© 2017 IJSRST | Volume 3 | Issue 8 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X
Themed Section: Scienceand Technology

Performance Analysis of Multiband Bandpass Filtrer With Dumbell Shaped Defect in Ground Plane.

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ABSTRACT
A multiband band pass filter with dumbell shaped defects in ground plane is designed and its performance is analyzed in this paper. The designed filter exhibits improved performance and good selectivity. The filter shows a return loss of -12dB at 5.0 GHz, -23.5 dB at 5.7 GHz, and -24.9 dB at 6.5GHz while the insertion losses at these frequencies are -0.01dB, -0.001dB, and -0.001dB respectively.
Keywords: Multiband Bandpass Filter, Hairpin Resonator, Return Loss.

I. INTRODUCTION

Bandpass filter is a device having the quality to select the signals within a specific range and the signals which are outside of that particular range are rejected [1, 2]. In order to improve the harmonic response of the bandpass filter, researchers have put forward an idea to solve the problem [3, 4]. In microwave communication, filters play an important role. Hairpin filter is one of the most widely used configuration because of its compact size. 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 has been developed.Literatures [5-8] reveal the performance of bandpass filter and microstrip antennas using defected ground structure.Defected Ground Structure(DGS) is one of the most popular method amongst all other techniques which are used for enhancing the parameters such as return loss,insertionloss,selectivity, harmonic suppression etc.Several researches [9,10,11] have been reported for DGS.

II. DESIGN METHODOLOGY

In the proposed method, multiband bandpass filter is designed using the hairpin resonator. Parameters used in designing hairpin band pass filter are L_1=1mm,L_2=4.1mm,L_3=1.55mm,L_4=0.12mm,L_5=0.2mm .Fig.1 showsdesigned hairpin bandpass filter. Fig.2 shows the designed dumbell shaped defect.Parameters and their values used in designing the dumbell shaped defect are given in Table 1.

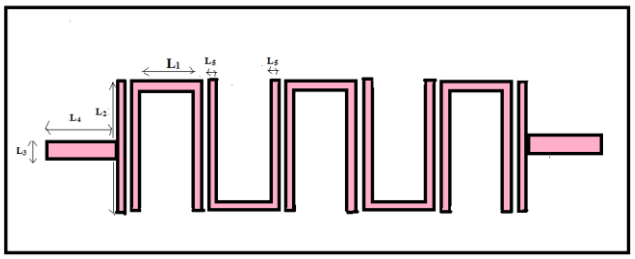

Figure 1. Designed Hairpin bandpassfilter

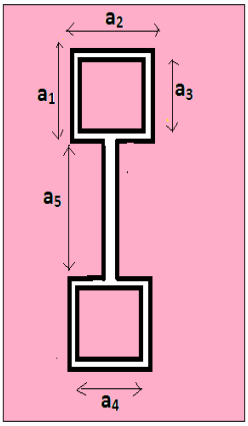

Figure 2. The designed dumbell shaped defect.

Table 1: Parameters used in designing dumbell shaped defect

Parameters	Value
a_1	1 mm
a_2	1mm
a_3	0.6 mm
a_4	0.6 mm
a_5	3 mm

III. RESULTS AND DISCUSSION

The designed multiband band pass filter shows good selectivity, and better return loss. The designed filter showed a return loss of -12dB at 5.0 GHz, -23.5 dB at 5.7 GHz, and -24.9 dB at 6.5GHz while the insertion losses at these frequencies are -0.01dB,-0.001dB, and 0.001dB respectively. 3dB band width is 180 MHz, 200 MHz, and 160 MHz, while fractional band-width(%FBW) is 3.6%, 3.50877%, and 2.46154 at 5.0 GHz, 5.7 GHz, and 6.5GHz respectively. Fig.3 shows S_{11} and S_{12} Plots of the designed filter.

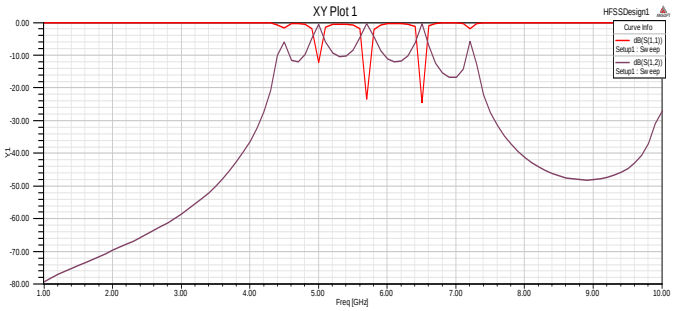

Figure 3. S_{11} and S_{12} Plots

IV. CONCLUSION

In this paper, a multiband band pass filter with dumbell shaped defects in ground plane is designed and its performance is analyzed. The designed filter consists of two dumbell shaped defects in the ground plane. The proposed filter has low insertion loss and good return loss.

V. REFERENCES

[1]. R. Yadav, K. Dagar, B. Yadav, "Design of ultra high band pass filter by using dielectric resonator", I.J.E.C.S., vol. 2, issue 4 April, pp.1093-1096, 2013.

[2]. M. Alaydrus, "Designing Microstrip Bandpass Filter at 3.2 GHz", International Journal on Electrical Engineering and Informatics, vol.2, no.2, pp. 71-78, 2010.

[3]. J.S. Hong, M.J. Lancaster, "Microstrip Filters for RF Microwave Applications", Wiley, New York, 2001.

[4]. T. Lopetegi , M.A.G. Laso, J. Hernandez, M. Bacaicoa, D.Benito, M.J. Garde, M.Sorolla and M. Guglielmi, "New microstrip wiggly-line filters with spurious pass band suppression", IEEE Microwave Theory and Technology, vol.49, no.9, pp. 1593-1598, 2001.

[5]. D. Guha, S. Biswas , M. Biswas, J.Y. Siddiqui and Y.M.M. Antar, "Concentric ring-shaped defected ground structures for microstrip applications", IEEE Antennas and Wireless Propagation Letters, vol.10, pp.298-301 , 2011.

[6]. J. Pie, A.G. Wang, S.Gao, and W.Leng, "Miniaturized triple-band antenna with a defected ground plane for WLAN/WiMAX applications", IEEE Antennas and Wireless Propagation Letters, vol. 10, pp. 298-301, 2011.

[7]. Y. Sung, "Bandwidth enhancement of a microstrip line-fed Printed wide-slot antenna with a parasitic center patch", IEEE Transactions on Antennas and Propagation, vol. 60, no.4, pp. 1712-1716, 2012.

[8]. L. Singh, P.K. Singhal, "Design and analysis of hairpin line bandpass filter", I.J.A.R.E.C.E., vol.2, issue2, pp. 228-230, Feb 2013.

[9]. D. Guha, S. Biswas, M. Biswas, J. Y. Siddiqui, and Y. M. M. Antar, "Concentric ring-shaped defected ground structures for microstrip applications," IEEE Antennas and Wireless Propagation Letters, vol. 5, no. 1, pp. 402–405, 2006.

[10]. J. Pei, A.-G. Wang, S. Gao, and W. Leng, "Miniaturized triple-band antenna with a defected ground plane for WLAN/WiMAX applications," IEEE Antennas and Wireless Propagation Letters, vol. 10, pp. 298–301, 2011.

[11]. Y. Sung, "Bandwidth enhancement of a microstrip line-fed printed wide-slot antenna with a parasitic center patch," IEEE Transactions *on Antennas and Propagation*, vol. 60, no. 4, pp.1712–1716, 2012.