
**ELECTROMAGNETIC
WAVES PIERM 24**

Progress

In

Electromagnetics

Research M

© 2012 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 1937-8726

**ELECTROMAGNETIC
WAVES PIERM 24**

Progress

In

Electromagnetics

Research M

Chief Editor: Weng Cho Chew

EMW Publishing

Cambridge, Massachusetts, USA

CONTENTS

TRANSMITARRAY USING PERFORATED DIELECTRIC MATERIAL FOR WIDEBAND APPLICATIONS*S. H. Zainud-Deen, S. M. Gaber, and K. H. Awadalla*

| | | |
|---|--|----|
| 1 | Introduction | 1 |
| 2 | Perforated Transmitarray | 3 |
| 3 | Comparison between the Perforated Dielectric Material Reflectarray and Transmitarray | 8 |
| 4 | Conclusion | 11 |

SCATTERING OF AN ARBITRARILY ORIENTED ELECTRIC DIPOLE FIELD FROM AN INFINITELY LONG DB CIRCULAR CYLINDER*A. Mahmood, A. Illahi, A. A. Syed, and Q. A. Naqvi*

| | | |
|---|--|----|
| 1 | Introduction | 15 |
| 2 | Problem Formulation | 17 |
| 3 | Numerical Results and Concluding Remarks | 24 |

ANALYTICAL COMPUTATION OF RELUCTANCE SYNCHRONOUS MACHINE INDUCTANCES UNDER DIFFERENT ECCENTRICITY FAULTS*H. Akbari*

| | | |
|---|--|----|
| 1 | Introduction | 29 |
| 2 | Winding Function Analysis | 31 |
| 3 | Modeling of Different Kinds of Eccentricities in Reluctance Machines | 33 |
| 4 | Analytical Expressions for Inductances and Their Derivatives | 35 |
| 5 | Computation of Inductances | 38 |
| 6 | Comparison with Finite Element Results | 40 |
| 7 | Conclusion | 42 |

UNIAXIAL ANISOTROPIC SUBSTRATE EFFECTS ON THE RESONANCE OF AN EQUITRIANGULAR MICRO-STRIP PATCH ANTENNA

L. Djouablia, I. Messaouden, and A. Benghalia

| | | |
|---|---|----|
| 1 | Introduction | 45 |
| 2 | Problem Formulation | 46 |
| 3 | Numerical Results and Discussions | 51 |
| 4 | Conclusion | 55 |
| | Appendix A. Explicit Expressions for the Coefficients Introduced in Section 2 | 55 |

PRELIMINARY RESULTS ON BRAIN MONITORING OF MENINGITIS USING 16 CHANNELS MAGNETIC INDUCTION TOMOGRAPHY MEASUREMENT SYSTEM

H. J. Luo, W. He, Z. Xu, and L. Liu

| | | |
|---|-------------------------------|----|
| 1 | Introduction | 57 |
| 2 | The Forward Problem | 58 |
| 3 | System and Methods | 60 |
| 4 | Results | 63 |
| 5 | Discussions | 67 |

ELECTROMAGNETIC WAVES SCATTERING AND RADIATION BY VIBRATOR-SLOT STRUCTURE IN A RECTANGULAR WAVEGUIDE

M. V. Nesterenko, V. A. Katrich, D. Yu. Penkin, S. L. Berdnik and V. I. Kijko

| | | |
|---|--|----|
| 1 | Introduction | 69 |
| 2 | Problem Formulation and Solution of Integral Equations | 71 |
| 3 | Numerical Results | 77 |
| 4 | Conclusion | 82 |

HYBRID FINITE DIFFERENCE/FINITE VOLUME METHOD FOR 3-D CONDUCTING MEDIA PROBLEMS

Z.-L. He, K. Huang, and C.-H. Liang

| | | |
|---|---|----|
| 1 | Introduction | 85 |
| 2 | General Formulations | 86 |
| 3 | Numerical Results and Discussions | 90 |
| 4 | Conclusion | 94 |

**A SIMPLE TECHNIQUE FOR OPTIMIZING THE
IMPLEMENTATION OF THE APERTURE THEOREM
BASED ON EQUIVALENCE PRINCIPLE**

S. Qiu, Y. Lu, N. Liu, and P. Li

| | | |
|---|---|-----|
| 1 | Introduction | 97 |
| 2 | Aperture Theorem and the Separation Technique | 98 |
| 3 | Formulations and Moment Procedure | 102 |
| 4 | Conclusion | 108 |

**RESONANT TRANSMISSION THROUGH A PAIR OF
RIDGE-LOADED CIRCULAR SUB-WAVELENGTH
APERTURES**

J.-I. Lee, Y.-K. Cho, J.-H Ko, and J. Yeo

| | | |
|---|--------------------------------|-----|
| 1 | Introduction | 114 |
| 2 | Numerical Analysis | 115 |
| 3 | Experimental Results | 121 |
| 4 | Conclusions | 124 |

**CONVERGENCE PROPERTIES OF A DIAKOPTICS
METHOD FOR ELECTROMAGNETIC SCATTERING
FROM 3-D COMPLEX STRUCTURES**

V. Lancellotti and A. G. Tijhuis

| | | |
|---|---|-----|
| 1 | Introduction | 127 |
| 2 | Problem formulation with LEGO | 129 |
| 3 | Numerical Solution (Outline) | 131 |
| 4 | Numerical Results | 132 |
| 5 | Conclusion | 139 |

