Compact UWB Bandpass filter with notched frequency

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Abstract: This paper presents the ultra wideband bandpass filter design and also the Notch Creation at a specific frequency. Here ,We are implementing a UWB Bandpass Filter to create a notch at a specific frequency. The purpose of this isto avoid interference of the Bandpass filter from WLAN freq existing at 5.7-5.8 GHz

Keywords: Inter-digital hairpin resonators, Return loss, Insertion loss, UWB, IE3D, HFSS, SONNET, Notch.

INTRODUCTION

Ultra-wideband systems use wireless technology capable of transmitting data overawide spectrum of frequency bands (3.1-10.6GHz) for short distances (1-10 m) with very low power and high data rates. They are used for the operation of sending and receiving extremely short bursts of RF energy, The UWB technology delivers high data rates in excess of 100 Mbps up to 1 Gbps, can penetrate through doors and other obstacles. There are several advantages associated with UWB communications like Large channel capacity, ability to work with low signal to noise ratios, low transmit power, resistance to jamming, high performance in multipath channel.

FILTER DESIGN

Layout of the filter-Fig.1

Sl. No.	Parameters Notation	Parameters Value
	Overall size of the filter	3.5mmx7.5mm
1.	Width wo,Length Lo	3.5mm,7.5mm
2.	Offset width w1	0.15mm
3.	W2 of each finger	0.3mm
4.	W3 distance between finger	0.15mm
5.	Length L1	8mm
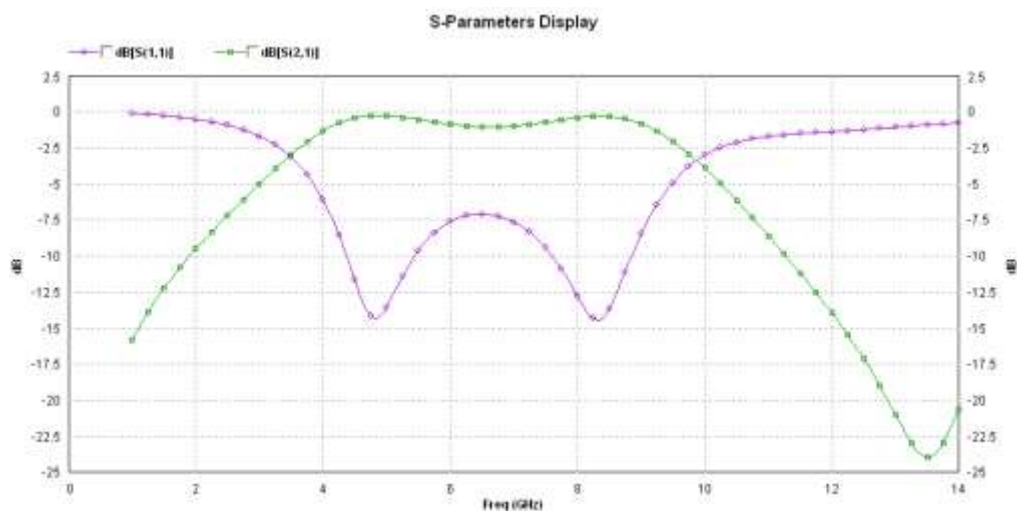
FILTER with Notch - Fig. 2

