E-Shaped Slotted Microstrip Antenna with Enhanced Gain for Wireless Communication

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***Abstract*— In this paper a new design of Microstrip antenna has been proposed. An E- shaped Microstrip Antenna has been designed and designed structure is simulated using Ansoft HFSS™ 11.1 software. Low volume and low profile configuration, easily mounted, light weight, low fabrication cost are the advantages of this antenna. Designed antenna can be operated in dual frequencies such as 5.1GHz and 7.5GHz with return loss of -22db and -12db respectively. Maximum achieved gain of the designed antenna is 11.5.**

***Keywords*— E-Shaped Microstrip Antnna, resonant frequency, Ansoft HFSS™ 11.1, gain.**

I. INTRODUCTION

A microstrip patch antenna is a type of antenna that offers a low profile, i.e. thin and easily manufacturability, which provides great advantages over traditional antennas [1-2].

However, patch antennas have a main disadvantage i.e. narrow bandwidth [3]. Researchers have made many efforts to overcome this problem and many configurations have been presented to extend the bandwidth. Patch antennas are planner antennas used in wireless links and other microwave applications.

An E-shaped patch antenna is easily formed by cutting two slots from a rectangular shape as shown in fig 1. By cutting the slots from a patch, gain and bandwidth of microstrip antenna can be enhanced. An E-shaped patch antenna is proposed in this paper. In this designed microstrip antenna the E-shaped patch is placed on the top of the dielectric sheet and the dielectric sheet is placed on a ground plane. In [4], an E-shaped microstrip antenna is proposed, in which patch and the ground plane are separated by silicon spacer.

II. ANTENNA STRUCTURE

This antenna consists of a ground plane, dielectric layer and E-shaped patch. The size of the ground plane is 100×100 (mm), and the thickness of the dielectric layer is 4mm. The dielectric constant of the dielectric layer is in between 2.2 to 12. The size of the patch is 50×50 (mm). In the E-shaped patch probe is fed in the middle with the 50ohms-SMA connector as shown in fig 2. The side view of the antenna is shown in fig 3.

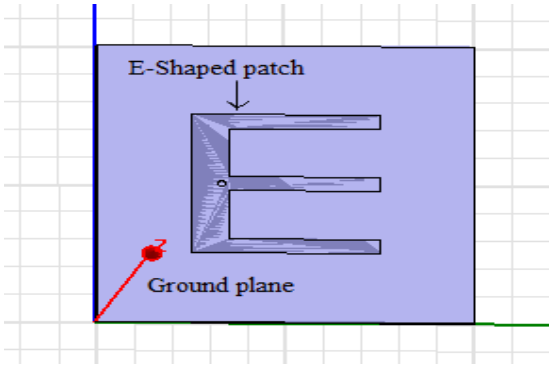

Figure. 1

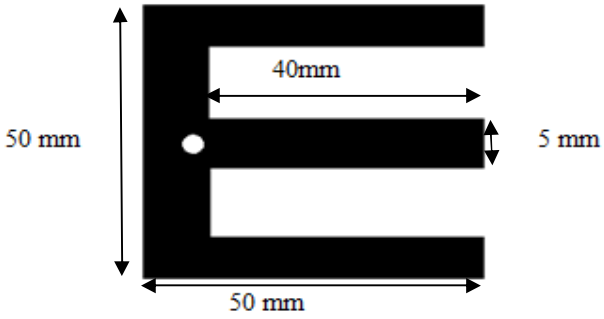

Figure. 2

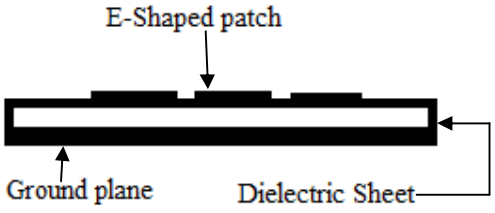

Figure. 3

The microstrip antenna dimensions are calculated and calculation details can be found in [5].

III. PARAMETRIC STUDY

In this section we will discuss the effect of parameters on the performance of designed E-shaped microstrip antenna. It has been observed that position of the feed line with specific antenna structure affects the various performance parameters such as gain, radiation pattern and return loss of the antenna. Variations in the dielectric constant also affect the performance parameters of the designed microstrip antenna which is shown in simulated results.

