

PIERS 2023 Prague

PhotonIcs & Electromagnetics Research Symposium
also known as Progress In Electromagnetics Research Symposium

Program

July 3–6, 2023
Prague, CZECH REPUBLIC

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15:30 **Coffee Break**

Session 2P12b
**Advanced RF and Microwave Technologies for
New Mobility Applications**

Tuesday PM, July 4, 2023
Room 12 - South Room 224

Organized by Sang-Min Han

 Chaired by Sang-Min Han, Yongchae Jeong

16:00 Miniaturized Four Port MIMO Antenna for URLLC and Virtual MIMO Applications

Osama Aziz (Ghulam Ishaq Khan Institute of Engineering Sciences and Technology); MuhibUr Rahman (Polytechnique Montreal);

16:15 Utilizing Transmission Lines for Efficient Energy Harvesting in 5G Networks

Maryam Eshaghi (University of Windsor); Rashid Rashidzadeh (University of Windsor);

16:30 The Method of De-embedding without the TRL Calibration Board

Minseong Kim (Soonchunhyang University); Sohui Kim (Soonchunhyang University); Jiwon Kim (Soonchunhyang University); Heaseong Cha (SAWNICS Co., Ltd.); Soon Hong Ahn (SAWNICS Co., Ltd.); Youna Jang (Soonchunhyang University); Dal Ahn (Soonchunhyang University);

16:45 Design of Compact and High Selective RF Front-end Module for Low-band 5G and IoT Applications

Trong-Hieu Le (Electric Power University); Manh-Cuong Ho (Electric Power University); Le-Cuong Nguyen (Electric Power University);

17:00 Compact Microwave Device Designs with DGSs for Mobility Applications

Sang-Min Han (Soonchunhyang University); Won-Sang Yoon (Hoseo University); Jongsik Lim (Sooncheonhyang University); Dal Ahn (Soonchunhyang University);

17:15 Deep Reinforcement Learning-based Auto-tuning Algorithm for Cavity Filters

Daniel Poul Mtowe (Soonchunhyang University); Seong-Ho Son (Soonchunhyang University); Dal Ahn (Soonchunhyang University); Dong Min Kim (Soonchunhyang University);

17:30 Magnetless Nonreciprocal Bandpass Filter Using Time-modulated Resonators

Girdhari Chaudhary (Jeonbuk National University); Phanam Pech (Jeonbuk National University); Samdy Saron (Jeonbuk National University); Yongchae Jeong (Jeonbuk National University);

17:45 Unequal Termination Impedances Bandpass Filter Based on Different-mode Substrate Integrated Waveguide Cavity

Phanam Pech (Jeonbuk National University); Samdy Saron (Jeonbuk National University); Girdhari Chaudhary (Jeonbuk National University); Yongchae Jeong (Jeonbuk National University);

18:00 A Design of Multilayer Interdigital Bandpass Filter Using Low-temperature Co-fired Ceramic (LTCC) Technology

Sohui Kim (Soonchunhyang University); Minseong Kim (Soonchunhyang University); Dae-Ung Lee (Huba Research Institute); Hyung-Sik Park (Huba Research Institute); Youna Jang (Soonchunhyang University); Dal Ahn (Soonchunhyang University);

 18:15 **A Size-reduced CPW Ring Hybrid Coupler Using a Phase Converting Structure**
Jongsik Lim (Sooncheonhyang University); Donghun Kang (Soonchunhyang University); Kyung-min Park (Soonchunhyang University); Gil-Young Lee (Air Force Academy); Sang-Min Han (Soonchunhyang University); Dal Ahn (Soonchunhyang University); Yongchae Jeong (Jeonbuk National University);

Session 2P13
Poster Session 3

Tuesday PM, July 4, 2023
14:00 PM - 18:00 PM
Room 13 - Congress Hall Foyer 2

 1 Glare Points in Laser Flow Cytometry
Alexander Putz (Physikalisch-Technische Bundesanstalt); M. Hussels (Physikalisch-Technische Bundesanstalt); Jonas Gienger (Physikalisch-Technische Bundesanstalt);

