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Sharp Rejection Microstrip Ultra-Wide Bandstop Filter

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Abstract— In this paper, a sharp rejecting ultra wide bandstop filter (BSF) design is demonstrated. To get sharp rejection at pass bands a model is considered with three zero levels in transmissions by implementing this we can achieve stop band characteristics also. Bandwidth of the stop band and depth of the stop band can be varied and controlled by the Impedances of configuration used in the design. In order to derive design equations here we have used a simple model of a lossless transmission line. Further, for convenient folding of the design low impedance sections were replaced by its compact geometry. To support the theoretical values, a band stop filter which is having a sharp rejection at 10dB with a rejection bandwidth of 44% ranging from 0.77GHz to 1.1GHz has been designed and fabricated.

Keywords— Ultra wideband, bandstop filter, Transmission zeros.

I. INTRODUCTION

Microstrip antennas are picking up noticeable quality and ending up exceptionally interesting in current and future wireless communication systems for the most part because of two components. Firstly, the high need for the wideband and multiband operating antennas along with the high data transmission rates with a very low power consumption in a very compact structure has got a growing interest towards the microstrip antennas. These requirements have given a scope for a need of innovative research work in this area. In UWB applications some intermediate frequency bands are been assigned for some specific applications and it will cause interference in the antenna with UWB Band applications. So we need some bandstop filter to reduce these interferences. The second component is the noise generated by the components in the communication system. As most of the present day systems have more active components they will generate unwanted harmonics which will effect the system performance.

With respect of advantage of bandwidth in the UWB antenna there also involved some noise parameters and unwanted signal interferences. In order to overcome these issues we need a bandstop filter which will eliminate the particular frequencies.

II. FILTER DESIGN

Figure 1 below shows the flow chart for the design methodology followed for the design of the proposed filter, the filter consists of a FR-4 substrate, on the surface of the substrate with the help of microstrip lines the filter is fabricated. Each microstrip line is of different impedance.

The filter is having a length and width of 35.4mm×23.4mm. each microstrip line is having different lengths and widths for different impedances. Filter is fabricated with the help of ANSYS High Frequency Structure Simulator (HFSS). The proposed filter will reject the particular frequencies as filter is designed. Fig1. Shows the flow chart of fabricated filter.

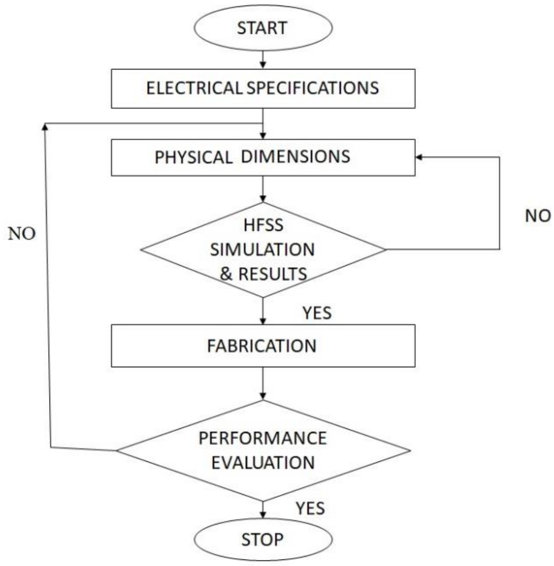

Fig 1. Flow chart Fabricated Ultra wide bandstop filter

The flow chart shows the step by step procedure how the filter is fabricated and its performance evaluated.

III. DESIGN METHODOLOGY

The filter is designed and simulated using ANSYS HFSS Electromagnetic suite 16.0.

HFSS is an intelligent framework whose essential frame work is tetrahedron. This allows to solve any subjective 3D geometry, particularly those with complex bends and shapes, in a small amount of the time it would take utilizing different systems. for example, distracting vector limited components, versatile cross section, and versatile Lanczos Pade Sweep. The Ansoft HFSS Desktop gives an instinctive, simple to-utilize

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interface for creating inactive RF device models.

The Ansoft HFSS Desktop gives an instinctive, simple to utilize interface for creating detached RF device models.