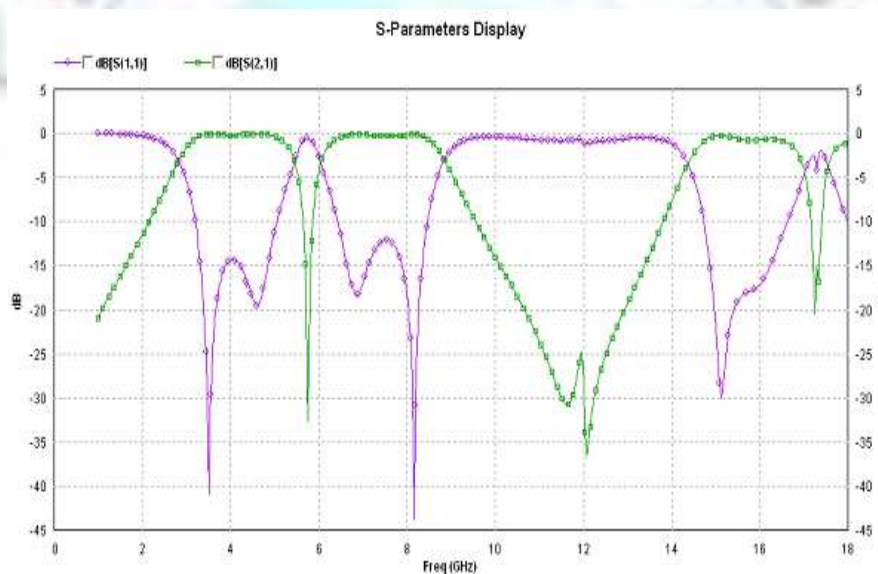| Sl. No.	Parameters Notation	Parameters Value
1.	Overall size of the filter	3.5mm x 7.5mm
2.	Width wo,Length Lo	3.5mm, 7.5mm
3.	Offset width w1	0.15mm
4.	W2 of each finger	0.4mm
5.	W3 distance between finger	0.2mm
	Length L1	9.4mm
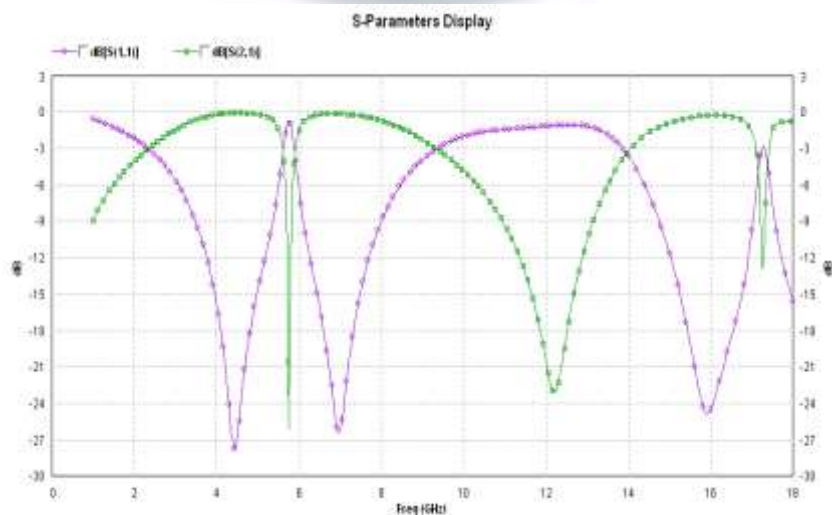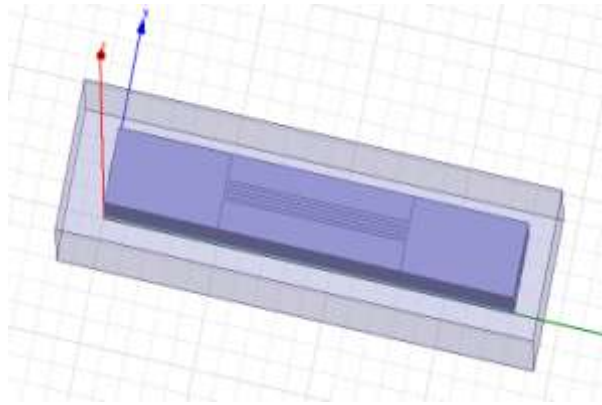
Filter With Interdigital Resonator -3 fingers in HFSS
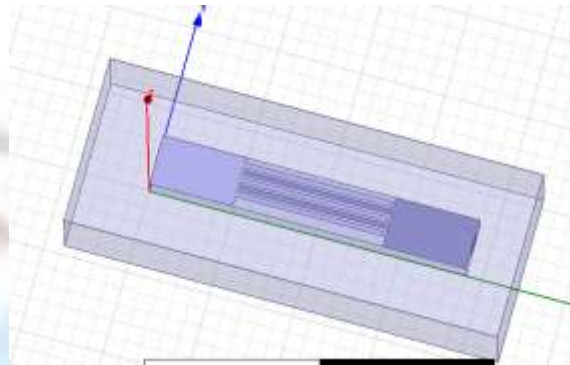

