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Uniplanar Consolidated Filtering Dipole Antenna Using Edge Coupling Feed

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Abstract - *In this paper a consolidated filtering planar dipole antenna is presented with a second order filtering retaliation of increased frequency selectivity. At the initial stage of filter is a U-shaped half wave length resonator but whereas second stage is planar dipole antenna. The dipole bandwidth which is being handled by edge coupling between two stages. The U-shaped resonator behaves as a Balun. The measured antenna shows central frequencies at 3.9 G Hz and 4.45 GHz with end-fire radiation pattern and sharper roll-off. The designed antenna works in c-band frequencies and gain of antenna is 4.32dB.*

Key Words: **Balun, resonator, consolidated filter, edge coupling feed, second order filter.**

1. INTRODUCTION

The Microwave filters as well as antennas are two main components in a lot of RF front ends. Combining the adjacent antenna and filter with in a single platform which would have direct benefits of reducing the component count as well as device footprint. Besides, that the selectivity and the antenna bandwidth can be controlled through a easy integrational approach where in, the resonant antenna element is made as one resonant pole which is coupled electromagnetically with the non-radiating resonator and coupled resonator filter.

The coupling is used to control the bandwidth of the antenna but the embedded filtering increases the selectivity frequency. Whereas the alternating advantages of the integrating approach is totally eliminated by 50 ohms interface between antennas and traditionally cascaded filters.

In this paper, the filtering antenna is designed using half wavelength dipole and resonator by electromagnetic coupling. This antenna is having a unique feature that acts as a Balun. Edge coupling feed is implemented to the antenna. A microstrip partial ground is used in order to achieve end fire radiation pattern.

2. ANTENNA DESIGN

In this paper a second order consolidated filter with the help of edge coupling feeding technique in which the half wavelength dipole acts as secondary resonator. FR4 is used as substrate which is having a thickness of 1.6mm and a dielectric constant of 4.4 with a loss tangent of 0.0027. The upper layer of the filtering antenna consists of U-shaped resonator, line feed and dipole of continuous line as shown in figure1. The lower surface consists of truncated microstrip partial ground where it also behaves also a reflector. A interdigital model is used between U-shaped resonator as well as feed line to achieve high capacitive coupling, where it is been used for enhancing bandwidth. To the dipole of half its length mainly on its central point, where we get to see that both capacitive and inductive coupling are at its current peaks. Ld which is length of the dipole has to be increased in order to achieve impedance matching. The size of partial ground is 18 mm x 7.92 mm. Radiation pattern and impedance matching has a huge impact based on the size of partial ground. The total measurements of the filtering antenna is 30 mm x 60 mm.

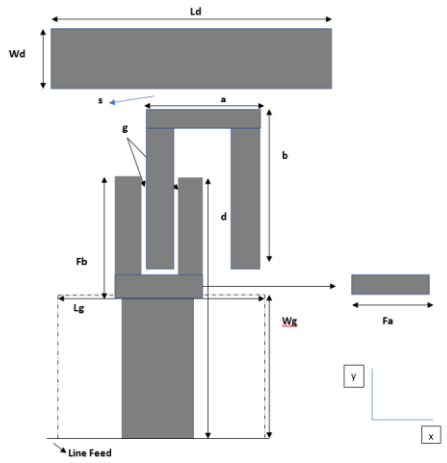

Fig 1 uniplanar Consolidated Filtering Dipole antenna using Edge Coupling feed

Ld = 22 mm; Wd = 4 mm; a = 5.2 mm; b = 7.92 mm; Fa = 4 mm; Fb = 6.1 mm; d = 13.3 mm; Lg = 18 mm; Wg = 7.92 mm; g = 0.2 mm; s = 0.3 mm.

For the above designed antenna, the measured results are shown below in fig 2 with the central frequencies of 3.68 G Hz and 4.2 G Hz. Between the frequency range of 3.65 G Hz and 4.4 G Hz.

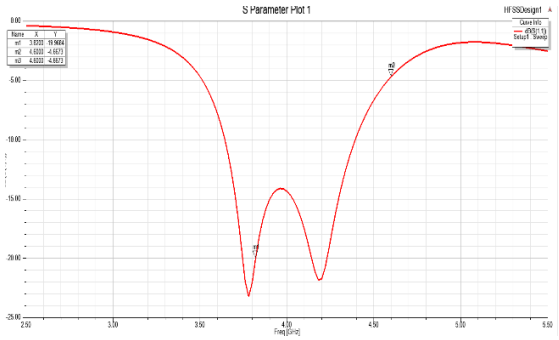

Fig.2 return loss of the designed antenna operated at 5 G Hz frequency.

