

ISSN: 1942-0730 Volume 11, Number 5, May 2019



# Journal of Electromagnetic Analysis and Applications



[www.scirp.org/journal/jemaa](http://www.scirp.org/journal/jemaa)

# JOURNAL EDITORIAL BOARD

ISSN: 1942-0730 (Print)

ISSN: 1942-0749 (Online)

<http://www.scirp.org/journal/jemaa>

---

## Editor-in-Chief

**Prof. Yuanzhang Sun**

Wuhan University, China

## Editorial Advisory Board

**Prof. C. C. Chan**

University of Hong Kong, China

**Prof. Ryuichi Yokoyama**

Waseda University, Japan

## Editorial Board

**Prof. Vladimir N. Binh**

Russian Academy of Sciences, Russia

**Prof. Marco Breschi**

University of Bologna, Italy

**Prof. Iver Hakon Brevik**

Norwegian University of Science and  
Technology, Norway

**Prof. Antonella D'Orazio**

Polytechnic of Bari, Italy

**Dr. Hosam El-Ocla**

Lakehead University, Canada

**Prof. Mohamed H. Gaber**

Cairo University, Egypt

**Prof. Kerim Guney**

Nuh Naci Yazgan University, Turkey

**Dr. Yuchun Guo**

Jiangnan Electronic Communication  
Research Institute, China

**Prof. Xijiang Han**

Harbin Institute of Technology, China

**Prof. Eisuke Hanada**

Saga University Graduate School of Science and Engineering,  
Japan

**Prof. Yahya Salameh Hassan Khraisat**

Al-Balqa' Applied University, Jordan

**Prof. Isabel Jesus**

Institute of Engineering of Porto, Portugal

**Dr. Bu Sik Park**

Food and Drug Administration (FDA), USA

**Prof. Haiduke Sarafian**

The Pennsylvania State University, USA

**Prof. Yonghua Song**

Tsinghua University, China

**Prof. Vishnu Srivastava**

Central Electronics Engineering Research Institute, India

**Prof. Francisco Torrens**

Universitat of Valencia, Spain

**Prof. Uygun V. Valiev**

Mirzo Ulugbek National University of  
Uzbekistan (NUUz), Uzbekistan

**Prof. Chao-Fu Wang**

National University of Singapore, Singapore

**Prof. Tham-Choy Yoong**

Wawasan Open University, Malaysia

**Prof. Zeev Zalevsky**

Bar-Ilan University, Israel

# Table of Contents

**Volume 11    Number 5**

**May 2019**

**Multiphysics Analysis for Thermal Management of a 3 MeV, 325 MHz Radio Frequency  
Quadrupole Accelerator for Indian Spallation Neutron Source**

N. K. Sharma, C. P. Paul, S. C. Joshi, G. V. Kane, A. Chaturvedi.....55

# Journal of Electromagnetic Analysis and Applications (JEMAA)

## Journal Information

### SUBSCRIPTIONS

The *Journal of Electromagnetic Analysis and Applications* (Online at Scientific Research Publishing, [www.SciRP.org](http://www.SciRP.org)) is published monthly by Scientific Research Publishing, Inc., USA.

#### Subscription rates:

Print: \$89 per issue.

To subscribe, please contact Journals Subscriptions Department, E-mail: [sub@scirp.org](mailto:sub@scirp.org)

### SERVICES

#### Advertisements

Advertisement Sales Department, E-mail: [service@scirp.org](mailto:service@scirp.org)

#### Reprints (minimum quantity 100 copies)

Reprints Co-ordinator, Scientific Research Publishing, Inc., USA.

E-mail: [sub@scirp.org](mailto:sub@scirp.org)

### COPYRIGHT

#### Copyright and reuse rights for the front matter of the journal:

Copyright © 2019 by Scientific Research Publishing Inc.

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>

#### Copyright for individual papers of the journal:

Copyright © 2019 by author(s) and Scientific Research Publishing Inc.

#### Reuse rights for individual papers:

Note: At SCIRP authors can choose between CC BY and CC BY-NC. Please consult each paper for its reuse rights.

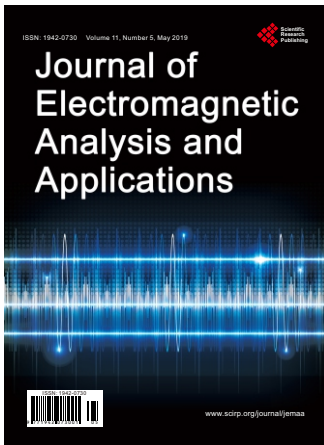
#### Disclaimer of liability

Statements and opinions expressed in the articles and communications are those of the individual contributors and not the statements and opinion of Scientific Research Publishing, Inc. We assume no responsibility or liability for any damage or injury to persons or property arising out of the use of any materials, instructions, methods or ideas contained herein. We expressly disclaim any implied warranties of merchantability or fitness for a particular purpose. If expert assistance is required, the services of a competent professional person should be sought.

