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MICROSRTIP LINE BANDPASS UWB FILTER USING MMR AND APERTURE AT GROUND

Mrs.Shally Goyal*

* Department of Electronic and Communication Amity University-M.P

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ABSTRACT

Parallel coupled band pass filter is proposed for UWB applications using MMR. For better performance defected ground is proposed. firstly designed a PCML band pass filter with MMR at the center frequency of 6.85GHz and after that introduced a rectangular aperture on ground plane for enhancing the filter performance. The proposed filter passband is from 5.1GHz to 8.5GHz for filter without defected ground and after defected ground it is enhanced from4.2 GHz to 9.9GHz. the proposed filter size is 52.2 mm.

KEYWORDS:Multiple mode resonator(MMR),Aperture at back side.

INTRODUCTION

For high-speed wireless connectivity, in February 2002 The FCC Report and Order (R&O) issued, 3.1 to 10.6 GHz frequency band with 110% fractional bandwidth at 7.5 GHz for Indoor and handheld systems that is 7,500 MHz of spectrum for unlicensed use. This allocation of band gives us new potential to develop UWB technologies. Ultra-wideband (UWB) transmission has recently received significant attention in both academic and industry for applications in wireless communications. UWB is not considered a technology any more but, instead is available spectrum for unlicensed use [1] [4][3].I tried to design filter structure that have wideband property . so given designs are planar, simpler, compact. simulation are performed on the HFSS tool [5]. The substrate is Gilgml1032 which has thickness 0.762mm and relative permittivity 3.2

DESIGNINING OF PCML FILTER

Schematic of the parallel coupled line ultra wide band bandpass filter is shown in Figure 1 illustrates with centre frequency 6.85 GHz. In the center part of this filter a a non-uniform multiple-mode resonator is composed and at both sides of MMR two identical parallel-coupled microstrip lines are composed.[6] At passband, one quarter-wavelength are selected for two side sections of the MMR and one half-wavelength ($\lambda g0/2$) [7-8] is selected for the central section.

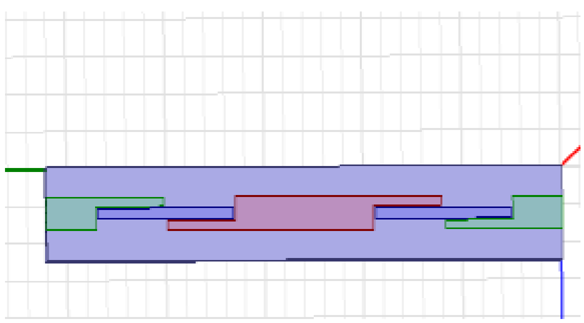


Fig.1 : PCML filter with MMR

The structure was analyzed and optimized with HFSS [5] . The optimized parameters are given in Table 1. This was useful for making the ultra wideband filter successfully Wavelength ($\lambda g0$) is the guided wavelength, and it can be calculated by given equation

$$\lambda_{g0} = \frac{c}{f\sqrt{\epsilon_{eff}}}$$

Where,

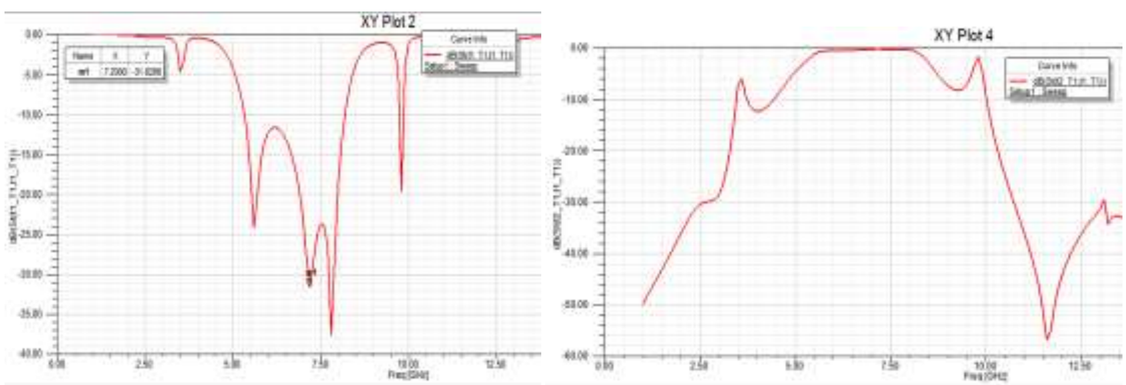
f = frequency of operation
c = light velocity in free space
ϵ_{eff} = Effective dielectric constant

Th characteristic impedance of transmission line is 50Ω. coupled line, length, gap and width can be calculated [3][4][1]. substrate having relative permittivity 3.2 and thickness 0.762mm.

