
**ELECTROMAGNETIC
WAVES** **PIER 79**

Progress

In

Electromagnetics

Research

© 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.

ISSN 1070-4698

E-ISSN 1559-8985

**ELECTROMAGNETIC
WAVES** **PIER 79**

Progress

In

Electromagnetics

Research

Chief Editor: J. A. Kong

EMW Publishing

Cambridge, Massachusetts, USA

CONTENTS

**CLOSED-FORM SOLUTION TO THE SCATTERING OF
A SKEW STRIP FIELD BY METALLIC PIN IN A SLAB***C. A. Valagiannopoulos*

1	Introduction	1
2	Statement of the Problem	3
3	Primary Green's Function Derivation	4
4	Secondary Green's Function Derivation	5
5	Integration along the Strip	9
6	Numerical Results	10
7	Conclusion	19

**QUAD RIDGED HORN ANTENNA FOR UWB
APPLICATIONS***R. Dehdasht-Heydari, H. R. Hassani, and A. R. Mallahzadeh*

1	Introduction	23
2	Antenna Configuration	25
3	Results of Simulation	32
4	Conclusion	37

**A NOVEL DESIGN OF DUAL CIRCULARLY
POLARIZED ANTENNA FED BY L-STRIP***G.-L. Wu, W. Mu, G. Zhao, and Y.-C. Jiao*

1	Introduction	39
2	Antenna Design	40
3	Experimental Results and Discussion	40
4	Conclusion	45

**SCATTERING FROM SEMI-ELLIPTIC CHANNEL
LOADED WITH IMPEDANCE ELLIPTICAL CYLINDER***M. M. Zahedi and M. S. Abrishamian*

1	Introduction	47
2	Formulation	48
3	Numerical Results	51
	Appendix A. Expansion of Normalization Integrals	57

**MODAL ANALYSIS OF EXTRAORDINARY
TRANSMISSION THROUGH AN ARRAY OF
SUBWAVELENGTH SLITS**

G. Ghazi and M. Shahabadi

1	Introduction	59
2	Modal Expansion in Different Regions	61
3	Modal Analysis in the Metallic Grating	63
4	Transmission Analysis	66
5	Conclusions	73

**PATTERN SYNTHESIS OF CONFORMAL ANTENNA
ARRAY BY THE HYBRID GENETIC ALGORITHM**

Z. Xu, H. Li, Q.-Z. Liu, and J.-Y. Li

1	Introduction	75
2	Conformal Antenna Array Theory	76
3	Hybrid Genetic Algorithm	78
4	Model Configuration	82
5	Optimization Results	85
6	Conclusion	89

**MONTE CARLO INTEGRATION TECHNIQUE FOR THE
ANALYSIS OF ELECTROMAGNETIC SCATTERING
FROM CONDUCTING SURFACES**

M. Mishra and N. Gupta

1	Introduction	91
2	Monte Carlo Integration Technique	94
3	Formulation of the Circular Disk Problem	95
4	Results and Discussion	99
5	Conclusions	103

**AN EXACT SOLUTION OF COHERENT WAVE
PROPAGATION IN RAIN MEDIUM WITH REALISTIC
RAINDROP SHAPES**

M. Bahrami, J. Rashed-Mohassel, and M. Mohammad-Taheri

1	Introduction	107
2	Theory	108
3	Results	112
4	Conclusion	117

ANALYTICAL INVESTIGATION AND EVALUATION OF PULSE BROADENING FACTOR PROPAGATING THROUGH NONLINEAR OPTICAL FIBERS (TRADITIONAL AND OPTIMUM DISPERSION COMPENSATED FIBERS)

A. Andalib, A. Rostami, and N. Granpayeh

1	Introduction	120
2	Mathematical Modeling	121
3	Simulation Results	128
4	Conclusion	134

APPLICATION OF THE INVASIVE WEED OPTIMIZATION TECHNIQUE FOR ANTENNA CONFIGURATIONS

A. R. Mallahzadeh, H. Oraizi, and Z. Davoodi-Rad

1	Introduction	137
2	Invasive Weed Optimization Algorithm	138
3	Antenna Configurations Optimization Using IWO	140
4	Conclusion	148

