

PIERS 2017 St Petersburg

Progress In Electromagnetics Research Symposium

Abstracts

22-25 May 2017

RUSSIA

www.emacademy.org

www.piers.org

Session 4A7

Microwave and Millimeter Wave Circuits and Devices, CAD 1

<p>Synthesis of an Artificial High Effective Permittivity Medium in a SIW Periodically Loaded with Metallic Cylinders</p> <p><i>Gaspar Vicent, Angela Coves Soler, Enrique Bronchalo, German Torregrosa-Penalva,</i></p> <p>Number of Calibration Loads and Degree of Freedom of Fixture's T-parameter for Indirect S-parameter Estimation</p> <p><i>Yuya Kojima, Toshikazu Sekine, Yasuhiro Takahashi,</i></p> <p>Design of Compact Strip-line Directional Couplers for High Power Operation within Frequency Band 4–12 GHz</p> <p><i>Mikhail G. Pischenko, Dmitry G. Pischenko, Mikhail B. Manuilov,</i></p> <p>A Design of 180° Coupler with Predefined Negative Group Delay Characteristics</p> <p><i>Girdhari Chaudhary, Boram An, Phirun Kim, Jongsik Lim, Yongchae Jeong,</i></p> <p>Application of Transmission Line-based Inductors to Dual-band Branch Line Couplers</p> <p><i>Jongsik Lim, Boram An, Yongchae Jeong, Sang-Min Han, Dal Ahn, Kwansun Choi,</i></p> <p>Full Wave Analysis and Design of Waveguide Diplexer with Ridged Sections and Diaphragms</p> <p><i>Mikhail B. Manuilov, K. V. Kobrin,</i></p> <p>On the Complexity of Randomly Overlapped Subarray Feeding Networks</p> <p><i>Davide Bianchi, Simone Genovesi, Agostino Monorchio,</i></p> <p>Compact Microstrip Feed Networks for Low-impedance Quadrifillar Helix Antennas</p> <p><i>Dmitriy Aleksandrovitch Dyomin, Nikolai Petrovitch Chubinskiy, Evgeniya Sergeevna Stukalova, Ivan Vasilevitch Filatov,</i></p> <p>Multiphysics Analysis of High Power CW Ferrite Phase Shifter Designs for Application in Circulators</p> <p><i>Harish V. Dixit, Aviraj R. Jadhav, Yogesh M. Jain, Alice N. Cheeran, Vikas Gupta, Pro-mod K. Sharma,</i></p> <p>Design of Wideband Lumped Element Circulator</p> <p><i>Mrunmay Mahesh Sahasrabudhe, Parth Shah, Arun C. Nambiar, Shreya Shah, Neha Gharat, Vikas Gupta, Harish Dixit,</i></p> <p>Design of a High Power Junction Circulator</p> <p><i>Arun C. Nambiar, Shreya Shah, Mrunmay Mahesh Sahasrabudhe, Parth Shah, Vikas Gupta, Neha Gharat, Harish Dixit,</i></p>	<p>1668</p> <p>1670</p> <p>1671</p> <p>1672</p> <p>1673</p> <p>1675</p> <p>1676</p> <p>1678</p> <p>1679</p> <p>1680</p> <p>1681</p>
--	---

Application of Transmission Line-based Inductors to Dual-band Branch Line Couplers

Jongsik Lim¹, Boram An², Yongchae Jeong², Sang-Min Han¹, Dal Ahn¹, and Kwansun Choi¹

¹Soonchunhyang University, Republic of Korea

²Chonbuk National University, Republic of Korea

Abstract— In many cases, arbitrary lumped element values are required for refined performances with a good improvement of RF and microwave circuits. However in practice, predefined or quantized lumped elements such as chip capacitors and inductors are provided because of some industrial-background reasons like cost, mass production, and industrial standard system. So compromised lumped element values are adopted by designers with a trade-off between required ideal performances and practically obtainable ones. In this work, a method is discussed to overcome this problem by focusing on the realization of arbitrary inductance values with high-impedance transmission line and capacitors. An inductance L shown in Fig. 1(a) can be replaced by a transmission line at the design frequency with the line impedance of Z_{c1} and electrical length of θ_1 as in Fig. 1(b). In addition, when a capacitor (C) is connected to a transmission line with Z_{c2} and θ_2 as in Fig. 1(c), this combination also acts like an inductor at the design frequency. Calculating and comparing three input impedances (Z_{in} , Z_{in1} , and Z_{in2}), it is clear that an arbitrary inductance value can be obtained by selecting proper line impedances (Z_{c1} and Z_{c2}), length (θ_1 and θ_2), and capacitor value (C). Furthermore, this arbitrary inductance value can be controlled continuously by adjusting Z_{c1} , Z_{c2} , θ_1 , θ_2 , and C . Fig. 2 shows an example of the calculated equivalent inductance values of Fig. 1(b) by adjusting θ_1 , for a fixed Z_{c1} . It is well understood that arbitrary inductance values can be provided with a good continuously-varying property. In this work, this property is applied to design of dual-band stubs, and further, dual-band branch line couplers using CRLH (composite right/left handed) transmission lines. Fig. 3(a) and Fig. 3(b) illustrate the dual-band stubs composed of ideal CRLH sections and practically realizable high impedance lines. Fig. 3(c) proves that the required dual-band properties are well

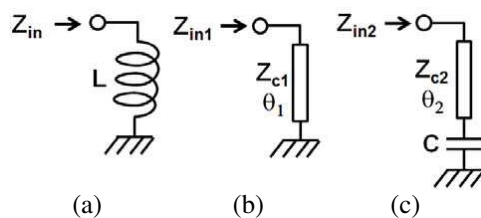


Figure 1.

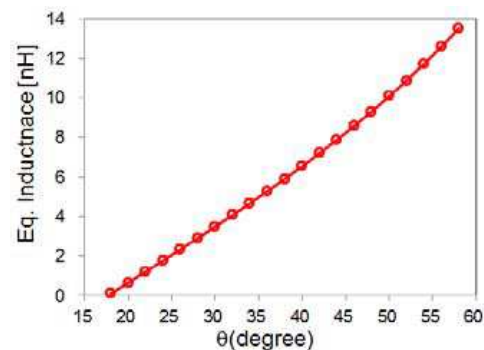


Figure 2.

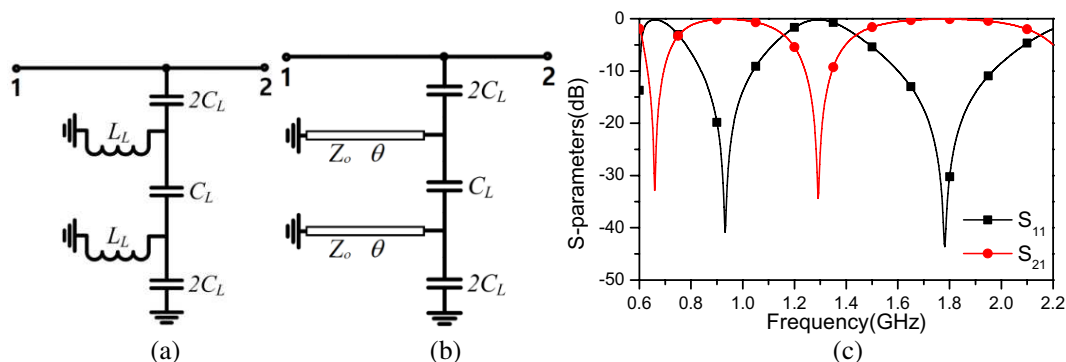


Figure 3.