 2 A Single-layer Polarization-insensitive Broadband Absorber for X-band Applications
Cheng-Yen Chung (Yuan Ze University); Cheng-Nan Chiu (Yuan Ze University); Ming-Kun Hsieh (Bureau of Standards, Metrology and Inspection, Ministry of Economic Affairs); Yuan-Fu Ku (Taiwan Testing and Certification Center);

 3 Utilization of Transmission Phase Shift Method for Characterizing Properties of Material Encapsulated by Rectangular Waveguide
Sulistyaningsih (Institut Teknologi Bandung); Zulfi (Institut Teknologi Bandung); Umar Khayam (Institut Teknologi Bandung); Achmad Munir (Institut Teknologi Bandung);

A Size-reduced CPW Ring Hybrid Coupler Using a Phase Converting Structure

Jongsik Lim¹, Donghun Kang¹, Kyungmin Park¹, Gil-Young Lee²,
Sang-Min Han¹, Dal Ahn¹, and Yongchae Jeong³

¹Soonchunhyang University, Republic of Korea

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³Chonbuk National University, Republic of Korea

Abstract— Microwave ring hybrid couplers (RHCs) are widely used high frequency circuits for wireless communication systems and other mobility applications. One can obtain two types of performances representatively from RHCs, i.e., in-phased and out-of-phased divided signals, by selecting the incident port out of four ports. In the normal structure of RHCs, $1.5\lambda_g$ of circumference at the center frequency is required essentially as shown in Fig. 1. It is noted that if the longest line section of $0.75\lambda_g$ is electrically maintained the performances of RHCs are preserved. So, it is possible to reduce the circuit size by inserting an abrupt 180° phase converting structure, which corresponds to $0.5\lambda_g$ into the longest line. The longest line can be replaced by physically $0.25\lambda_g$ line as illustrated in Fig. 2. It has been studied that coplanar waveguide (CPW) transmission lines may have an 180° phase converting structure by making intersection the center signal line and both ground planes. This seems to be one of inherent advantages of CPW lines because the signal line and ground planes are on the same plane. Fig. 3 shows the designed size-reduced RHC and the CPW phase converting structure with the magnified Tee-junction area. The performances of the miniaturized RHC are well preserved even after the size has been reduced by almost 50%.

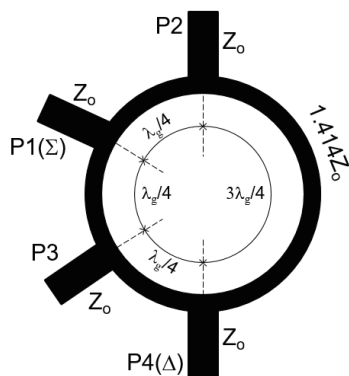


Figure 1.

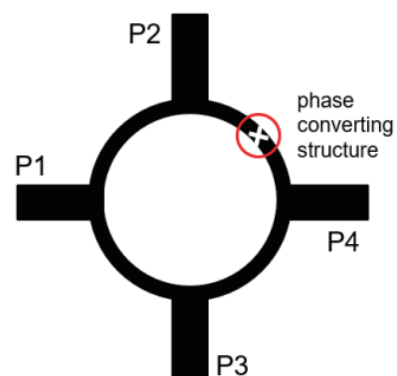


Figure 2.

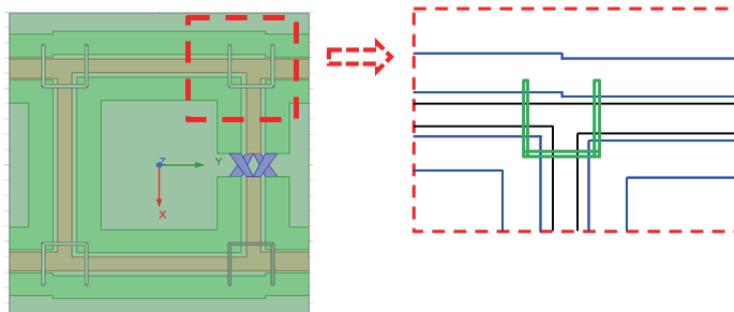


Figure 3.

ACKNOWLEDGMENT

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