Indonesian Journal of Electrical Engineering and Computer Science
Vol. 5, No. 3, March 2017, pp. 650 ~ 655
DOI: 10.11591/ijeecs.v5.i3.pp650-655

Compact Wideband Broadside-Coupled Microstrip-Slot Bandpass Filter for Communication Applications

Norhudah Seman*[1], Dyg Norkhairunisa Abang Zaidel[2], Zuhaili Amalina Abd. Wahid[3], Nor Azimah Mohd Shukor[4] and Tharek Abd Rahman[5]
[1,3,4,5]Wireless Communication Centre (WCC), Faculty of Electrical Engineering,
Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia
[2]Department of Electrical and Electronics Engineering, Faculty of Engineering,
Universiti Malaysia, Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia
*Corresponding author, e-mail: huda@fke.utm.my

Abstract

This paper proposes a compact size design of wideband bandpass filter (BPF). The broad-side coupling microstrip-slot technique is used to accomplish a good passband response with very low insertion loss across a wideband frequency range. The BPF that is designed using Rogers RO4003C substrate shows a good performance with the respective maximum reflection coefficient and insertion loss of -10 dB and 1.2 dB between 0.92 GHz and 5 GHz. This type of BPF filter is useful in any communication applications.

Keywords*: Bandpass Filter, Broad-side Coupling, Microstrip-Slot, Stub, Wideband*

1. Introduction

The immense needs in the direction of high-speed wireless communication connection appear to be never end, despite the current facilitation of the fourth generation (4G) of the wireless communication system. Where, the technology of wireless communication actuates toward fifth generation (5G) with the concept of communication that not restricted to humans but additionally the machine-to-machine and vehicle-to-vehicle, which anticipated by the year 2020. This intense 24/7 desire of the ubiquitous and limitless high-speed communication access to any apparatus at anytime pilots to excessive challenge and problem to the engineers and researchers implying network planning, and radio frequency (RF) and microwave component design. Subsequently, the vital front-end component features in the wireless communication system, includes bandpass filter (BPF). In recent years, it can be seen that various rapid developments in the variety of BPF designs have been reported in the literature [1-7].

In [1], the authors present a theory and direct synthesis of a wideband progressively coupled BPF. The designed filter is claimed adequate to accomplish similar manageable number transmission zeros as that of resonators over the passband. The resonators contain a parallel pair attached capacitive loaded, and grounded inductive stubs are linked over a short section of a transmission line with a certain assigned electrical length, which allow the filter to have a wide range of stopband.

Besides, numbers of researchers have also proposed a design of bandpass filter by using defected ground structure (DGS) technique [2-3]. In [2], the design has four coupled U-shaped DGS on the common ground plane. Meanwhile, at the top of the designed filter, shunt coupled T-shaped microstrip lines is added in order to act as an inverter for the filter. As a result, the BPF displays two transmission zeros on either side of the passband, thereby improving the selectivity of the filter on both sides of the passband. Similar to the filter reviewed in [3], the DGS has been implemented into the filter designed whereas the motivation of the DGS technique is impending from the bandgap structures of electromagnetic/photonic (EBG/PBG). In the paper, the authors introduce the function of metamaterials. Metamaterials are employed in order to accomplish a variety of performance-enhancement features. The authors have claimed that the filter design with DGS and metamaterials to be simpler compared to the complex EBGs/PBGs.

Received December 1, 2016; Revised February 4, 2017; Accepted February 19, 2017