### PRODUCTION INFORMATION

For manuscripts that have been accepted for publication, please contact:

E-mail: [jemaa@scirp.org](mailto:jemaa@scirp.org)



# Journal of Electromagnetic Analysis and Applications

ISSN: 1942-0730 (Print) ISSN: 1942-0749 (Online)

<http://www.scirp.org/journal/jemaa>

**Journal of Electromagnetic Analysis and Applications (JEMAA)** is a professional journal in the field of electromagnetic analysis, testing and application. The goal of this journal is to provide an international platform for engineers and academicians all over the world to promote, share, and discuss various new issues and developments in the field of electromagnetics. This journal is edited to encourage deeper understanding and greater effectiveness in theory analysis, testing, numerical calculation and engineering application that relevant electromagnetic fields.

## Editor-in-Chief

Prof. Yuanzhang Sun

Wuhan University, China

## Subject Coverage

JEMAA publishes four categories of original technical reports: papers, communications, reviews, and discussions. Papers are well-documented final reports of research projects. Communications are shorter and contain noteworthy items of technical interest or ideas required rapid publication. Reviews are synoptic papers on a subject of general interest, with ample literature references, and written for readers with widely varying background. Discussions on published reports, with author rebuttals, form the fourth category of JEMAA publications. Topics of interest include, but are not limited to:

- Antenna Arrays
- Antenna Theory and Applications
- Biological Effects
- Eddy Current Problems
- Electric Power and Grounding (Earth)
- Electric Power Line
- Electrical Machine
- Electrocardiograph (ECG)
- Electroencephalograph (EEG)
- Electromagnetic Breaker
- Electromagnetic Compatibility (EMC)
- Electromagnetic Compatibility and Electromagnetic Environment
- Electromagnetic Devices
- Electromagnetic Field Theory
- Electromagnetic Interferences (EMI)
- Electromagnetic Inverse Problems
- Electromagnetic Launch
- Electromagnetic Material Modelling
- Electromagnetic Measurement Technology and Instruments
- Electromagnetic Nondestructive Testing
- Electromagnetic Numerical Analysis
- Electromagnetic Physics
- Electromagnetic Solid Mechanics
- Electromagnetic Structure Optimization
- Electromagnetism and Biological Tissues
- Electromagnetism and Medical Devices
- Electromagnetism in Medical Applications

- Electromyography
- Environmental Pollution by Electromagnetics
- Fiber Optics
- High Frequency Techniques
- Integrated Optics
- Magnetic Fluid
- Measuring Technique of Radiated Electromagnetic
- Medical Applications
- Moving Conductor Eddy Current Problems
- Multiphysics Coupled Problems
- Noise and Signals
- Noise Reduction
- Optical and Millimeter Wave Techniques
- Printed Circuits
- Quasi-Static Fields
- Radar Measurements and Applications
- Radiated Electromagnetic
- Scattering and Diffraction
- Serges (Thunderbolts or Static Electricity)
- Solid State Devices and Circuits
- Static Fields
- Static Magnetic
- Test Electromagnetic Analysis Method (Team) Workshop Benchmark Problems
- The Problems of the Propagation of Electromagnetic Waves
- Waveguides

## Notes for Intending Authors

Submitted papers should not be previously published nor be currently under consideration for publication elsewhere. Paper submission will be handled electronically through the website. All papers will be peer reviewed. For more details about the submissions, please access the website.

## Website and E-Mail

<http://www.scirp.org/journal/jemaa>

E-mail: [jemaa@scirp.org](mailto:jemaa@scirp.org)

## ***What is SCIRP?***

Scientific Research Publishing (SCIRP) is one of the largest Open Access journal publishers. It is currently publishing more than 200 open access, online, peer-reviewed journals covering a wide range of academic disciplines. SCIRP serves the worldwide academic communities and contributes to the progress and application of science with its publication.

## ***What is Open Access?***

All original research papers published by SCIRP are made freely and permanently accessible online immediately upon publication. To be able to provide open access journals, SCIRP defrays operation costs from authors and subscription charges only for its printed version. Open access publishing allows an immediate, worldwide, barrier-free, open access to the full text of research papers, which is in the best interests of the scientific community.

- High visibility for maximum global exposure with open access publishing model
- Rigorous peer review of research papers
- Prompt faster publication with less cost
- Guaranteed targeted, multidisciplinary audience



**Scientific  
Research  
Publishing**

**Website: <http://www.scirp.org>**

**Subscription: [sub@scirp.org](mailto:sub@scirp.org)**

**Advertisement: [service@scirp.org](mailto:service@scirp.org)**