Parameters of CPWs	95
3	Adaptive Neuro-Fuzzy Inference System	97
4	Application to the Problem	99
5	Results and Conclusion	101

PRACTICAL ALGORITHMS TO FOCUS B-SCAN GPR IMAGES: THEORY AND APPLICATION TO REAL DATA

C. Ozdemir, S. Demirci, and E. Yigit

1	Introduction	109
2	Imaging Techniques in GPR Systems	111
3	GPR Focusing Algorithms	113
4	Simulation and Measurement Results of the Focusing Methods	114
5	Conclusion	121

MODELLING OF SHADOWING LOSS DUE TO HUGE NON-POLYGONAL STRUCTURES IN URBAN RADIO PROPAGATION

A. Kara and E. Yazgan

1	Introduction	124
2	Urban Radio Propagation	124
3	3D Modelling of Multiple Non-Polygonal Structures	127
4	Shadowing Loss	131
5	Conclusions	132

PLANE WAVE DIFFRACTION BY A STRONGLY ELONGATED OBJECT ILLUMINATED IN THE PARAXIAL DIRECTION

F. A. Molinet

1 Introduction 135
 2 Creeping Waves on Strongly Elongated Bodies 136
 3 Magnetic Field on the Surface — Asymptotic Current 141
 4 Indirect Determination of the Derivative of the Incident Field 148
 5 Conclusion 150

INFLUENCE OF MOTION ON THE EDGE-DIFFRACTION

M. Idemen and A. Alkumru

1 Introduction 153
 2 Formulation of the Problem 154
 3 Solution of the Problem 156
 4 Analysis of the Field 161
 5 An Illustrative Example 166

NEURAL MODELS FOR THE ELLIPTIC- AND CIRCULAR-SHAPED MICROSIELD LINES

S. Kaya, M. Turkmen, K. Guney, and C. Yildiz

1 Introduction 169
 2 Characteristic Parameters of ESML and CSML 171
 3 Artificial Neural Networks (ANNs) 172
 4 ANNs for Characteristic Parameters 176
 5 Numerical Results and Conclusion 178

TEMPORAL CAVITY OSCILLATIONS CAUSED BY A WIDE-BAND WAVEFORM

O. A. Tretyakov and F. Erden

1 Introduction 183
 2 Formulation of the Time Domain Problem 185
 3 Field Expansions over a Modal Basis 188
 4 Waveforms in the Hollow Lossy Cavity 190
 5 Calculation of a Vector Convolution Integral 192
 6 Evolution Equations in Presence of a Medium 193
 7 Discussion 202

**A NEW ELECTROMAGNETIC ENGINEERING
PROGRAM AND TEACHING VIA VIRTUAL TOOLS**

L. Sevgi

1	Introduction	205
2	Modeling and Simulation Strategies in EM	206
3	Novel EM Virtual Tools	208
4	A Novel EM Engineering Program — EMEP	219
5	Conclusions	222

**ADAPTIVE NEURO-FUZZY INFERENCE SYSTEM FOR
THE COMPUTATION OF THE CHARACTERISTIC
IMPEDANCE AND THE EFFECTIVE PERMITTIVITY
OF THE MICRO-COPLANAR STRIP LINE**

N. Sarikaya, K. Guney, and C. Yildiz

1	Introduction	225
2	The Effective Permittivity and the Characteristic Impedance of MCS Line	227
3	Adaptive Neuro-Fuzzy Inference System (ANFIS)	229
4	Application of ANFIS to the Computation of the Effective Permittivity and the Characteristic Impedance	232
5	Results and Conclusion	233

**DIFFRACTION BY A WEDGE OR BY A CONE WITH
IMPEDANCE-TYPE BOUNDARY CONDITIONS AND
SECOND-ORDER FUNCTIONAL DIFFERENCE
EQUATIONS**

N. Y. Zhu and M. A. Lyalinov

1	Diffraction by an Impedance Wedge with a Semi-Infinite Impedance Sheet Attached to Its Edge	240
2	Acoustic Scattering of a Plane Wave by a Right-Circular Impedance Cone	248
3	Epilogue	253

**A CLONAL SELECTION ALGORITHM FOR ARRAY
PATTERN NULLING BY CONTROLLING THE
POSITIONS OF SELECTED ELEMENTS**

B. Babayigit, K. Guney, and A. Akdagli

1	Introduction	257
2	Problem Formulation	258

3	Clonal Selection Algorithm	259
4	Numerical Results	262
5	Conclusion	265

**PLANE WAVE DIFFRACTION BY A FINITE
PARALLEL-PLATE WAVEGUIDE WITH FOUR-LAYER
MATERIAL LOADING: PART II — THE CASE OF H
POLARIZATION**

E. H. Shang and K. Kobayashi

1	Introduction	267
2	Formulation of the Problem	268
3	Solution of the Wiener-Hopf Equations	272
4	Scattered Field	277
5	Numerical Results and Discussion	279
6	Conclusions	287
	Appendix A. Some Useful Formulas for the Fourier Coefficients	288

**PROPAGATION OF WAVES IN A BIFURCATED
CYLINDRICAL WAVEGUIDE WITH WALL
IMPEDANCE DISCONTINUITY**

A. Büyükkaksoy, A. Demir, and F. Hacvelioğlu

1	Introduction	295
2	Mixed Method of Formulation	296
3	Computational Results	303
4	Conclusion	304

**CHARACTERISTIC BASIS FUNCTION METHOD FOR
ITERATION-FREE SOLUTION OF LARGE METHOD OF
MOMENTS PROBLEMS**

R. Mittra and K. Du

1	Introduction	307
2	CBFM for Microstrip Circuits and Printed Array Antenna Problems	308
3	CBFM for Scattering Problems	319
4	Some Recent Developments in CBFM	328
5	Conclusion and Future Work	330

**A STABLE MARCHING-ON-IN-TIME SCHEME FOR
WIRE SCATTERERS USING A NEWMARK-BETA
FORMULATION***S. E. Bayer and A. A. Ergin*

1	Introduction	338
2	The Electric Field Integral Equation (EFIE)	338
3	Solution of EFIE for Thin-Wires by Classical MOT	339
4	Solution of EFIE for Thin-Wires by Newmark-Beta Formulation (B-MOT)	343
5	Solution of EFIE with Analytic Evaluation of Potential Integrals	344
6	Numerical Results	352

**ANALYTICAL AND NUMERICAL ASPECTS OF BRAGG
FIBER DESIGN***D. V. Prokopovich, A. V. Popov, and A. V. Vinogradov*

1	Introduction	361
2	Problem of Multilayer Mirror Optimisation	362
3	Planar Waveguide with Leaky Modes	368
4	Bragg Mode Radiation Loss	369
5	Finite-Difference Scheme for Solving the Boundary Value Problem	370
6	Maxwell's Equations and Scalar Approximation for a BF	373
7	Conclusion	378