

**APPLIED
COMPUTATIONAL
ELECTROMAGNETICS
SOCIETY
JOURNAL**

February 2020
Vol. 35 No. 2
ISSN 1054-4887

The ACES Journal is abstracted in INSPEC, in Engineering Index, DTIC, Science Citation Index Expanded, the Research Alert, and to Current Contents/Engineering, Computing & Technology.

The illustrations on the front cover have been obtained from the research groups at the Department of Electrical Engineering, The University of Mississippi.

THE APPLIED COMPUTATIONAL ELECTROMAGNETICS SOCIETY

<http://aces-society.org>

EDITORS-IN-CHIEF

Atef Elsherbeni

Colorado School of Mines, EE Dept.
Golden, CO 80401, USA

Sami Barmada

University of Pisa, ESE Dept.
56122 Pisa, Italy

ASSOCIATE EDITORS: REGULAR PAPERS

Mohammed Hadi

Kuwait University, EE Dept.
Safat, Kuwait

Alistair Duffy

De Montfort University
Leicester, UK

Wenxing Li

Harbin Engineering University
Harbin 150001, China

Maokun Li

Tsinghua University
Beijing 100084, China

Mauro Parise

University Campus Bio-Medico of Rome
00128 Rome, Italy

Yingsong Li

Harbin Engineering University
Harbin 150001, China

Riyadh Mansoor

Al-Muthanna University
Samawa, Al-Muthanna, Iraq

Antonio Musolino

University of Pisa
56126 Pisa, Italy

Abdul A. Arkadan

Colorado School of Mines, EE Dept.
Golden, CO 80401, USA

Salvatore Campione

Sandia National Laboratories
Albuquerque, NM 87185, USA

Wei-Chung Weng

National Chi Nan University, EE Dept.
Puli, Nantou 54561, Taiwan

Alessandro Formisano

Seconda Universita di Napoli
81031 CE, Italy

Piotr Gas

AGH University of Science and Technology
30-059 Krakow, Poland

Long Li

Xidian University
Shaanxa, 710071, China

Marco Arjona López

La Laguna Institute of Technology
Torreon, Coahuila 27266, Mexico

Paolo Mezzanotte

University of Perugia
I-06125 Perugia, Italy

Luca Di Rienzo

Politecnico di Milano
20133 Milano, Italy

Lei Zhao

Jiangsu Normal University
Jiangsu 221116, China

Sima Noghianian

University of North Dakota
Grand Forks, ND 58202, USA

Qiang Ren

Beihang University
Beijing 100191, China

Nunzia Fontana

University of Pisa
56122 Pisa, Italy

Atif Shamim

King Abdullah University of Science and Technology (KAUST)
Thuwal 23955, Saudi Arabia

Stefano Selleri

DINFO – University of Florence
50139 Florence, Italy

ASSOCIATE EDITORS: EXPRESS PAPERS

Lijun Jiang

University of Hong Kong, EEE Dept.
Hong, Kong

Shinichiro Ohnuki

Nihon University
Tokyo, Japan

Kubilay Sertel

The Ohio State University
Columbus, OH 43210, USA

Steve J. Weiss

US Army Research Laboratory
Adelphi Laboratory Center (RDRL-SER-M)
Adelphi, MD 20783, USA

