Progress
In
Electromagnetics
Research Letters
Progres in Electromagnetics Research Letters

Chief Editors: Weng Cho Chew and Sailing He
## CONTENTS

A Dual-Band 8-Element 4/5G Printed MIMO Antenna Using Open Slot Radiators  
Mohamed M. Morsy ................................................................. 1

Mechanisms and Influence Factors of Dynamic Behavior of Water Droplets on the  
Composite Insulator Surface under AC Electric Field  
Wen Cao, Hua Feng, Hao Xue, Wei Shen, Long Zhao, and Hao Yang ................................. 9

Orbital Angular Momentum Orthogonality Based Crosstalk Reduction  
Unaiza Tariq, Hiva Shahoei, Guang Yang, and Duncan L. MacFarlane ................................. 17

Optimization of the Wheeler Cap Technique for Efficiency Measurement of RFID  
Antennas Matched to Complex Loads  
Nadeen Rishani, Jean-Marc Laheurte, Stephane Protat, and Raed Shubair .......................... 25

A Low-Loss Dual-Band Negative Group Delay Circuit with Flexible Design  
Yuwei Meng, Zhongbao Wang, Yu Bai, Shaojun Fang, and Hongmei Liu ............................... 33

Gain Enhancement Using Modified Circular Loop FSS Loaded with Slot Antenna for  
Sub-6 GHz 5G Application  
Anubhav Kumar, Asok De, and Rakesh K. Jain ................................................................. 41

Synthesis of In-Line Fully Canonical Response Filters with Frequency-Variant Couplings  
Angel Triano and Pedro de Paco ....................................................................................... 49

Surface-Mount PIFA Using Ball Grid Array Packaging for 5G mmWave  
Xi Wang, Xiubo Liu, Wei Zhang, Dongning Hao, and Yanyan Liu ........................................ 55

Bandpass Filters Based SIW Square Cavity with Novel Feeding and Coupling Schemes  
Bo Yin, Qianqian Huang, and Xiangyu Shi ........................................................................... 61

Compact LTCC Filter with 7th-Order Harmonics Suppression for 5G N77 Band  
Applications  
Lan Luo, Huanyan Tie, Qiang Ma, and Bo Zhou ................................................................. 69

Design of Tri-Band Hybrid Dielectric Resonator Antenna for Wireless Applications  
Lavuri Nageswara Rao, Govardhani Immadi, and Madhavareddy Venkata Narayana ............ 75

Design of Low-Profile and Safe Low SAR Tri-Band Textile EBG-Based Antenna for IoT  
Applications  
Wissem El May, Imen Sfar, Jean M. Ribero, and Lotfi Osman ............................................. 85

A Low-F/D Wideband Transmitarray Antenna  
Yan-Fang Liu, Lin Peng, Bo Wang, Wei-Sheng Yu, Tian-Cheng Zheng, and Xing Jiang ....... 95
Surface Mounted Microstrip Antenna Using Ball Grid Array Packaging for mmWave Systems Integration
Xi Wang, Xiubo Liu, Wei Zhang, Dongning Hao, and Yanyan Liu .......................... 105

Plastronic Circular Line Matched Dipole Antenna
Gildas Bengloan, Anne Chousseaud, Bruno Froppier, Jacques Girard, Marc Brunet and Eduardo Motta Cruz ................................................................. 113

A Novel Planar Filtering Magic-T
Jun-Mei Yan, Hai-Ying Zhou, and Liang-Zu Cao .................................................. 121

Analysis and Design of Miniaturized Wideband Rat-Race Coupler with Improved Phase Performance
Hongmei Liu, Yao Wang, Tielin Zhang, Shaojun Fang, and Zhongbao Wang ................ 129

A Compact Negative Group Delay Circuit Topology Based on Asymmetric Coplanar Striplines and Double-Sided Parallel Striplines
Zhongbao Wang, Yu Bai, Yuwei Meng, Shaojun Fang, and Hongmei Liu ..................... 139

Four-Element Low-Band MIMO Antenna for Mobile Phones with Small Clearance
Harri Varheenmaa, Rasmus Luomaniemi, Anu Lehtovuori, Pasi Ylää-Oijala, and Ville Viikari . . . 145

Compact Four-Band Cactus-Shaped Antenna for 5G and WLAN Applications
Juan Zhang, Xiaoming Liu, Chen Wang, Lu Gan, Ye Wang, and Lijun Sun ......................... 155