

PIERS 2019 Rome

Photonics & Electromagnetics Research Symposium

also known as Progress In Electromagnetics Research Symposium

Program

June 17 - 20, 2019

Rome, ITALY

www.emacademy.org

www.piers.org

- 18:00 Solar Activity Influence on the Mesopause Temperature and F2 Peak Electron Density
Irina Medvedeva (Institute of Solar-Terrestrial Physics); Konstantin G. Ratovsky (Institute of Solar-Terrestrial Physics, SB RAS);

Session 4P2

Electromagnetic Methods and Electronic Devices for Security

Thursday PM, June 20, 2019

Room 5 - 1st Floor

Organized by Lorenzo Capineri

Chaired by Pierluigi Falorni, Daniela Deiana

- 14:30 Background Removal for the Processing of Scans Acquired with the “UGO-1st” Landmine Detection Platform
Lorenzo Capineri (Università di Firenze); Pierluigi Falorni (Università di Firenze); G. Borgioli (Università degli Studi di Firenze); Luca Bossi (Università di Firenze); Gennadiy Pochanin (O. Ya. Usikov Institute for Radiophysics and Electronics of the National Academy of Sciences of Ukraine); V. Ruban (O. Ya. Usikov Institute for Radiophysics and Electronics of the NAS of Ukraine); O. Pochanin (O. Ya. Usikov Institute for Radiophysics and Electronics of the NAS of Ukraine); T. Ogurtsova (O. Ya. Usikov Institute for Radiophysics and Electronics of the NAS of Ukraine); Fronefield Crawford (Franklin & Marshall College); Timothy D. Bechtel (Franklin & Marshall College);
- 14:50 Development of Multifrequency MW Detection Device to Scan Liquids in Security Checkpoints
M. Vafadar Yengejeh (Gebze Technical University); Sultonazar Mamadazizov (Gebze Technical University); B. Colak (Alanya Alaaddin Keykubat University); Bulat Rameev (Gebze Technical University);
- 15:10 Multi-sensor Fusion Applied to the Detection of Person-Borne Improvised Explosive Devices (PB-IEDs)
Daniela Deiana (Electronic Defence, TNO Defence, Safety and Security); Patrick Hanckmann (Intelligent Autonomous Systems, TNO Defence, Safety and Security);
- 15:30 Electromagnetic Induction Imaging with Atomic Magnetometers: Surveillance and Security Applications
Cameron Deans (University College London); Luca Marmugi (University College London); Ferruccio Renzoni (University College London);
- 15:50 Design of Small Sized SFCW Radar for Landmine Detection
D. Sipos (University of Maribor); Dusan Gleich (University of Maribor);
- 16:10 Smart Radar Sensors for Critical Sites Protection
Simone Ledda (University of Florence); Guido Biffi Gentili (University of Florence);
- 16:30 **Coffee Break**
- 17:00 Magnetic Resonance and Microwave Techniques for Security Applications
Bulat Rameev (Gebze Technical University);
- 17:20 Remote Sensing for the Detection of Explosives and Energetic Materials by ¹⁴N NQR and ¹⁴N NMR
Georgy Mozhukhin (Gebze Technical University); A. Marasli (Gebze Technical University); S. Mamadazizov (Gebze Technical University); B. Colak (Alanya Alaaddin Keykubat University); Bulat Rameev (Gebze Technical University);
- 17:40 Compressed Sensing Stepped Frequency Ground Penetrating Radar Using Structure
Venceslav Kafedziski (University Ss Cyril and Methodius);
- 18:00 Some Opinion and Estimation about Possibility to See Stealth by Microwave Radiometer
Hao Liu (Harbin Institute of Technology); Chao Wu (Harbin Institute of Technology); Dajing Wang (Harbin Institute of Technology); Jing-Hui Qiu (Harbin Institute of Technology); Oleksandr Denisov (Harbin Institute of Technology);

