

**APPLIED  
COMPUTATIONAL  
ELECTROMAGNETICS  
SOCIETY  
JOURNAL**

December 2016  
Vol. 31 No. 12  
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>

## EDITOR-IN-CHIEF

**Atef Elsherbeni**

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

## ASSOCIATE EDITORS-IN-CHIEF

**Sami Barmada**

University of Pisa. ESE Dept.  
Pisa, Italy, 56122

**Mohamed Bakr**

McMaster University, ECE Dept.  
Hamilton, ON, L8S 4K1, Canada

**Antonio Musolino**

University of Pisa  
56126 Pisa, Italy

**Mohammed Hadi**

Kuwait University, EE Dept.  
Safat, Kuwait

**Abdul Arkadan**

Marquette University, ECE Dept.  
Milwaukee, WI 53201, USA

**Marco Arjona López**

La Laguna Institute of Technology  
Torreon, Coahuila 27266, Mexico

**Alistair Duffy**

De Montfort University  
Leicester, UK

**Paolo Mezzanotte**

University of Perugia  
I-06125 Perugia, Italy

## EDITORIAL ASSISTANTS

**Matthew J. Inman**

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

**Shanell Lopez**

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

## EMERITUS EDITORS-IN-CHIEF

**Duncan C. Baker**

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

**Ahmed Kishk**

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

**Allen Glisson**

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

**Robert M. Bevensen**

Box 812  
Alamo, CA 94507-0516, USA

**David E. Stein**

USAF Scientific Advisory Board  
Washington, DC 20330, USA

## EMERITUS ASSOCIATE EDITORS-IN-CHIEF

**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

**Fan Yang**

Tsinghua University, EE Dept.  
Beijing 100084, China

## 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

**Mohamed Al Sharkawy**  
Arab Academy for Science and Technology, ECE Dept.  
Alexandria, Egypt

## DECEMBER 2016 REVIEWERS

**Iftikhar Ahmed**  
**Jiefu Chen**  
**Ramin Dehdasht-Heydari**  
**Ahmed Elkorany**  
**Grant Ellis**  
**Thomas Ellis**  
**Khaled ElMahgoub**  
**Saeed Fakhte**  
**Zhenhong Fan**  
**Idayachandran Govindanarayanan**  
**Ahmed Hassan**  
**Mang He**  
**Ahmad Hosseinbeig**  
**Robert Ilgner**  
**Jamie Infantolino**

**Raphael Kastner**  
**Nitin Kathuria**  
**Erika Pittella**  
**Azhagu R.**  
**Rama Rao**  
**Abhishek Sharma**  
**Varun Singh**  
**Vitawat Sittakul**  
**Thomas Søndergaard**  
**Mehmet Tabakcioglu**  
**Dattaprasad Torse**  
**SureshKumar TR.**  
**Theodoros Tsiboukis**  
**John Young**



**THE APPLIED COMPUTATIONAL ELECTROMAGNETICS SOCIETY**  
**JOURNAL**

Vol. 31 No. 12

December 2016

**TABLE OF CONTENTS**

Reconstruction of the Antenna Far-Field Pattern through a Fast Plane-Polar Scanning Francesco D'Agostino, Flaminio Ferrara, Claudio Gennarelli, Rocco Guerriero, and Massimo Migliozi.....	1362
The Fourth-Order One-Step Leapfrog HIE-FDTD Method Mian Dong, Anxue Zhang, Juan Chen, Songlin Zhang, and Yuchen He .....	1370
A Speeding up Technique for Lossy Anisotropic Algorithm in FDTD Method Fatih Kaburcuk and Atef Z. Elsherbeni.....	1377
Full-Wave Analysis of Microstrip Circuits with Reciprocal Matrix Compression Technique Mengmeng Li, Chenhui Xia, and Rushan Chen.....	1382
Finite Element Analysis of Three Dimensional Complex Scatterers in Layered Media Xuewei Ping, Xinghui Yin, Li Li, Changli Li, and Qingbo Li .....	1389
A New HIE-PSTD Method for Solving Problems with Fine and Electrically Large Structures Simultaneously Jiaying Guo, Juan Chen, Jianguo Wang, and Anxue Zhang .....	1397
Development of a Low Profile Wideband Backward-Wave Directional Coupler Using Neural Network Zahra S. Tabatabaeian and Mohammad H. Neshati.....	1404
Planar Dual-Band WLAN MIMO Antenna with High Isolation Hui Li, Le Kang, Yuan Xu, and Ying-zeng Yin .....	1410
A Compact Planar Ultra Wideband Antenna with Triple-Notched Bands Using Capacitive Coupled and Parallel LC Elements Amin Araghi.....	1416
A Four-Leaf Clover Shape MIMO Antenna for UWB Applications Wang Yao, Helin Yang, Xiaojun Huang, and Zetai Yu.....	1421
Transparent Flexible Antenna for UWB Applications Mohammad Reza Haraty, Mohammad Naser-Moghadasi, Abbas Ali Lotfi- Neyestanak, and Alireza Nikfarjam .....	1426

Design of a Planar Surface Wave Antenna with a Bidirectional Pattern Based on Periodic Structures for Telemetry Applications Isa Mazraeh-Fard, Mohsen Maddahali, Zaker H. Firouzeh, and Hamed Khayam Nekoei .....	1431
A Novel Tunable Graphene Based Terahertz Absorber with Polarization Insensitive Sayed V. Masuminia, Changiz Ghobadi, Javad Nourinia, Mohsen Karamirad, and Bahman Mohammadi .....	1439
Multiband and Perfect Absorber with Circular Fishnet Metamaterial and its Variations Yusuf Ozturk and Asim Egemen Yilmaz.....	1445
Novel Mathematical Formulation of the Antenna Array Factor for Side Lobe Level Reduction Oussama Gassab and Arab Azrar .....	1452