FAST ITERATIVE SOLUTION METHODS IN ELECTROMAGNETIC SCATTERING

B. Carpentieri

1	Introduction	151
2	SParse Approximate Inverse Methods (SPAI)	153
3	Spectral Deflation	160
4	Inner-Outer Iterative Schemes	170
5	Conclusions	174

NONLINEAR STABILITY ANALYSIS OF MICROWAVE OSCILLATORS USING THE PERIODIC AVERAGING METHOD

H. Vahdati and A. Abdipour

1	Introduction	179
2	Theoretical Basis	182
3	Formulation of Oscillator Stability	184
4	Application of the Proposed Method to Stability Analysis of Oscillators	185
5	Conclusion	191

Appendix A. Proof of Corollary 2	191
--	-----

**A CLOSED-FORM SOLUTION TO ANALYZE RCS OF
CAVITY WITH RECTANGULAR CROSS SECTION**

L. Xu, J. Tian, and X. W. Shi

1 Introduction	195
2 Prediction Method	196
3 Results and Analysis	204
4 Conclusions	207

**AN ELECTROMAGNETIC SCATTERING MODEL FOR
SOYBEAN CANOPY**

Y. Du, Y. L. Luo, W. Z. Yan, and J. A. Kong

1 Introduction	209
2 Theoretical Model	211
3 Model Results and Comparisons	218
4 Conclusion	220

**DEVELOPMENT OF A MODEL FOR DETECTION AND
ESTIMATION OF DEPTH OF SHALLOW BURIED
NON-METALLIC LANDMINE AT MICROWAVE
X-BAND FREQUENCY**

K. C. Tiwari, D. Singh, and M. K. Arora

1 Introduction	226
2 Experimental Setup	228
3 Modelling and Implementation	231
4 Results and Discussions	238
5 Conclusion	247

**ACCURATE MODELING OF MONOPOLE ANTENNAS
IN SHIELDED ENCLOSURES WITH APERTURES**

X. C. Nie, N. Yuan, L. W. Li, and Y. B. Gan

1 Introduction	251
2 Simulation Model and Formulations	252
3 Examples and Discussions	256
4 Conclusion	260

**BROADBAND RADAR CROSS SECTION REDUCTION
OF A RECTANGULAR PATCH ANTENNA**

S.-C. Zhao, B.-Z. Wang, and Q.-Q. He

1	Introduction	263
2	RCS Reduction Techniques	264
3	Optimizing Results	271
4	Conclusion	274

**ROBUST ADAPTIVE BEAMFORMING FOR STEERING
VECTOR UNCERTAINTIES BASED ON EQUIVALENT
DOAS METHOD**

Y. J. Gu, Z. G. Shi, K. S. Chen, and Y. Li

1	Introduction	278
2	Background	279
3	Robust Beamformer Based on Equivalent DOAS Method . . .	281
4	Simulations	283
5	Conclusion	287

**RAMAN AMPLIFICATION AND SUPERLUMINAL
PROPAGATION OF ULTRAFAST PULSES BASED ON
LOOP SILICON WAVEGUIDES: THEORETICAL
MODELING AND PERFORMANCE**

J.-W. Wu, F.-G. Luo, and Q.-T. Zhang

1	Introduction	291
2	Theoretical Modeling	292
3	Results and Discussions	297
4	Conclusions	301

**STUDY ON CONFORMAL FDTD FOR
ELECTROMAGNETIC SCATTERING BY TARGETS
WITH THIN COATING**

X.-J. Hu and D.-B. Ge

1	Introduction	305
2	Conformal FDTD Method for Coated Targets	307
3	Numerical Results	313
4	Conclusion	317

**OPTIMIZATION OF SIDE LOBE LEVEL AND FIXING
QUASI-NULLS IN BOTH OF THE SUM AND
DIFFERENCE PATTERNS BY USING CONTINUOUS
ANT COLONY OPTIMIZATION (ACO) METHOD**

S. Ali Hosseini and Z. Atlasbaf

1	Introduction	321
2	Mathematical Formulation	323
3	Ant Colony Optimization Theory	325
4	Numerical Simulations — Pattern Optimization	326
5	Numerical Simulations — Fixing (Quasi) Nulls in both Sum and Differerence Patterns	331
6	Conclusion	335