Table 1: Dimensions of the filter

Dielectric substrate	Thickness of substrate: 0.762 mm Metal film: 10 μm Cu, εr: 3.2				
50 ohm microstrip line(mm)	Width=1.8 Length= 5				
Filter dimensions (mm)	$\lambda_{g0}/4$	W1	W2	G_1	G_2
	6.85	0.5	0.6	0.2	0.1

parameters that are optimized are listed in Table 1. In figure 1 shows the schematic of filter with center MMR . HFSS tool is used for the designing and analyzing of this filter, and the simulation results is shown in fig.2. But this filter is not fulfill our requirement. so this design is modified using defected ground.

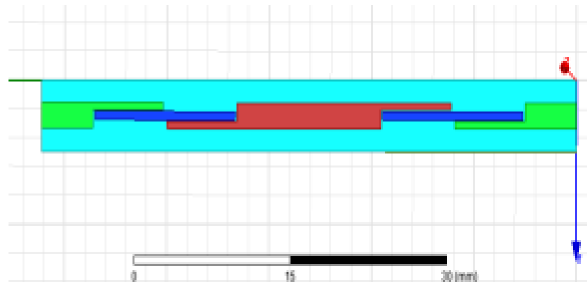


(a) S11 ***(b) S21***

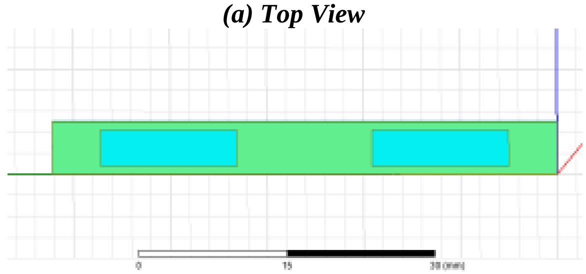
Fig. 2: Simulated result

DESIGNINING OF PCML FILTER WITH DEFECTED GROUND

the out-of band performance for the filter described in section II is not satisfactory. Hence, in the present study the structure is modified by cascading two coupled-line sections on either side of the MMR as shown in Fig.3. This filter has multiple-mode resonator (MMR) in the centre part and two parallel-coupled microstrip lines on either side and two back apertures in the back side . The structure was analyzed and optimized with HFSS [5]. The optimized parameters are listed in Table 2. MMR introduce the seven transmission poles. This was useful for making the ultra wideband filter successfully. the width of the back aperture is W=3.5 and length is $\lambda_{g0}/2+2G2$



(a) Top View



(b) Back View

Figure 3 Proposed UWB bandpass filter

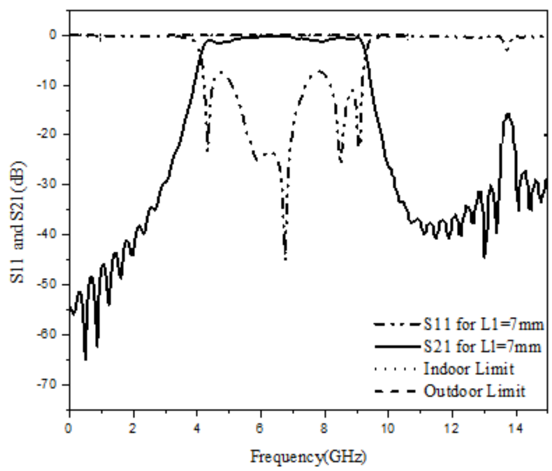


Fig. 4

In Fig.4, simulated result of filter with aperture at ground is shown, the effect of change in band can be easily conclude from the simulation result. The -45.8dB is the maximum return loss of filter with aperture at ground that is at 7.4GHz. the filter band width is from 4.2GHz to 9.9GHz. total bandwidth 5.7 GHz that is a good agreement of UWB filter. that conclude that the aperture back side plane is increasing the coupling between the coupled lines.

CONCULISION

In this paper the design and analysis of Ultra wide band ,parallel coupled microstrip line bandpass filter is proposed. The bandwidth of the proposed filter has been enhanced by using defected ground technique[2].The filter shows good passband performance by using backside aperture.

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