Filter with Notch designed in HFSS


Output of Filter with multiple notches

DESIGN CONSIDERATIONS

Firstly, the UWB Filter with 3 fingers was designed (refer Fig.1). In this the passband from 3.1-10 Ghz was achieved. Further to Create a notch the no of fingers was increased to five. The structure was designed on ARLON substrate with rel. permittivity 2.55 an height =1.524mm ,thickness t=1 mm. With Fig.2 ,the notch was obtained at a frequency of 5.77 Ghz (in range of 5.7-5.8 Ghz).The structures in Fig.1 and Fig.2 is designed and simulated with Electromagnetic Simulator IE3D. The results were then evaluated in hfss simulator also with same design specifications.
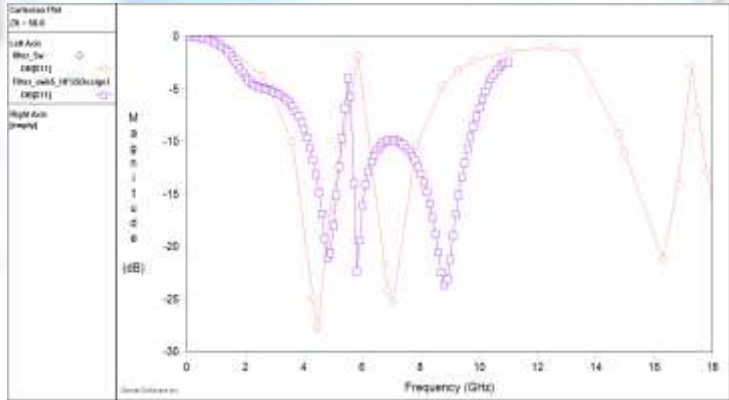
COMPARATIVE GRAPH
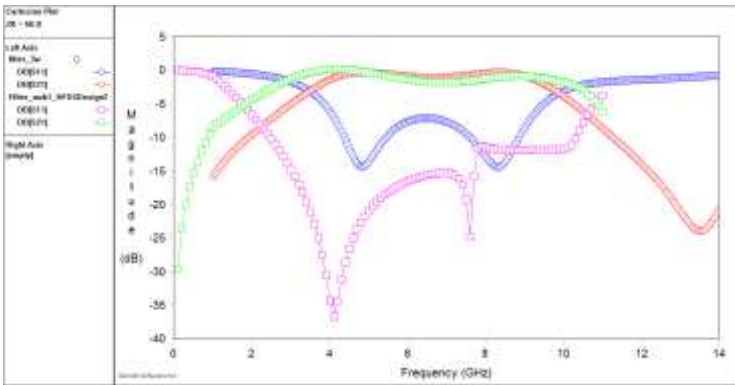
IE3D and HFSS plot compare in sonnet for Filter Fig.1 for s11 and s21 (in db)
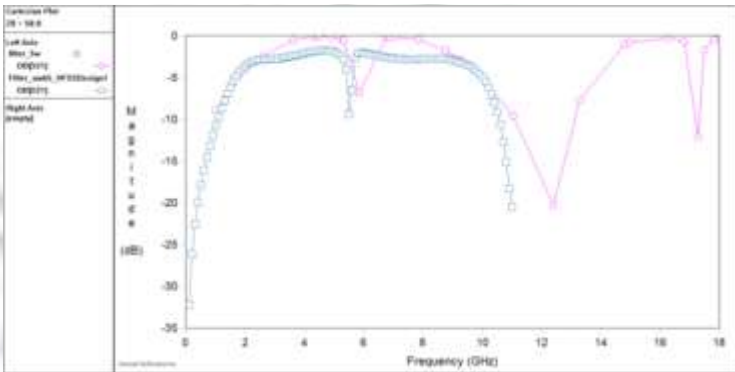
IE3D and HFSS plot compare in sonnetfor Notch Filter Fig.2 for s21 in dB

IE3D vs HFSS plot in sonnet for Notch Filter For s11 in db

RESULTS

Sl .no	-10 dB frequency band	Pass band insertion loss S21 (dB)	Pass band return loss S11 (dB)
1. Filter fig .1	8.83-4.37=4.46 GHz	-0.28 at 4.74GHz	-14.34 at 4.82&-14.42at 8.34 GHz
2. Notch Filter fig.2	8-3.5=4.5GHz	-0.22 at 4 GHz	-26.371at 6.91GHz&-26.13 at 4.48GHz

CONCLUSION

- Here ,the UWB Filter has been designed and also Notch Filter with insertion loss, Return loss parameter is observed

- The Band pass Filter is composed of two cascaded interdigital hairpin resonator units similar to that used in Notch Filter structure.

REFERENCES

[1]. F.wei, L. Chen, X.W. Shi, "compact uwb Bandpass Filter With Notched Band"-Progress in Electromagnetics Research C, Vol. 4,121-128, 2008

[2]. Qing-Xin Chu, Xu-Kun Tian, "Design of a Compact UWB Bandpass Filter With Notched Band"-Proceedings of Asia – Pacific Microwave Conference 2010.

[3]. IEEE Microwave and Wireless Components Letters, Vol.18, No.9, Sept. 2008.