**SOLVING TIME DOMAIN HELMHOLTZ WAVE
EQUATION WITH MOD-FDM**

B. H. Jung and T. K. Sarkar

1	Introduction	339
2	Formulation	341
3	Numerical Examples	345
4	Conclusion	349

**MODIFIED MULTI-OBJECTIVE PARTICLE SWARM
OPTIMIZATION FOR ELECTROMAGNETIC
ABSORBER DESIGN**

*S. Chamaani, S. A. Mirtaheri, M. Teshnehlab, M. A. Shooredeli
and V. Seydi*

1	Introduction	353
2	Particle Swarm Optimization	354
3	Multi-Objective Particle Swam Optimization	355
4	Modified Multi-Objective Particle Swarm Optimization	358
5	The Absorber Modeling	358
6	Simulation Results	359
7	Conclusion	365

**A NONDESTRUCTIVE TECHNIQUE FOR
DETERMINING COMPLEX PERMITTIVITY AND
PERMEABILITY OF MAGNETIC SHEET MATERIALS
USING TWO FLANGED RECTANGULAR WAVEGUIDES**

M. W. Hyde IV and M. J. Havrilla

1	Introduction	367
2	Derivation and Solution of Coupled Magnetic Field Integral Equations	369
3	Spectral Domain Integration	373
4	Measurement Results	377
5	Conclusion	382
	Appendix A.	383

**ELECTROMAGNETIC SCATTERING ANALYSIS USING
THE TWO-DIMENSIONAL MRFD FORMULATION**

M. Gokten, A. Z. Elsherbeni, and E. Arvas

1	Introduction	387
2	Formulation	388
3	Numerical Results	394
4	Conclusion	398

**PERFORMANCE OF IMPULSE RADIO UWB
COMMUNICATIONS BASED ON TIME REVERSAL
TECHNIQUE**

X. Liu, B.-Z. Wang, S. Xiao, and J. Deng

1	Introduction	401
2	Basic Concept of the TR-IR-UWB	402
3	Performance of TR-IR-UWB	405
4	Conclusions	411

**PATTERN SYNTHESIS OF CYLINDRICAL
CONFORMAL ARRAY BY THE MODIFIED PARTICLE
SWARM OPTIMIZATION ALGORITHM**

Z. B. Lu, A. Zhang, and X. Y. Hou

1	Introduction	415
2	Pattern Formula of Conformal Array	416
3	PSO Algorithm	417
4	Design Examples	419
5	Conclusion	423

**DISPLACED SENSOR ARRAY FOR IMPROVED SIGNAL
DETECTION UNDER GRAZING INCIDENCE
CONDITIONS**

R. M. Shubair and R. S. Nuaimi

1	Introduction	427
2	Array Configuration	430
3	Advantages of DSA Configuration	431
4	Signal Model Using DSA Configuration	432
5	DOA Estimation Algorithm	434
6	Simulation Results	435
7	Conclusions	438

**FRACTIONAL BOUNDARY CONDITIONS IN PLANE
WAVE DIFFRACTION ON A STRIP**

E. I. Veliev, M. V. Ivakhnychenko, and T. M. Ahmedov

1	Introduction	443
2	Problem Formulation	445
3	Solution to the Problem	447
4	Dual Integral Equations	448
5	Physical Characteristics of the Scattered Field	452
6	Numerical Results	455
7	Conclusion	460

**A COMBINATION OF TIME DOMAIN FINITE
ELEMENT-BOUNDARY INTEGRAL WITH TIME
DOMAIN PHYSICAL OPTICS FOR CALCULATION OF
ELECTROMAGNETIC SCATTERING OF 3-D
STRUCTURES**

F. Faghihi and H. Heydari

1	Introduction	463
2	FE-BI Overview for Electromagnetic Scattering from Complex Objects	464
3	TDPO as a Useful Method for Combinative Structures	467
4	Computational Results	469
5	Conclusions	471

**INTERFERENCE SUPPRESSION OF LINEAR
ANTENNA ARRAYS BY AMPLITUDE-ONLY CONTROL
USING A BACTERIAL FORAGING ALGORITHM***K. Guney and S. Basbug*

1	Introduction.....	475
2	Problem Formulation.....	477
3	Bacterial Foraging Algorithm (BFA).....	478
4	Numerical Results	483
5	Conclusions	491