A Microwave Triple-Band Bandpass Filter using Parallel Stepped Impedance Resonator

[1]Abhinav Vishwakarma,
Maharajganj, India
,

Abstract: In this proposed paper a Bandpass filter for triple-band Bandpass filter is introduce with the help of open stepped impedance resonator. The proposed filter having an extra added two parallel open stabbed impudence resonator on the substrate and the filter design is designed for input output transmission lines where structure is totally coupled. A simulated design of microwave triple-band Bandpass filter is operating at its centre frequencies (1.734, 2.56, 3.31) GHz which make this filter liable candidate of triple band Bandpass filter. The s-parameter result of proposed filter has been simulated correctly which shows remarkable characteristics of microwave triple-band Bandpass filter using parallel stepped impedance resonator.

***Keywords*: Triple band filters, Dual E-shaped multimode resonator, coupling model**

I. INTRODUCTION

This is the time of modern wireless communication several applications are used of triple band Bandpass filter and dual-band Bandpass filter. The number of configuration and methodologies has been performed to realize this filter in the past with three separate pass band. Complexity in design, large, high insertion loss is the filter has number of disadvantages. A pass-band with sharp notch between a very wide pass-band by separating the pass band in to three small pass-bands to realize a triple band Bandpass filter. On the other hand, it covers large circuit area. In the recent years to make triple band BPF the stepped impedance resonators are commonly used. In the structure design of SIR tunable resonance frequency by just adjusting the parameter band pass filter. To make and realize the technique of triple-band operation. The impedance ratio and total electrical length of SIR on easily tune the harmonics fundamental resonance frequency. The central frequency of these three band are controlled simultaneously .The two feed lines is used the impedance transformer. On the other this progressive approach gives large size and complexity to design.

In this prepared model to create a triple band microstrip band pass filter. An after half wavelength SIR with a large U shaped in the impedance portion and double side microstrip line used. The proposed filter having an extra added two parallel open stabbed impudence resonator on the substrate and the filter design is designed for input output transmission lines where structure is totally coupled. Filter application is designed and measured in the proposed model of triple -band Bandpass filter.

2. SPECIFIC DESIGN OF PROPOSED FILTER

The prepared filter structure is used HFSS simulation tools. The model specification is designed a substrate called ROGER RO3010, relative constant 10.2 and substrate of thickness 0.64. The common structure of SIR is shown in figure 1.

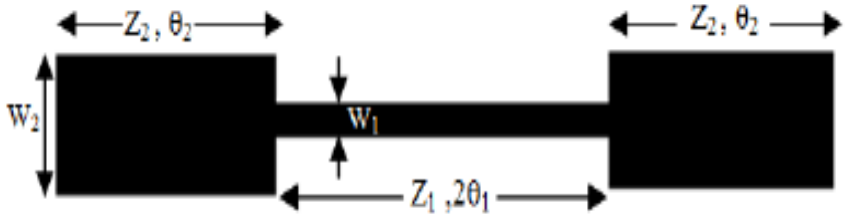

Figure 1.Common structure of SIR

The high impedance line is put in the middle between two low impedance transmission lines which consists the structure of SIR. It includes two different features impedance Z 1 and Z2, which electric length are θ_1 and θ_2 simultaneously.The resonant condition of typical SIR.

$$K - \tan\theta_1 \tan\theta_2 = 0; \text{ at } f = f_o \quad (1)$$

$$K \tan\theta_1 + \tan\theta_2 = 0; \text{ at } f = f_1 \quad (2)$$

The characteristics impedance ratio of K

$$K = Z_2/Z_1$$

The prepared filter is design for triple-band operation for 1.734 GHz, 2.56 GHz and 3.31GHz. Figure 3 show the prepared triple-band Bandpass filter whose two parallel SIRs is used with the large U shaped in cenral. The both side parallel coupled microstrip feed structure is used between feed lines and corresponding SIRs. The proposed filter having an extra added two parallel open stabbed impudence resonator on the substrate and the filter design is designed for input output transmission lines where structure is totally coupled.