Before fabricating the filter the filter is designed and analyzed in the HFSS tool a step by step process is done in the tool to design the ultrawide stop band filter. Fig2. Shows the simulated design of UWB bandstop filter.

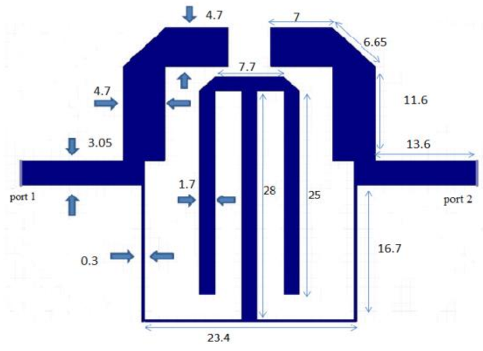

Fig 2. Simulated UWB stop filter

The results like return loss and insertion loss are observed with the HFSS tool. Fig 3. Shows the fabricated ultra wide bandstop filter

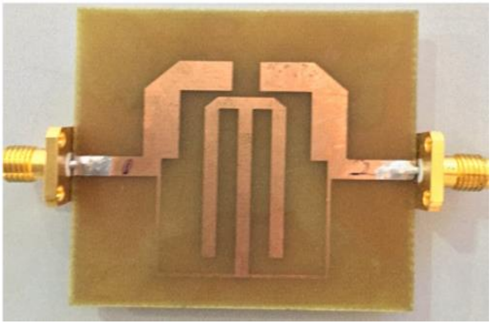

Fig 3. Fabricated filter

The filter is fabricated at 1.6mm thickness and r = 4.4 on a FR-4 substate.

IV. RESULTS AND ANALYSYS

The filter is designed and simulated using HFSS tool results such as insertion loss and return loss are observed at 10dB rejection ratio. Fig 4.Shows the Insertion loss of the simulated design.

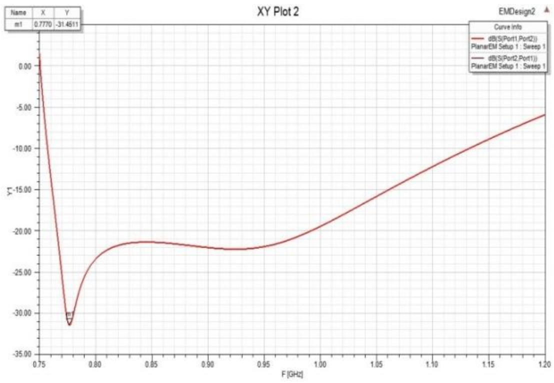

Fig 4. Insertion loss

The insertion loss in the above figure shows the frequencies from 0.77 GHz to 1.1GHz are rejected by the bandstop filter as the ranging frequencies having insertion loss -30dB which is less than the -15 dB so this is an optimum bandstop filter.

Fig 5.Shows the Return loss of the simulated filter design.

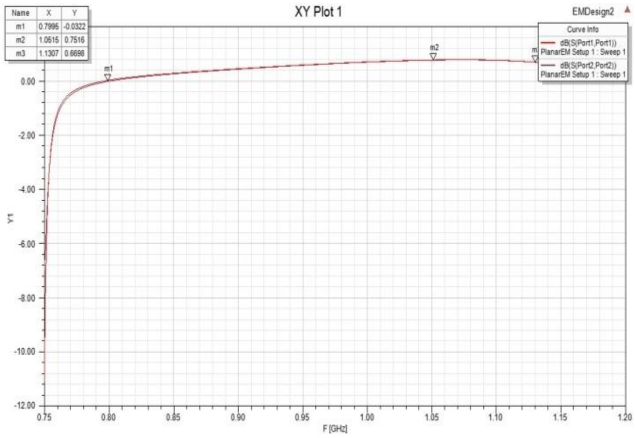

Fig 4. Return loss

The return loss in the above figure is showing -0dB for the selected frequencies which is greater than the 10dB so the frequencies are rejected by the band stop filter.

