

PIERS 2015 Prague

Progress In Electromagnetics Research Symposium

Program

July 6 - 9, 2015

CZECH REPUBLIC

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- 08:20 A Compact Band Pass Filter with Wide Stop-band in LGA Package by Low-temperature Co-fired Ceramic
Li Ju Chen (National Sun Yat-Sen University, Taiwan); Ken-Huang Lin (National Sun Yat-Sen University, Taiwan);
- 08:40 Heuristic Circuit Transformation Based on Left-handed Filter and Right-handed Filter
Kosei Tanii (National Institute of Technology, Kisarazu College, Japan); Koji Wada (The University of Electro-Communications, Japan); Takano Ohno (Kisarazu National College of Technology, Japan);
- 09:00 A Compact Tunable Dual-band Bandpass Filter Using Varactor-loaded Step-impedance Resonators
Xiang Zhang (Chinese Academy of Sciences, University of Science and Technology of China, China); Chang Chen (Chinese Academy of Sciences, University of Science and Technology of China, China); Mingkang Li (Chinese Academy of Sciences, University of Science and Technology of China, China); Lingyun Zhou (Chinese Academy of Sciences, University of Science and Technology of China, China); Bin Liu (Chinese Academy of Sciences, University of Science and Technology of China, China);
- 09:20 Concentric Open End Rings Resonator Filter
Mahmood Karami (Iran University of Science and Technology (IUST), Iran); Ramezan Ali Sadeghzadeh (K. N. Toosi University of Technology, Iran); Mahdi Oliaei (K. N. Toosi University of Technology, Iran);
- 09:40 Conductor Loss Evaluation of Thin Microstrip Line with Various Copper Roughnesses
Ryosuke Suga (Aoyama Gakuin University, Japan); Tatsuya Suzuki (Aoyama Gakuin University, Japan); Tomoki Uwano (Aoyama Gakuin University, Japan); Yasumasa Akatsuka (Nippon Kayaku Co. Ltd., Japan); Kazuhiko Ishii (Nippon Kayaku Co. Ltd., Japan); Osamu Hashimoto (Aoyama Gakuin University, Japan);
- 10:00 **Coffee Break**
- 10:20 Composite Right-/left-handed Transmission Line Stub Resonator with Improved Out-of-band Rejection Characteristics
Kengo Saito (Shibaura Institute of Technology, Japan); Shinichi Tanaka (Shibaura Institute of Technology, Japan);
- 10:40 Effect of Bending on RF Performance of Ink-jet Printed Microstrip Line on Flexible Substrate
Yeonsu Lee (Chonbuk National University, Korea); Sung-Min Sim (Chonbuk National University, Korea); Kwon-Yong Shin (Korea Institute of Industrial Technology, Korea); Sang-Ho Lee (Korea Institute of Industrial Technology, Korea); Jung-Mu Kim (Chonbuk National University, South Korea);
- 11:00 Fabrication of Silver Ink-jet Printed Microstrip Line on Polyimide Substrate
Sung-Min Sim (Chonbuk National University, Korea); Yeonsu Lee (Chonbuk National University, Korea); Kwon-Yong Shin (Korea Institute of Industrial Technology, Korea); Sang-Ho Lee (Korea Institute of Industrial Technology, Korea); Jung-Mu Kim (Chonbuk National University, South Korea);
- 11:20 **Coupled Line Power Divider with Multiple-pole Negative Group Delay Characteristics**
Girdhari Chaudhary (Chonbuk National University, Republic of Korea); Seungho Jeong (Chonbuk National University, Republic Of Korea); Phirun Kim (Chonbuk National University, Republic of Korea); Yongchae Jeong (Chonbuk National University, Republic of Korea);
- 11:40 An Estimation Method for 2-port S -parameters Using Cable or Jig with Leakage Couplings
Shinji Ohno (Gifu University, Japan); Toshikazu Sekine (Gifu University, Japan); Yasuhiro Takahashi (Gifu University, Japan);
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- Session 4P1**
Metamaterials and Plasmonics
-
- Thursday PM, July 9, 2015**
Room A
Chaired by Aaron Ho-Pui Ho
-
- 13:00 Spheres and Circles with Radial Anisotropy: Unexpected Scattering Properties
Ari Sihvola (Aalto University School of Electrical Engineering, Finland); Henrik Kettunen (University of Helsinki, Finland); Henrik Wallen (Aalto University, Finland);
- 13:20 Ultra Thin Metamaterial Absorbers for Short Millimeter Wave Bolometers: Multiparametric Optimization and Practical Implementation
Sergey Alexandrovich Kuznetsov (Novosibirsk State University, Russia); Andrey Georgievich Paulish (Novosibirsk State University, Russia);