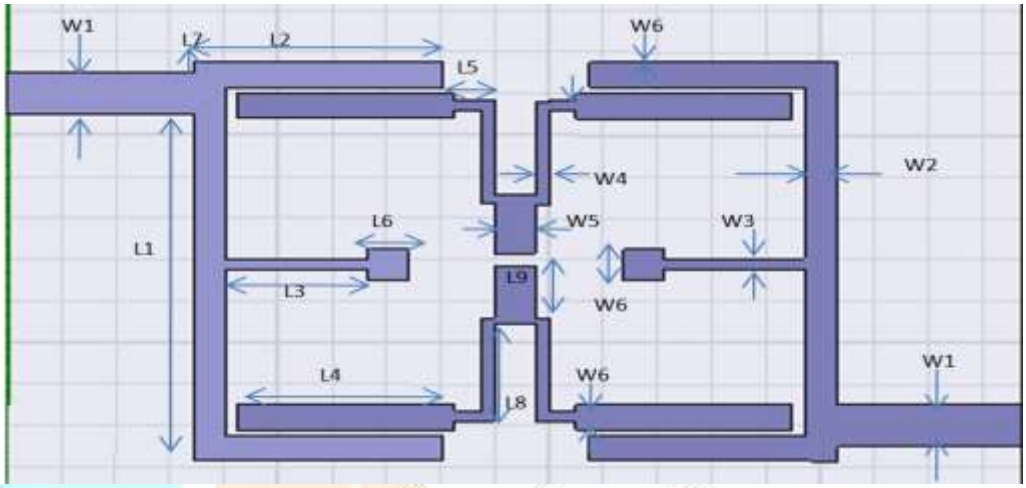

Figure3. Triple band bandpass filter layout

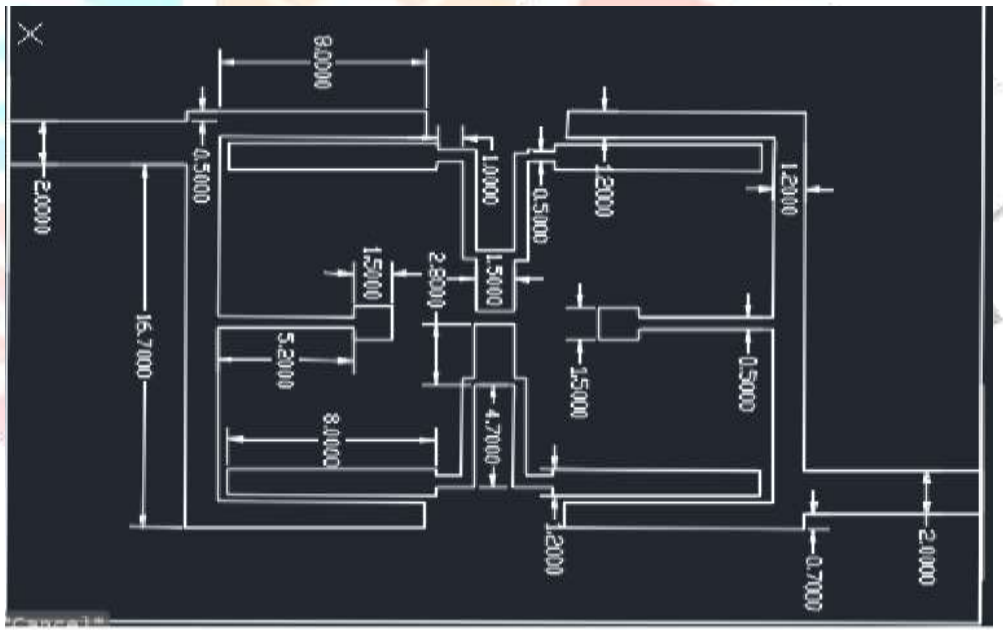

Figure3a.Dimenstion of triple band bnadpass filter

3. TRIPLE BAND BANDPASS FILTER SIMULATION RESULTS

The simulation results figure 4a & 4b,the triple-band Bandpass filter in the proposed paper. A device or machine the simulated results of tripl- band Bandpass filter is operating frequency 1.734 GHz, 2GHz and 3.31 GHz. The return loss is more than -10 dB. The three passband filter return loss is 24 dB, 14dB and 34 dB. The insertion loss is less than -5 dB. The prepared filter is based on SIRs a triple-band Bandpass filter has been designed ROGER RO3010, relative constant 10.2 and thickness of substrate 0.64. The microstrip filters in term of S parameter S11 and S21.