The fabricated filter results are obtained with the measurement setup. A Vector Network Analyses (Agilent series) and Radiation pattern measurement setup(Anechoic chamber) is used to obtain the return loss and insertion loss of the fabricated ultra wide band stop filter.

Fig 5. Shows the insertion loss of the fabricated band stop filter.

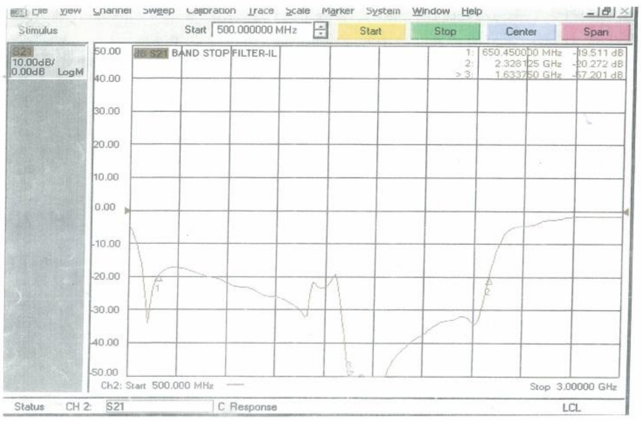

Fig 5. Insertion loss of fabricated filter

The above figure shows the insertion loss at 10dB rejection ratio which is rejecting frequencies from 0.65GHz to 2.3 GHz so the simulated frequencies are inclusive of these frequencies the filter is working for the designed frequencies.

Fig 6. Shows the return loss of fabricated bandstop filter

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Fig 6. Return loss of Fabricated filter

The return loss in the above figure is showing -2dB which is greater than the 10dB so the frequencies from 0.65GHz to 2.3GHz are rejected by the filter.

The results obtained for the fabricated filter are good agreement with the simulated results.

The Table 1 shows the results summary of the fabricated filter at various frequencies.

Table 1 Results Summary

Frequency (GHz)	Return Loss	Insertion Loss
0.65	-2.2	-20
1.63	-2.4	-50
2.3	-3.3	-20
3	-18	-1.2
0.5	-5	-5

V. CONCLUSION

A sharp rejection ultra wide band stop filter is proposed and implemented. A filter prototype is designed and simulated using HFSS and fabricated. The designed filter achieves a bandwidth of 340 Mhz and return loss, insertion loss are also simulated by high frequency structure simulator. In this design micro strip lines are used on substrate. Here microstrip line dimensions and position are varied to provide the impedance matching. This sharp rejection ultra wide band stop filter is designed and simulated from 0.77GHz to 1.1GHz successfully. The simulated return loss and insertion loss at required are plotted. The simulated and tested results are in good agreement with systems.

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REFERENCES

1. D. M. Pozar, Microwave Engineering, 2nd ed. New York: Wiley, 1998.
2. A. Gorur and C. Karpuz, "Uniplanar compact wideband bandstop filter," IEEE Microw Wireless Compon.Lett., vol. 13, no. 3, pp. 114–116, Mar. 2003.
3. M. Hsieh and S. Wang, "Compact and wideband microstrip bandstop filter," IEEE Microw.Wireless Compon.Lett., vol. 15, no. 7, pp. 472–474, Jul. 2005.
4. M.K. Mandal, V.K.Velidi, and S.Sanyal,"Design of ultra-wideband bandstop filter with three transmission zeros," Wiley Microw. Optical Tech. Lett., vol. 50, no. 11, pp. 2955–2957, Nov. 2008.
5. M. K. Mandal and S.Sanyal,"Compact bandstop filter using signal interference technique,"IEE Electron.Lett., pp. 110–111, Jan. 2007.
6. K. Divyabramham, M. K. Mandal, and S. Sanyal, "Sharp-rejection wideband bandstop filters," IEEE Microw.WirelessCompon.Lett., vol. 18, no. 10, pp. 662–664, Oct. 2008.
7. J. S.Hong and M. J.Lancaster, Microstrip Filters for RF/Microwave Applications. New York: Wiley, 2001.

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