IV. SIMULATED RESULTS

Simulation of the designed antenna is done using HFSS software. In this simulation analysis we try to optimize different performance parameters of the antenna such as return loss, gain, radiation pattern etc.

1.1. It has been observed that the feed point has crucial effect on the performance of designed antenna. By varying the feed point, return loss of the designed antenna has been optimized. If we take the feed point in the middle strip of E-shaped patch (fig. 4) the simulated return loss is -14db as shown in fig. 5

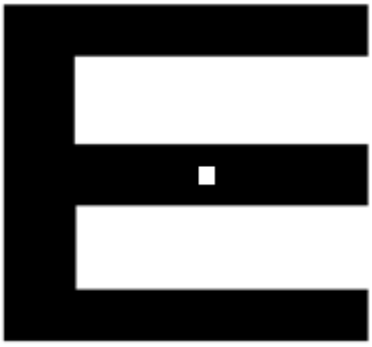

Figure. 4

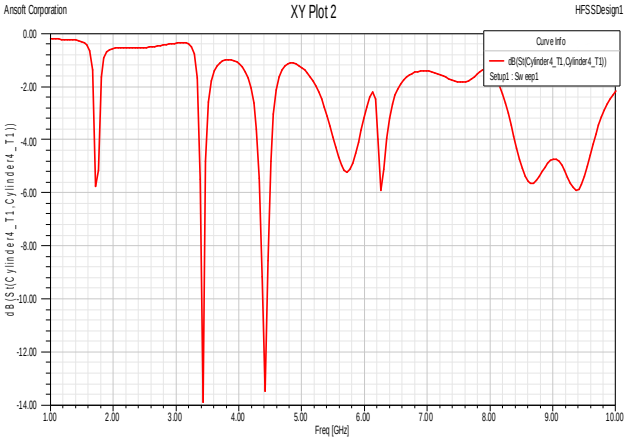

Figure. 5

1.2. If we take the feed point in end of the middle strip of E-shaped patch (fig 6) the simulated return loss is -18db as shown in fig. 7

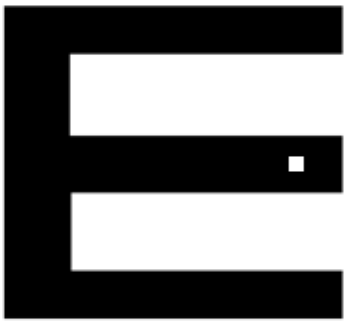

Figure. 6

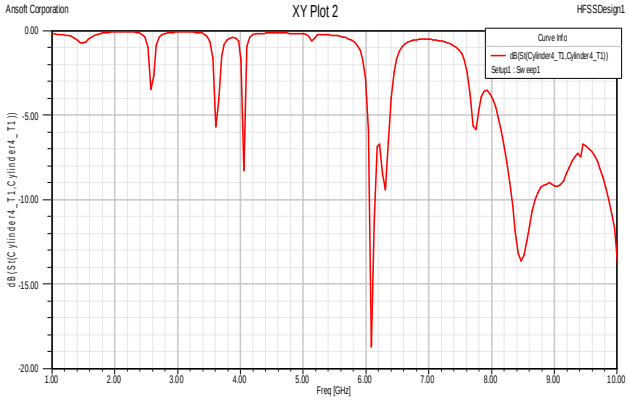

Figure. 7

1.1. If we take the feeding point as shown in fig 2. The return loss of the designed antenna is -22db.

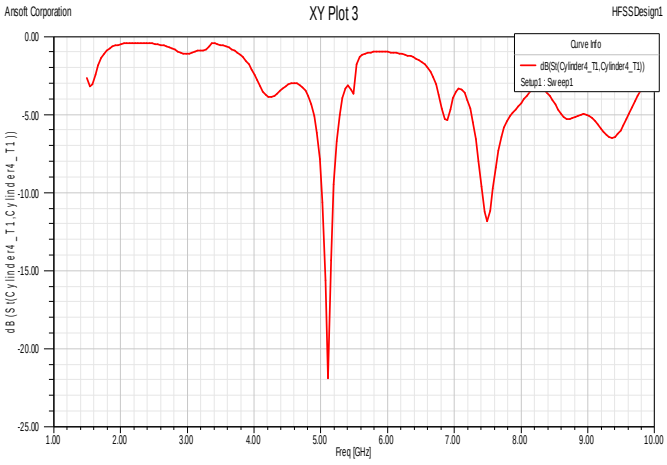

Figure. 8

This optimised antenna can be operated on two frequencies such as 5.1GHz and 7.5 GHz having return loss -22dB and -12dB respectively as shown in fig.8

