

---

**ELECTROMAGNETIC WAVES**  
**PIERC 91**

---

**Progress**

**In**

**Electromagnetics**

**Research C**

© 2019 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.

---

**ELECTROMAGNETIC WAVES**  
**PIERC 91**

---

**Progress**  
**In**  
**Electromagnetics**  
**Research C**

Chief Editors: Weng Cho Chew and Sailing He

EMW Publishing  
Cambridge, Massachusetts, USA



## CONTENTS

<b>Electromagnetic Wave Scattering from an Infinite Periodic Array of Hollow Conducting Circular Cylinders of Finite Length</b>	
Hongchang An and Akira Matsushima .....	1
<b>Effect of Limb Movements on Compact UWB Wearable Antenna Radiation Performance for Healthcare Monitoring</b>	
Richa Bharadwaj, Clive Parini, Shibani K. Koul, and Akram Alomainy .....	15
<b>Research on Moving Target Imaging Method of Ship Based on Velocity Synthetic Aperture Radar</b>	
Lin Zhang and Yicheng Jiang .....	27
<b>A Compact Notched UWB MIMO Antenna with Enhanced Performance</b>	
Ekta Thakur, Naveen Jaglan, Samir D. Gupta, and Binod K. Kanaujia .....	39
<b>A Compact UWB Printed Monopole MIMO Antenna with Mutual Coupling Reduction</b>	
Hossein Babashah, Hamid R. Hassani, and Sajad Mohammad-Ali-Nezhad .....	55
<b>A Novel Lightweight SARNet with Clock-Wise Data Amplification for SAR ATR</b>	
Yikui Zhai, Wenbo Deng, Yanqing Zhu, Ying Xu, Bing Sun, Jingwen Li, Qirui Ke, Yihang Zhi and Vincenzo Pirui .....	69
<b>Electronically Switchable Ultra-Wide Band/Dual-Band Bandpass Filter Using Defected Ground Structures</b>	
Eman G. Ouf, Esmat A. F. Abdallah, Ashraf S. Mohra, and Hadia M. S. Elhennawy .....	83
<b>Design of Miniaturized Quad-Band Dual-Arm Spiral Patch Antenna for RFID, WLAN and WiMAX Applications</b>	
Ayia A. S. A. Jabar and Dhirgham Kamal Naji .....	97
<b>Polarized Diversity Compact Planar MIMO Antenna for Wireless Access Point Applications</b>	
Alireza Moradi, Razali Ngah, and Mohsen Khalily .....	115
<b>Investigation of Massive MIMO Scenarios Involving Rooftop Propagation by Bidirectional Ray-Tracing</b>	
Mehmet Mert Taygur, Ilya O. Sukharevsky, and Thomas F. Eibert .....	129
<b>Development of Multiple-Frequency Wireless Coordinative Motor Drives</b>	
Chaoqiang Jiang, Kwok Tong Chau, Christopher Ho Tin Lee, Wei Han, Wei Liu and Wong-Hing Lam .....	143
<b>An Investigation of Stepped Open Slot Antenna with Circular Tuning Stub</b>	
Prashant Purohit, Bhupendra Kumar Shukla, and Deepak Kumar Raghuvanshi .....	157

<b>A Compact Universal Antenna Design for UHF RFID Handheld Reader</b>	
Waleed Abdelrahim Ahmed, Quanyuan Feng, Zhuang Xiong, and Muhammad Kabir Khan . . . . .	173
<b>Analysis of Multi-Band Circle MIMO Antenna Design for C-Band Applications</b>	
Kommana Vasu Babu and Bhuma Anuradha . . . . .	185
<b>MERR Inspired CPW Fed SSGF Antenna for Multiband Operations</b>	
Nirmala Jayarenjini and Cheruvathoor Unni . . . . .	197
<b>A New Approximation for Calculating the Attraction Force in Cylindrical Permanent Magnets Arrays and Cylindrical Linear Single-Axis-Actuator</b>	
Naamane Mohdeb, Hicham Allag, and Tarik Hacib . . . . .	213
<b>A Frequency Agility Synthesizer with Low Phase Noise for Fully Electronic Millimeter Wave Imaging</b>	
Chunhui Fang, Bing Huang, Liang Wu, and Xiaowei Sun . . . . .	227
<b>Compact Tri-Band Microstrip Filter Using Three Types of Resonators for Bluetooth, WIMAX, and WLAN Applications</b>	
Iman Jadidi, Mohammad A. Honarvar, and Farzad Khajeh-Khalili . . . . .	241
<b>Compact Complementary Folded Triangle Split Ring Resonator Triband Mobile Handset Planar Antenna for Voice and Wi-Fi Applications</b>	
P. Rajalakshmi and N. Gunavathi . . . . .	253
<b>Low-Power Microwave Induced Thermoacoustic Imaging: Experimental Study and Hybrid FEM Modeling</b>	
Ryan Jacobs, Mohand Alzuhiri, Mark Golkowski, and Yiming Deng . . . . .	265