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Dual-band Bandpass Filter Using Stubs to Controllable Passband

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Abstract

The dual band bandpass filter is presented with square ring-resonator structure. The stubs are inserted between the inside and outside ring-resonator for adjusting the second band. The first band is designed for supporting WLAN system at 2.45 GHz and the second band is covered within the radio altimeter system at 4.30 GHz. The measured results are agreed to the insertion losses are 2.01 dB, 2.18 dB and the return loss are 11.45 dB, 11.15 dB at the center frequency 2.45 GHz and 4.30 GHz, respectively.

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Keywords: bandpass filter; stub; stepped impedance resonator

1. Introduction

A novel compact microwave bandpass filter with high selectivity, wide stopband and small insertion loss is a good performance demanding in front end of wireless local area network [1]. There are a lot of resonator structures for proposing bandpass filter. A T-shaped resonator is one of favorite structures to be used. A dual-band bandpass filter using folded T-shaped half-wavelength resonator is proposed in [2].With capacitive load coupling for feeding and multiple transmission zeros are generated, although not good for the second band bandwidth is produced.The authors in [3] presented the technique to obtain extremely sharp skirt by using T-shaped resonators combine with high and low-impedance lossless line lowpass and U-shaped suppressing cells. On the other hand, defected ground structure (DGS) is applied to etch a microstrip line ground has a main advantage for providing high capacitive coupling [5 High speed wireless local and network become the major factor in global communications due to the

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exponential increase in the number of subscribers to the design cycle to meet the needs effectively. Meanwhile, the aeronautical communications, it is necessary to use RF signals through the same network [1].

A filter is one of the devices need to be designed in response to required frequencies. Many structures of dual-band are proposed especially the ring resonators as high quality factor and smaller size. For a compact dual-band filter, most of them presented the ring resonators to achieve good response with high selectivity [2-5].

In this paper, a simple spiral ring resonator is presented. The main ring resonator is generated two passbands which the fundamental passband is supporting the WLAN while the second frequency which employed for an altimeter system. The input and output ports enhance the external coupling.

2. Design

First, the main ring resonator is designed for generating the fundamental frequency and its total length is around the half wavelength at 2.45 GHz. The input and output port are designed by standard transmission line of 50 Ω. All dimensions of the proposed filter are shown in Fig.1.

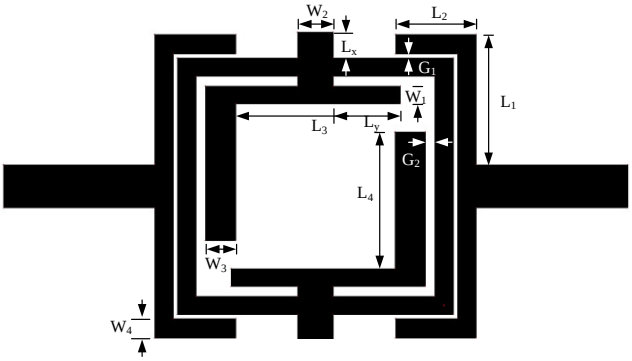

Fig. 1. The dimensions of the dual-band bandpass filter.

The gaps (G) between input-output port and the main square ring-resonator are adjusted. Their affecting is directly controlling the transmission zero at the higher edge and improves the insertion loss of the first band as shown in Fig.2. The optimized gaps result is 0.3 mm. In order to half wavelength designing, the harmonic frequency of the conventional bandpass filter is around $2f_0$ or around 5 GHz, but the radio altimeter systems operate at 4.30 GHz so that the second band can be adjusted by adding stubs between the center of the outer and inner ring resonators. In this case, the width of stub at the center ring-resonator, W_2, is fixed at 2.64 mm. The center of second band will be related to adjusting the length of stub at the center ring-resonator, L_x, as shown in Fig. 3.

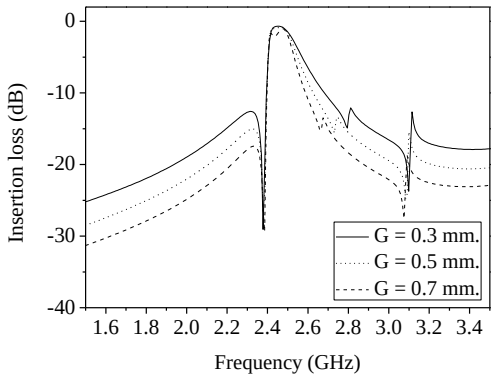

Fig. 2. Gap adjustment effecting to the first band.