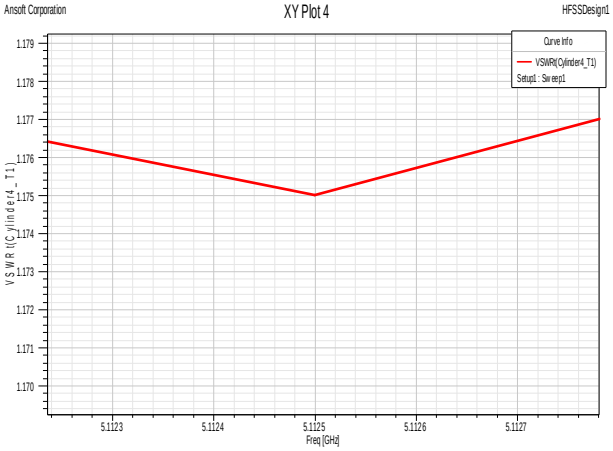

Figure 9

VSWR of 1.17 for the designed antenna can be observed from fig. 9.

2. The gain of the designed antenna is 11.5. The designed antenna is radiating all its power in one direction therefore optimised antenna has unidirectional radiation pattern as shown in fig. 11 and fig. 12. There is one major lobe in the radiation pattern of designed antenna and other side lobes are minimized. Hence, the designed antenna is more directive.

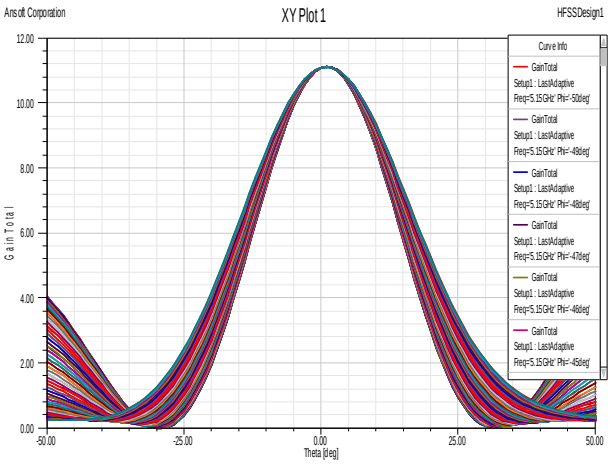

Figure.10

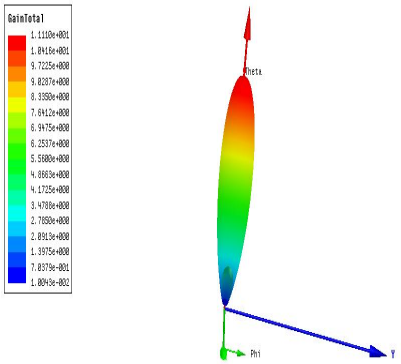

Figure 11

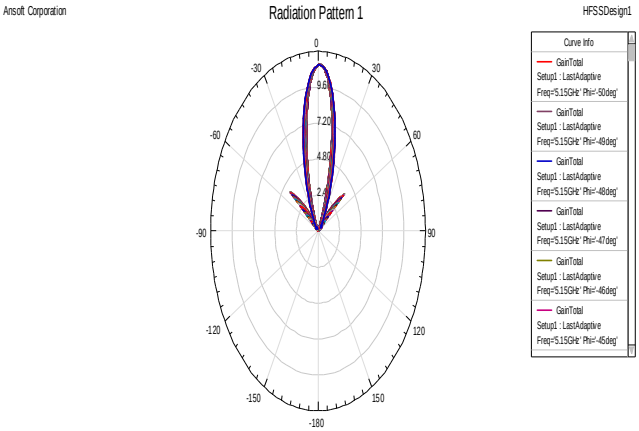

FIGURE 12

V. CONCLUSION

From the simulation analysis of the designed antenna it can be easily observed that the designed E-shaped microstrip antenna has good gain i.e. 11.5 and optimized return loss i.e.-22db. It has also been observed that feed point has a crucial effect on the performance of the designed antenna. By varying the feed point position, different performance parameters can be optimized. Designed antenna can be used in different applications such as in satellite communication, wireless communication, mobile phones etc.

VI. REFERENCES

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