**OPTIMAL SYNTHESIS OF THINNED ARRAYS USING
BIOGEOGRAPHY BASED OPTIMIZATION**

U. Singh and T. S. Kamal

| | | |
|---|---|-----|
| 1 | Introduction | 141 |
| 2 | Thinned Array Synthesis | 143 |
| 3 | Biogeography Theory | 144 |
| 4 | Biogeography-based Optimization | 146 |
| 5 | Design Examples | 147 |
| 6 | Conclusions | 153 |

STATISTICAL ANALYSIS OF ELECTROMAGNETIC FIELD INSIDE A JET ENGINE USING THE REVERBERATION CHAMBER APPROACH

A. F. Abdelaziz, D. Trincherro, and T. Khattab

| | | |
|---|---------------------------------------|-----|
| 1 | Introduction | 157 |
| 2 | Simplified Jet Engine Model | 159 |
| 3 | Statistical Analysis | 160 |
| 4 | Conclusions | 163 |

RADAR IDENTIFICATION OF HOSTILE FIRE BY MEANS OF THE ELECTROMAGNETIC COMPLEX NATURAL RESONANCES OF PROJECTILES

S. W. Harmer, S. E. Cole, and N. J. Bowring

| | | |
|---|-----------------------------|-----|
| 1 | Introduction | 167 |
| 2 | Proposed Solution | 168 |
| 3 | Theoretical Basis | 169 |
| 4 | Initial Results | 172 |
| 5 | Summary | 176 |

THEORETICAL AND EXPERIMENTAL STUDIES OF 35 GHz AND 96 GHz ELECTROMAGNETIC WAVE PROPAGATION IN PLASMA

*L. Zheng, Q. Zhao, S. Z. Liu, P. Ma, C. Huang, Y. F. Tang
X. L. Chen, X. J. Xing, C. Y. Zhang, and X. G. Luo*

| | | |
|---|--|-----|
| 1 | Introduction | 179 |
| 2 | Physical Model | 180 |
| 3 | Numerical Simulation Results | 183 |
| 4 | Experimental Results | 187 |
| 5 | Conclusions | 189 |

OPTICAL CHARACTERIZATION OF 50 HZ ATMOSPHERIC PRESSURE SINGLE DIELECTRIC BARRIER DISCHARGE PLASMA

M. Y. Naz, A. Ghaffar, N. U. Rehman, S. Shukrullah, and M. A. Ali

| | | |
|---|---|-----|
| 1 | Introduction | 193 |
| 2 | Experiment Setup | 196 |
| 3 | Experimental Results and Discussion | 197 |
| 4 | Conclusions | 204 |

THE EFFECT OF POWER-LINE SAGGED CONDUCTORS ON THE EVALUATION OF THE DIFFERENTIAL VOLTAGE IN A NEARBY CIRCUIT AT GROUND LEVEL

J. A. Brandão Faria

| | | |
|---|--------------------------------------|-----|
| 1 | Introduction | 209 |
| 2 | Zeroth Order Approach | 212 |
| 3 | First Order Approach | 214 |
| 4 | Second Order Approximation | 215 |
| 5 | Computation Results | 216 |
| 6 | Conclusion | 219 |

TM MODE ANALYSIS IN A METAMATERIAL BASED DIELECTRIC WAVEGUIDE

C. Jin, A. Alphones, and M. M. Dhirendra

| | | |
|---|--|-----|
| 1 | Introduction | 221 |
| 2 | Formulation of the dispersion relation | 223 |
| 3 | Dispersion Characteristic Analysis | 224 |
| 4 | Conclusion | 231 |

ANTENNA PATTERN RECONSTRUCTION DIRECTLY FROM NONREDUNDANT NEAR-FIELD MEASUREMENTS COLLECTED BY A CYLINDRICAL FACILITY

*F. D'Agostino, F. Ferrara, C. Gennarelli, G. Gennarelli
R. Guerriero and M. Migliozzi*

| | | |
|---|---|-----|
| 1 | Introduction | 235 |
| 2 | Sampling Representation on a Cylinder | 237 |
| 3 | Classical NF-FF Transformation | 241 |
| 4 | Direct NF-FF Transformation | 243 |
| 5 | Experimental Results | 245 |
| 6 | Conclusion | 247 |

A NOVEL RC-FDTD ALGORITHM FOR THE DRUDE DISPERSION ANALYSIS

A. Cala' Lesina, A. Vaccari, and A. Bozzoli

| | | |
|---|--------------------------------|-----|
| 1 | Introduction | 251 |
| 2 | Theoretical Approach | 252 |
| 3 | Simulations | 256 |
| 4 | Conclusion | 262 |

**HIGH- Q REFLECTION NOTCH METHOD FOR MM
WAVE MEASUREMENTS OF LARGE DIELECTRIC
LOSSES USING A STACK RESONATOR: ANALYSIS
AND SIMULATIONS***V. B. Yurchenko*

| | | |
|---|---|-----|
| 1 | Introduction | 265 |
| 2 | A Model of the Measurement Cell | 266 |
| 3 | Reflection, Transmission, and Absorption Spectra | 268 |
| 4 | Fields and Power Fluxes in the Cell | 269 |
| 5 | Phase Branch Points of S_{11} as Reflection Notch Markers | 271 |
| 6 | Phase Tuning in Back-reflected Waves as a Mechanism of Notch Formation | 272 |
| 7 | Optimization of the Measurement Cell | 274 |
| 8 | Conclusions | 276 |