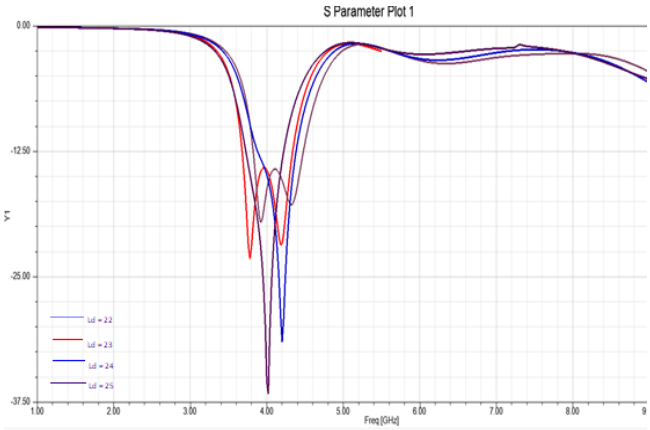

Fig 3.1 parametric sweep of dipole length

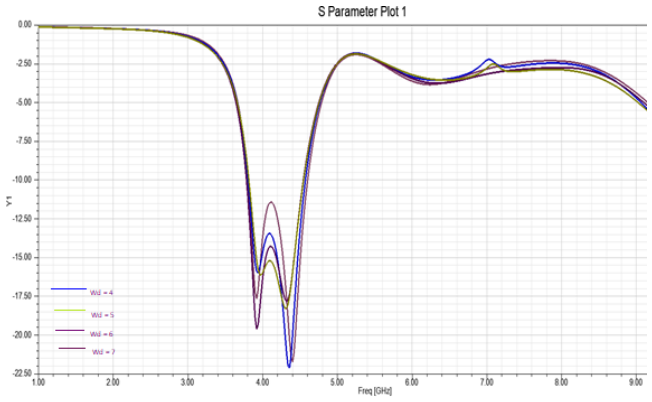

Fig 3.2 parametric sweep of dipole width

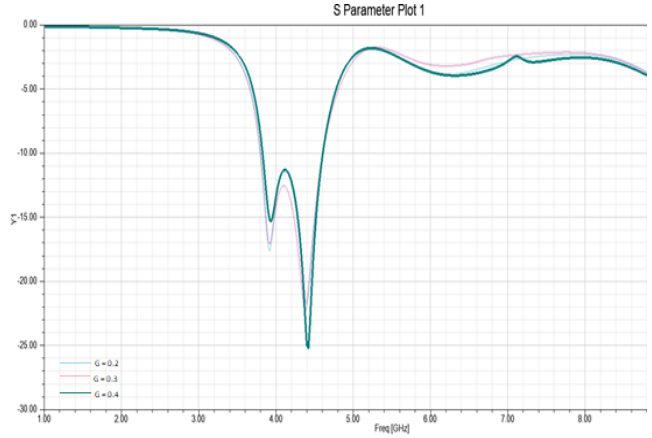

Fig 3.3 parametric sweep of the separation between resonator and dipole

3. SIMULATION RESULTS

The designed filtered antenna is of second order with two reflection dips which is having bandwidth of 0.52 G Hz range between 3.68 and 4.2 G Hz. The Gain of the designed filtering antenna is 4.32 dB that is shown in fig.4.

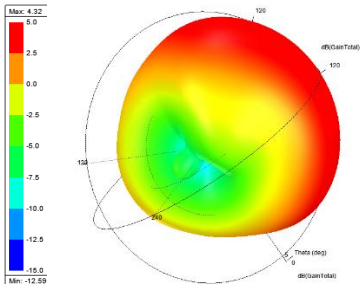

Fig 4.1 3D Gain of the antenna

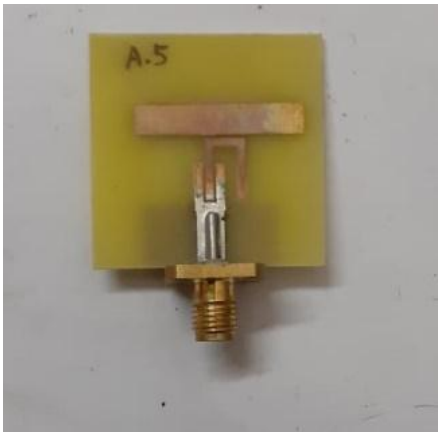

Fig 4.2 Fabricated antenna

4. CONCLUSION

This paper presents the consolidated filter uniplanar dipole with second order filter characteristics. In this antenna U-shaped dipole acts as the secondary resonator. This antenna acts as band pass filter by varying the width of U-shaped dipole the range can be adjusted. The gain of the antenna is 4.32 dB with bandwidth of 0.52 G Hz.

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