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Design of a high band-isolation diplexer based on asymmetric stepped-impedance resonators with side-coupling structure

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In this paper, a high band-isolation diplexer based on two bandpass filters (BPFs) formed using asymmetric stepped-impedance resonators is presented. The passbands of the diplexer are operated at 1.8 GHz for global system for mobile communications (GSM) and 2.4 GHz for wireless local area network (WLAN). Side-coupling structure is adopted in BPFs to create two additional transmission zeros, thus enhancing the band isolation and stopband region. The measured results of the proposed diplexer show the passband at 1.8 GHz with a low insertion loss of 1.09 dB, a 3 dB fractional bandwidth (FBW) of 9.4% in the first channel and a passband at 2.4 GHz with an insertion loss of 2.6 dB, a 3 dB FBW of 6.2% in the second channel. The measured results of the fabricated diplexer also show a good agreement with the simulated ones.

1. Introduction

Nowadays, wireless communication system has been developed rapidly [1–5]. Broad applications for the wireless communication system have been published in recent years. In the new developments, multi-service or multi-band communication products are the design trends in the modern wireless communication systems. Being an essential component in multi-service and multi-band communication systems [6,7], diplexer is a three ports device used to separate the input signals to two output ports and used to support the rear-end communication equipments with different channels. In general, diplexers should provide a high band-isolation between the two channels to avoid interference between each other. In [8], a high isolation diplexer based on a hairpin line structure was reported. Multiple stepped-impedance resonators were adopted to obtain the desired responses with low insertion loss. In [9], a compact diplexer based on double-sided parallel-strip line was proposed. The multi-layer structure was adopted to minimize the whole circuit size of the proposed diplexer. In [10], microstrip line resonators with loaded elements structure were used to design a microstrip diplexer. The characteristics of the proposed diplexer were controlled by varying the tapped positions of the loaded elements. However, the diplexers of the above researches show some disadvantages

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