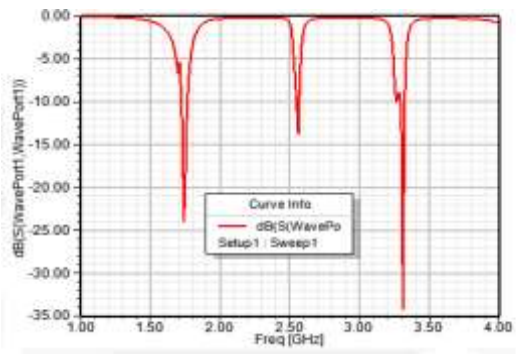

Figure4a. Frequency response S11 parameter

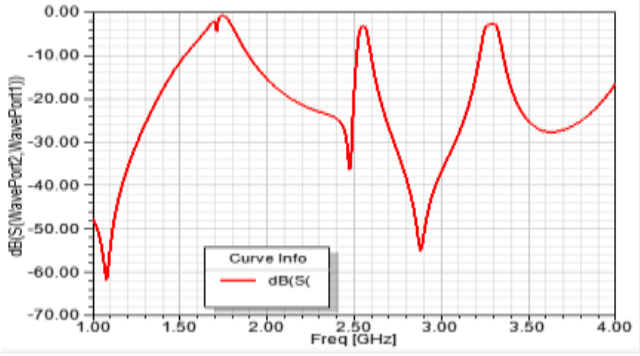

Figure 4b. Frequency response S21 parameter

4. CONCULSION

The prepared paper a triple-band Bandpass filter SIRs is propose has triple band performance 1.734 GHz, 2.56 GHz and 3.31GHz. The insertion loss less than -5 db In this proposed paper a Bandpass filter for triple-band Bandpass filter is introduce with the help of open stepped impedance resonator. The proposed filter having an extra added two parallel open stabbed impudence resonator on the substrate and the filter design is designed for input output transmission lines where structure is totally coupled. The return loss is more than -10 dB. The three passband filter return loss is 24 dB, 14dB and 34 dB.

REFERENCES

[1] Shuai Yang, Lei Lin, Jianzhong Chen, Kun Deng and Chang-Hong Liang 'Dual Band Band pass Filter Using Dual-Mode Stepped- Impedance Stub Resonators',IEEE Electronics Letter Year:2014,Voiume:50,Pages: 611-613

[2] Chen, J.-X., Shao, C., Shi, J., and Bao, Z.-H.: 'Multilayer independently controllable dual-band bandpass filter using dual-mode slotted-patch resonator', Electron. Lett., 2013, 49, (9), pp. 19–24

[3] Liu, H.W., Li, S., and Ren, B.P.: 'Microstrip dual-band bandpass filter with E-shaped multimode resonator', Electron. Lett., 2013, 49, (14), pp. 887–888

[4] Zhang, X.-Y., Chen, J.-X., Xue, Q., and Li, S.-M.: 'Dual-band bandpass filters using stub-loaded resonators', IEEE Microw. Wirel. Compon. Letts, 2007, 17, (8), pp. 583–585

[5] Chin, K.-S., and Yeh, J.-H.: 'Dual-wideband bandpass filter using shortcircuited stepped-impedance resonators', IEEE Microw. Wirel. Compon. Lett., 2009, 19, (3), pp. 155–157

[6] Mo, Y., Song, K.-J., Tao, P., and Fan, Y.: 'Miniaturised dual-band bandpass filter using modified SIR', Electron. Lett., 2013, 49, (14), pp. 888–890