Session 4P3a

Transmission Line, Waveguide & Filter

Thursday PM, June 20, 2019

Room 7 - 1st Floor

Chaired by Shinichi Tanaka, **Yongchae Jeong**

- 14:30 Development of Inkjet-printed Microwave Filters for 1–6 GHz Band Communications Applications
Hüseyin Sinan Aksimsek (Istanbul Kultur University); E. A. Ozek (Istanbul Kultur University);
- 14:50 A Compact Harmonic Filter Using CRLH Transmission Line Stubs for Class-E Power Amplifiers
H. Asami (Shibaura Institute of Technology); Shinichi Tanaka (Shibaura Institute of Technology);

- 15:10 CMOS Microwave Bandpass Filter Using High Q Active Inductor
Qi Wang (Chonbuk National University); Phirun Kim (Chonbuk National University); Girdhari Chaudhary (Chonbuk National University); Jongsik Lim (Soonchunhyang University); Yongchae Jeong (Chonbuk National University);
- 15:30 **Compact Wide-stopband Quarter-mode SIW Bandpass Filter with Triangle Cavity**
Phirun Kim (Chonbuk National University); Phanam Pech (Chonbuk National University); Jongsik Lim (Soonchunhyang University); Dal Ahn (Soonchunhyang University); Yongchae Jeong (Chonbuk National University);
- 15:50 Transmission Lines Modeling Approach Based on the Approximation of Pade
Zahra Bouzidi (Cadi Ayyad University); Abdelaziz El Idrissi (Cadi Ayyad University); Hicham Roujiaa (Hassan University 1); Mohamed Saïh (University of Sultan Moulay Slimane);
- 16:10 Measurement of Parameters of Objects in Non-standard Guiding Systems and in Free Space
Vladimir Ivanovich Evseev (LLC "Arzamas Instrument-making Design Bureau"); Oleg Veniaminovich Lavrichev (JSC "Arsamassky Pri-borostroitelny Zavod imeni Plandina"); Elena Alexandrovna Lupanova (Nizhniy Novgorod State Technical University n.a. R. E. Alekseev); Sergey Michailovich Nikulin (Alekseev's Nizhny Novgorod State Technical University);
- 16:30 **Coffee Break**
- 17:00 Comparative Study of Multipactor Effect in Rectangular and Parallel-plate Waveguides Partially Loaded with Dielectric
A. Berenguer (Universidad Miguel Hernandez de Elche); Angela Coves Soler (Universidad Miguel Hernandez de Elche); E. Bronchalo (Universidad Miguel Hernandez de Elche);
- 17:20 A CMOS Single Stage Sub-harmonic Mixer with Two Conversion Modes for Fast Spectrum Sensing Functionality
Seongjin Bae (Chonbuk National University); Donggu Im (Chonbuk National University);
- 17:40 Wideband Phase Shifter Using 3 Types of LC Resonant Circuits for Phase Slope Alignment
Youna Jang (Soonchunhyang University); Maaz Salman (Soonchunhyang University); Yongchae Jeong (Chonbuk National University); Kwansun Choi (Soonchunhyang University); Sang-Min Han (Soonchunhyang University); Dal Ahn (Soonchunhyang University);
- 18:00 A High-efficiency DC-to-RF/RF-to-DC Conversion Module with Zero-threshold FET for Bidirectional Wireless Power Transfer
Takaharu Kume (The University of Electro-Communications); Ryo Ishikawa (The University of Electro-Communications); Kazuhiko Honjo (The University of Electro-Communications);
- 18:20 Bandwidth Broadening of a Waveguide Circulator for Industrial Dual-band Magnetrons
Kaviya Aranganadin (Hanyang University); Hua-Yi Hsu (National Taipei University of Technology); Ming-Chieh Lin (Hanyang University);
- 18:40 Modeling a Gyrotron Mode Converter Using 3-D CFDTD Simulation
Ming-Chieh Lin (Hanyang University); Jianbo Jin (Forschungszentrum Karlsruhe); Stefan Illy (Karlsruhe Institute of Technology (KIT)); Konstantinos A. Avramidis (Karlsruhe Institute of Technology (KIT)); Manfred Thumm (Karlsruhe Institute of Technology); John Jelonnek (Institute for Pulsed Power and Microwave Technology, Karlsruhe Institute of Technology);

