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Design and Simulation of Multiband Band pass Filter Having Rectangular Shaped Defects in Ground Plane

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***Abstract* - The present paper represents the design and simulation of multiband band pass filter using the hairpin resonator. Two rectangular slot defects are made in the ground plane. The filter is designed on a substrate having thickness of 0.3mm. The filter exhibits improved performance and good selectivity. The filter shows good return loss at 5.0 GHz, 5.7 GHz, 6.5GHz, The return loss of the simulated filtered are measured as -18dB, -16dB, -23db, while the insertion loss are -0.05dB, -0.08dB, 0.1dB. The present work will also be suitable for multiband and multiservice applications.**

***Index Terms*— Bandpass Filter, Hairpin Resonator, Return Loss.**

I. INTRODUCTION

There is an important role of filters in many R/F microwave applications. To enhance the performance of the system and to reduce the size, compact and high performance filter is required in modern wireless communication systems. In the microwave communication antenna and filter play an important role. In an antenna at the receiver section there are some band of frequencies, which are not desired, so that there is a requirement of band pass filter [1]. A bandpass filter is used to eliminate the undesired signals in the transmitter and receiver section [2], because it selects the signals in operating band and rejects the out-of-band signals. In microstrip band pass filters, hairpin filter is one of the most popular and widely used configuration due to their compact design. They are formed by folding the arms of normal parallel coupled half-wavelength resonator, to reduce the size of filter.
Various studies [3-5] have been employed for bandpass filter with defected ground structure. Literature also shows the performance of Microstrip antennas with DGS [6,7]. Now-a-days the defected ground structure (DGS) has become one of the most popular method and an area of interest in microwave circuit [8]. Defected ground structures are formed by etching certain patterns from the metallic ground plane. DGS components are widely used for the size reduction and harmonic suppression.

II. PROPOSED METHOD

Due to the compact size of hairpin filter, it is widely used and most popular configuration amongst the microstrip band pass filters. The total length of a parallel coupled filter with λ/2 straight microstrip line resonator is excessive long and the size increases with the order of the filter. To solve this problem, U-shaped hairpin resonator was developed. In the proposed method multiband bandpass filter is designed using the hairpin resonator. The length of the hairpin is taken 4.1 mm, width of hairpin is 0.2 mm, height of substrate is 0.3mm, gap width is 0.05 mm.

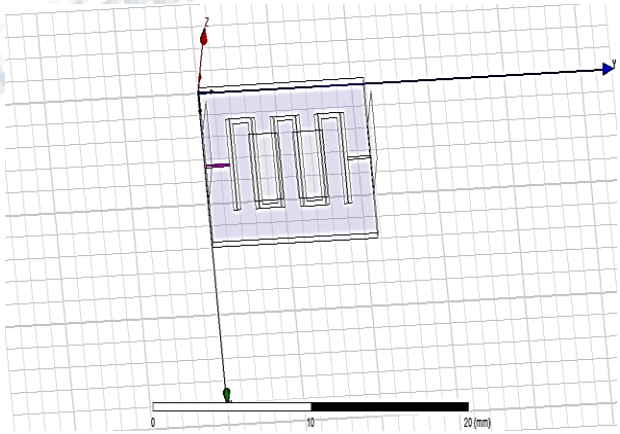

Fig. 1 Showing Hairpin Bandpass filter with DGS

III.RESULTS AND DISCUSSION

The multiband band pass filter is simulated. The results shows high performance and good selectivity. The proposed filter exhibits good return loss at 5.0 GHz, 5.7 GHz, 6.5GHz, The return loss of the simulated filtered are measured as -

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18dB, -16dB, -23db, while the insertion loss are -0.05dB, -0.08dB, 0.1dB.

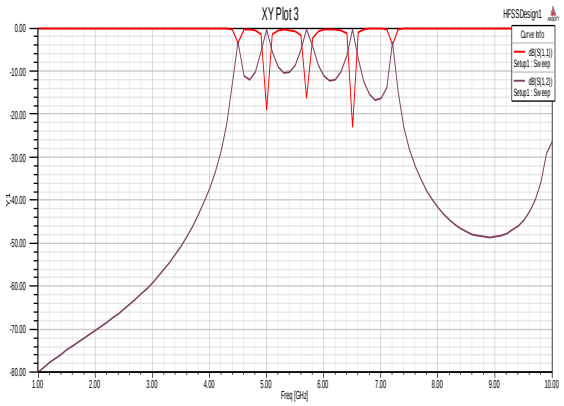

Fig.2 Showing S11 and S12 Plots

IV. CONCLUSION

The present work represents a new design methodology for realizing microstrip band pass filter. The new design consists of two rectangular slots defects in the ground plane. The proposed filter having compact size, low insertion loss and good return loss. The designed filter can be used for WiMAX and WLAN applications.

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