A MICROSTRIP FED CROSS SHAPED PATCH ANTENNA

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Abstract: This paper presents an antenna design where microstrip kind of feeding is involved. The outer appearance seems to be a cross shaped patc antenna. The desired bandwidth is obtained just by combining a cross shaped patch along with a rectangular ground plane.The dimension of the antenna occupies an area of 12mm x 22mm.The whole design is developed on FR4 substrate (ε_r=4.4, h=1.6 mm).This antenna structure is designed and simulated using Hfss software.The antenna frequency generated about 4.4 GHz.

Keywords: microstrip antenna ,S-parameter, patch antenna .

1. INTRODUCTION

Due to rapid and wide development of wireless communications in the last decade, compact, lightweight and low-cost antennas have attracted the attention of researchers. Simple and planar antenna is a good candidate for wireless systems. A planar antenna is basically a simple structure and very lightweight by nature. Omni-directional radiation characteristic, is one of its property. Several papers have been published on various designs of microstrip patch antennas. There have been efforts by researchers in the literature [1-5] to propose various patches and grounds for desired bandwidth. A fork shaped patch antenna is proposed in [1] to achieve triple bands. In [2] a U shaped antenna is demonstrated and studied. A L slot, D shaped and a beak shaped microstrip patch antennas have been studied in [3-5]. In this communication a simple, compact cross shaped patch with a rectangular ground plane is successfully proposed.

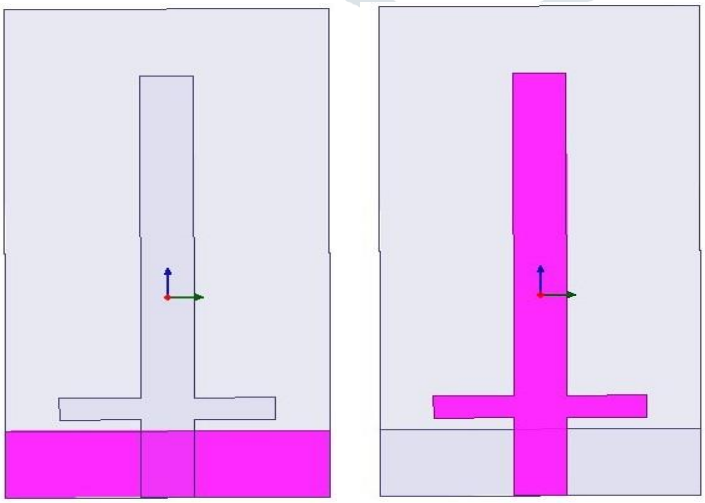

Figure I: Ground plane and Radiator of proposed antenna

2. ANTENNA DESIGN

Fig1 illustrates the configuration of the proposed antenna. The cross shaped patch is the main radiating element .The proposed antenns used a substrate of thickness 1.6mm fed by a 50 ohm microstrip feed line is simply a FR4 material. The antenna is of compact size 12mm x 22mm.The vertical strip of patch is of dimension 22mm x 2mm and horizontal strip has dimensions 8mm x 1mm. The rectangular ground plane 12mmx 3mm is found to be available in opposite side of the patch embedded in dielectric substrate.

3. SIMULATION RESULTS AND DISCUSSIONS

In this section, numerical result of proposed antenna is presented as shown in Fig 2. It shows the return loss as a function of frequency for the optimized set of antenna parameters and the antenna performance is analysed using high-frequency structure simulator (HFSS). The result is plotted in graph where X-axis represents frequency in GHz where as frequency response ie. return loss (S11) in dB is reflected along Y-axis.From the simulated result, it is illustrated the proposed design is resonant at 4.4GHz. The operatingimpedance bandwith is 16.14%, ranging from 4.1 GHz to 4.82 GHz. The current distribution at resonant frequency is simulated at resonant frequecny to visualize the operation of the antenna structure. Fig 3. Illustrates the current distribution, it can be clearly seen that strong eletric current flow near the feed and over the centre of the horizontal strip. This indicates that the horizontal strip alonwith vertical strip provides the electrical current path for producing the resonant band.