Session 4P4
Computational Electromagnetics, Hybrid Methods

Thursday PM, June 20, 2019
Room 8 - 1st Floor

 Chaired by Vladimir Okhmatovskii, Mikhail Sergeevich Mikhailov

Session 4P3b
Microwave and Millimeter Wave Circuits and Devices 2

Thursday PM, June 20, 2019
Room 7 - 1st Floor

 Chaired by Yongchae Jeong, Shinichi Tanaka

Compact Wide-stopband Quarter-mode SIW Bandpass Filter with Triangle Cavity

Phirun Kim¹, Phanam Pech¹, Jongsik Lim², Dal Ahn², and Yongchae Jeong¹

¹Division of Electronics and Information Engineering, Chonbuk National University, Republic of Korea

²Department of Electrical Engineering, Soonchunhyang University, Republic of Korea

Abstract— Bandpass filters (BPFs) with high performance and compact size are important components in modern microwave systems to suppress the unwanted harmonic signals and out-of-band interferences with low cost. In this paper, a quarter-mode triangle cavity substrate integrated waveguide (SIW) BPF is presented. Since the SIW with a full-mode cavity has a large circuit size, the quarter-mode resonator is analyzed and can be reduce a circuit size up to 75% compared to a full-mode cavity [1]. The square full-mode cavity can be divided in to four quarter-modes with square and/or triangle cavities [2, 3]. The quarter-mode triangle cavity has two magnetic sidewalls and one electric sidewall. However, the quarter-mode square resonator has two electric sidewalls and two magnetic sidewalls. Both quarter-mode cavities can operate at the same frequency. The triangle cavity is coupled to the other triangle cavity by a magnetic coupling that controlled with a sharing iris window. Moreover, the input/output-port couplings are controlled by the tapping position from the via-hold ground. For validity, a quarter-mode SIW BPF with triangle cavity was designed at center frequency of 8 GHz with FBW of 12% using two-stage resonators. The electromagnetic (EM) simulation of HFSS from Ansys is used. The filter is fabricated on RT/Duriod 5880 substrate with dielectric constant (ϵ_r) of 2.2 and thickness (h) of 0.52 mm. The overall circuit size of the proposed filter is $12 \text{ mm} \times 12 \text{ mm}$. From the measurement, input return loss better than 13 dB at the f_0 is measured. Moreover, the return loss better than 13.3 dB is measured within the frequency range of 7.46–8.55 GHz (FBW = 13.6%). The measured insertion loss (S_{21}) at the f_0 is 1.24 dB, showing a good agreement with the simulation results. Within the same passband, the measured insertion loss is better than 1.3 dB. The proposed filter provides a wide stopband attenuation with a transmission zero at 13.28 GHz ($1.66f_0$) which is measured and attenuated better than 36 dB. The attenuation at the lower stopband is measured better than 15 dB from DC to 5.7 GHz. Similarly, the attenuation at the higher stopband is measured better than 15 dB from 10.31 GHz to 15.32 GHz. The proposed filter provides a wide stopband characteristic and high stopband attenuation without fabrication difficulty in microstrip technology. Moreover, the circuit size of proposed BPF is compact with quarter-mode cavity.

REFERENCES

1. Hong, J.-S., *Filters for RF/Microwave Applications*, 2nd Edition, John Wiley & Sons, Inc., 2011.
2. Moscato, S., C. Tomassoni, M. Bozzi, and L. Perregrini, “Quarter-mode cavity filters in substrate integrated waveguide technology,” *IEEE Trans. Microwave Theory Techn.*, Vol. 64, No. 8, 2538–2547, Aug. 2016.
3. Jin, C., R. Li, A. Alphones, and X. Bao, “Quarter-mode substrate integrated waveguide and its application to antennas design,” *IEEE Trans. Antennas Propag.*, Vol. 61, No. 6, 2921–2928, Jun. 2013.