Jiming Song

Iowa State University, ECE Dept.
Ames, IA 50011, USA

Amedeo Capozzoli

Univerita di Napoli Federico II, DIETI
I-80125 Napoli, Italy

Yu Mao Wu

Fudan University
Shanghai 200433, China

Maokun Li

Tsinghua University, EE Dept.
Beijing 100084, China

EDITORIAL ASSISTANTS

Matthew J. Inman

University of Mississippi, EE Dept.
University, MS 38677, USA

Shanell Lopez

Colorado School of Mines, EE Dept.
Golden, CO 80401, USA

Madison Le

Colorado School of Mines, EE Dept.
Golden, CO 80401, USA

Allison Tanner

Colorado School of Mines, EE Dept.
Golden, CO 80401, USA

EMERITUS EDITORS-IN-CHIEF

Duncan C. Baker

EE Dept. U. of Pretoria
0002 Pretoria, South Africa

Allen Glisson

University of Mississippi, EE Dept.
University, MS 38677, USA

Ahmed Kishk

Concordia University, ECS Dept.
Montreal, QC H3G 1M8, Canada

Robert M. Bevensee

Box 812
Alamo, CA 94507-0516, USA

Ozlem Kilic

Catholic University of America
Washington, DC 20064, USA

David E. Stein

USAF Scientific Advisory Board
Washington, DC 20330, USA

EMERITUS ASSOCIATE EDITORS

Yasushi Kanai

Niigata Inst. of Technology
Kashiwazaki, Japan

Alexander Yakovlev

University of Mississippi, EE Dept.
University, MS 38677, USA

Levent Gurel

Bilkent University
Ankara, Turkey

Mohamed Abouzahra

MIT Lincoln Laboratory
Lexington, MA, USA

Ozlem Kilic

Catholic University of America
Washington, DC 20064, USA

Erdem Topsakal

Mississippi State University, EE Dept.
Mississippi State, MS 39762, USA

Sami Barmada

University of Pisa, ESE Dept.
56122 Pisa, Italy

Fan Yang

Tsinghua University, EE Dept.
Beijing 100084, China

Rocco Rizzo

University of Pisa
56123 Pisa, Italy

William O'Keefe Coburn

US Army Research Laboratory
Adelphi, MD 20783, USA

EMERITUS EDITORIAL ASSISTANTS

Khaled ElMaghoub

Trimble Navigation/MIT
Boston, MA 02125, USA

Christina Bonnington

University of Mississippi, EE Dept.
University, MS 38677, USA

Anne Graham

University of Mississippi, EE Dept.
University, MS 38677, USA

Kyle Patel

Colorado School of Mines, EE Dept.
Golden, CO 80401, USA

Mohamed Al Sharkawy

Arab Academy for Science and Technology, ECE Dept.
Alexandria, Egypt

FEBRUARY 2020 REVIEWERS: REGULAR PAPERS

**Stamatios Amanatiadis
Burak Aricioglu
Manuel Arrebola
Ercument Arvas
Ankan Bhattacharya
Jerdvisanop Chakarothai
Guan-Yu Chen
Kejian Chen
Ozlem Coskun
Xunwang Dang
Danesh Daroui
Alistair Duffy
Atef Elsherbeni
Ian Flintoft
Alfredo Gomes Neto
Nan Hu
Taha Imeci
Tianqi Jiao
Sebastien Lallechere**

**Yingsong Li
Paulo Mendes
Branislav Notaros
Giuseppe Pelosi
Anthony Pendurthy
Zhen Peng
Jalil Rashed-Mohassel
Vince Rodriguez
Nitin Saluja
Yan Shi
Hamidreza Siampour
Meriah Sidi Mohammed
Manuel Sierra Castañer
Koushick V.
Xing-Chang Wei
Wei-Chung Weng
Binbin Yang
Karam Younus**

TABLE OF CONTENTS – REGULAR PAPERS

Comparative Study on Indoor Path Loss Models at 28 GHz, 60 GHz, and 73.5 GHz Frequency Bands Huthaifa A. Obeidat, Ali A. Abdullah, Mahmood F. Mosleh, Atta Ullah, Omar A. Obeidat, and Raed A. Abd-Alhameed	119
Near-Field Scattering of Typical Targets Illuminated by Vortex Electromagnetic Waves Hai-tao Chen, Ze-qi Zhang, and Jie Yu.....	129
A New Method for Stranded Cable Crosstalk Estimation Based on BAS-BP Neural Network Algorithm Combined with FDTD Method Qiang Q. Liu, Yang Zhao, Chao Huang, Wei Yan, and Jian M. Zhou	135
Frequency Splitting Based on Spoof Surface Plasmon Polaritons Coplanar Waveguide Jun Wang, Yanhui Liu, Lei Zhao, Zhang-Cheng Hao, Lei Qiao, Yongjin Zhou, and Yingsong Li.....	145
A Qualitative Deep Learning Method for Inverse Scattering Problems He Yang and Jun Liu.....	153
Helmet Antenna Design Using Characteristic Mode Analysis Naobumi Michishita and Hisashi Morishita.....	161
Gain Enhancement of a Dual-Band Planar Slot Dipole using AMC Plane for WBAN and WLAN Applications Fatin Nabilah Gimam, Ping Jack Soh, Mohd Faizal Jamlos, Herwansyah Lago, Azremi Abdullah Al-Hadi, Sharul Kamal Abdul Rahim, Dominique Schreurs, Prayoot Akkaraekthalin, and Adalbert Beyer	167
Mutual Coupling Reduction of Dual-Band Uni-Planar MIMO System Using Neutralization Line Technique Adham M. Saleh, Tariq A. Nagim, Raed A. Abd-Alhameed, James M. Noras, and Chan H. See.....	176
A High-Gain Microstrip Patch Antenna Using Multiple Dielectric Superstrates for WLAN Applications Niamat Hussain, Uktam Azimov, Minjoo Jeong, Seungyeop Rhee, Seung W. Lee, and Nam Kim	187

A Tri-Band Frequency Reconfigurable Slot Antenna for Wireless Applications Karam M. Younus and Khalil H. Sayidmarie	194
A Novel Omnidirectional Circularly Polarized Pagoda Antenna with Four Shorting Pins for UAV Applications Zheyu Li, Yongzhong Zhu, Yu Shen, Xiaoyu Liu, and Guohao Peng	201
A High-Efficient Wideband Transmitarray Antenna with Vias Yongliang Zhang, Xiuzhu Lv, Lina Liu, Yaxin Yi, and Zhao Wu	210
Design of a Dielectric-loaded Wide Beam Quad-ridged Horn Antenna Yaqing Yu, Wen Jiang, Lv Qin, and Shuxi Gong	218
Wearable Textile Fabric Based 3D Metamaterials Absorber in X-Band Ediz Delihasanlar and Ahmet H. Yuzer	230
An Analytic Method of Determining a Critical Cable Spacing for Acceptable Crosstalk Pei Xiao, Wan-Wei Ran, and Ping-An Du	237