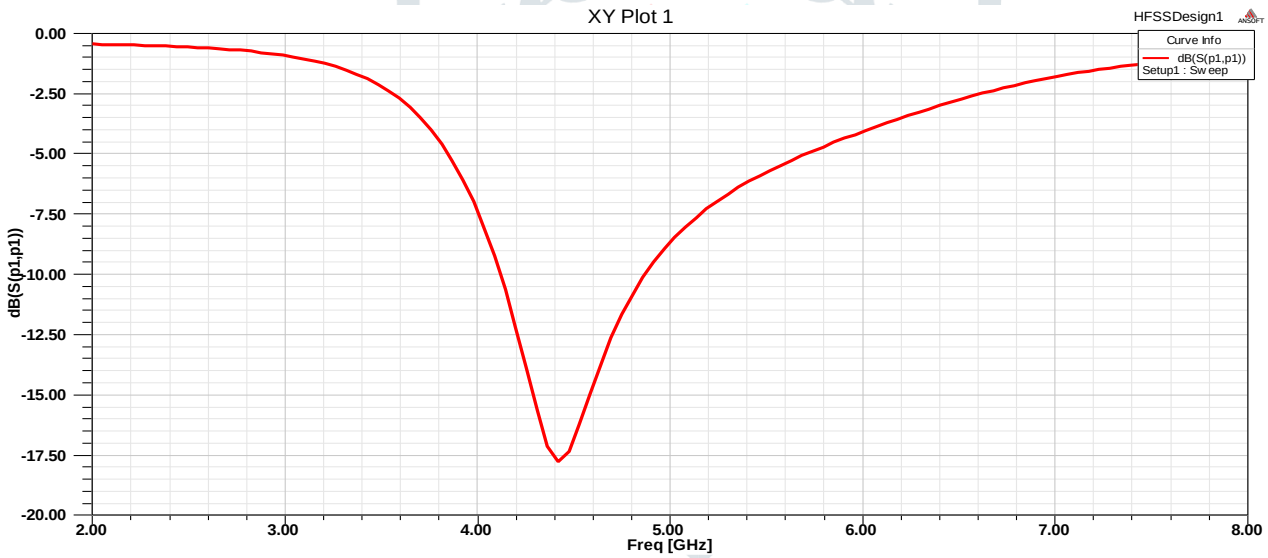

Fig 2 Simulated Return Loss.

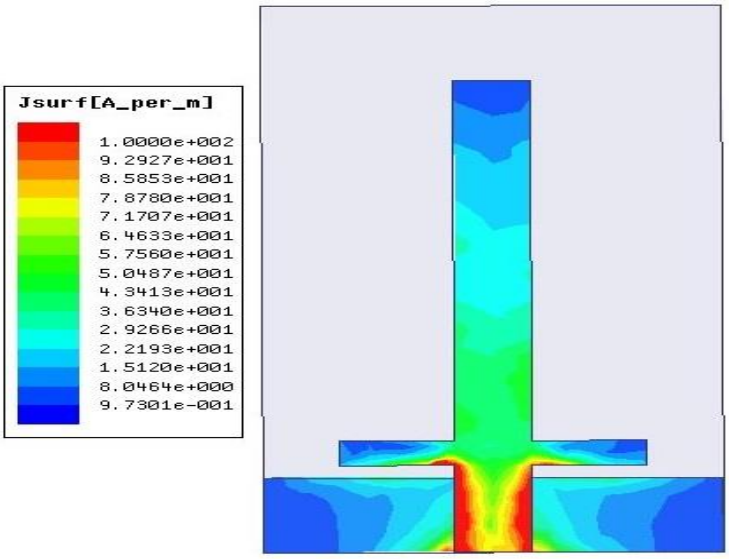

Fig 3 Current Distribution at 4.4GHz

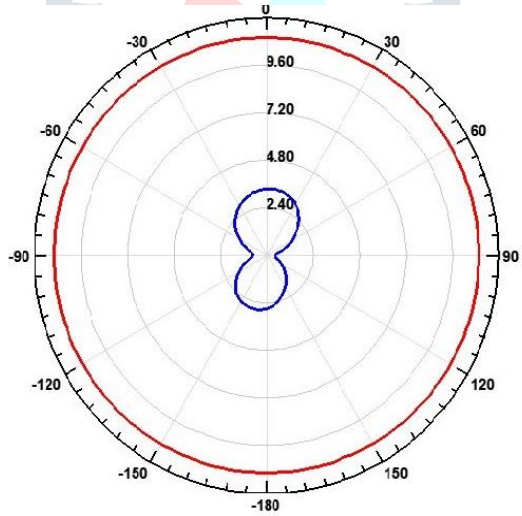

Fig 4. Radiation Pattern at 4.4 GHz

Fig 4 shows E and H field orientation in the space which also named as radiation pattern. It reveals that the antenna has omnidirectional radiation pattern due to its geometry and use of ground plane.The simulated radiation patterns explain about H-plane having equal gain. Apart from that a shape of digit 8 is clearly visible in vertical plane (E-plane).

4. CONCLUSION

A simple, compact patch antenna suitable for wireless applications is presented in this paper.Using a cross shaped patch and a rectangular ground plane, resonance with good impedance performance alongwith radiation pattern and simple structure makes this antenna suitable for practical communication systems.

References

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