Coupled Line Power Divider with Multiple-pole Negative Group Delay Characteristics

Girdhari Chaudhary, Seungho Jeong, Phirun Kim, and Yongchae Jeong
Chonbuk National University, Republic of Korea

Abstract— Power dividers are essential blocks in microwave and millimeter systems and have been applied for power combining and splitting in various applications such as antenna feeding networks, high power amplifiers (PAs), linearization of PAs, mixers, test setups, and measurement circuits. The conventional power dividers provide the positive group delay. Moreover, the group delay matching between different paths is essential in various circuits and systems such as supply modulated PAs and feedforward linearization technique. For these circuits and systems, the power divider with negative group delay (NGD) characteristics will be beneficial to compensate positive group delay. Therefore, two-way power NGD divider is proposed in this paper. The schematic of the proposed NGD power divider is shown in Fig. 1, which consists of serial coupled line and shunt connected short-circuited coupled lines with open-circuited isolation port. The center frequencies of shunt coupled lines are slightly different in order to get wideband multiple-pole NGD characteristics. For experimental validation, the NGD power divider with equal-power dividing ratio operating at center frequency of 2.14 GHz was designed, fabricated, and measured. From the measurements, the transmission parameters are determined as $S_{21} = -9.01$ dB and $S_{31} = -8.96$ dB at $f_0 = 2.15$ GHz, which is shown in Fig. 2. Similarly, the measured group delay between different paths are determined as $\tau_{21} = -0.338 \pm 0.07$ ns and $\tau_{31} = -0.341 \pm 0.09$ ns over bandwidth of 170 MHz, which is shown in Fig. 3. The measured amplitude and phase differences between the two output ports are shown in Fig. 4. It can be seen that the maximum amplitude imbalance of ± 0.6 dB and the phase imbalance of $\pm 2.2^\circ$ are observed over the 10 dB return loss bandwidth.

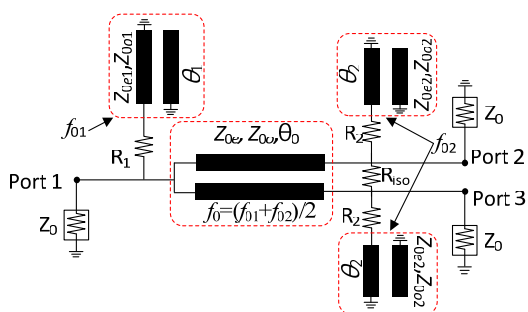


Figure 1.

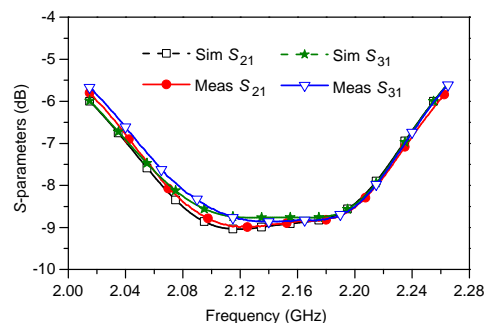


Figure 2.

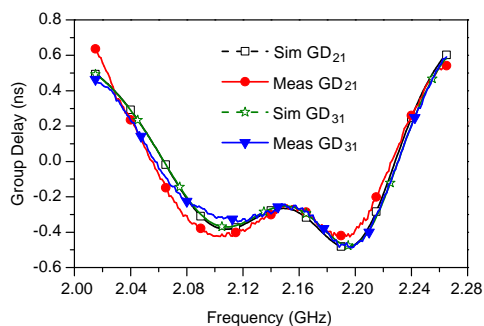


Figure 3.

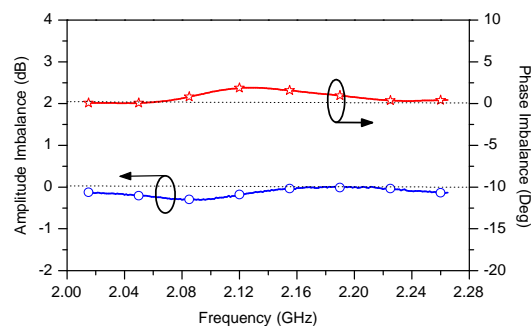


Figure 4.

ACKNOWLEDGMENT

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