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A NOVEL BROADBAND MICROSTRIP PATCHES ANTENNA FOR DIFFERENT WIRELESS APPLICATION

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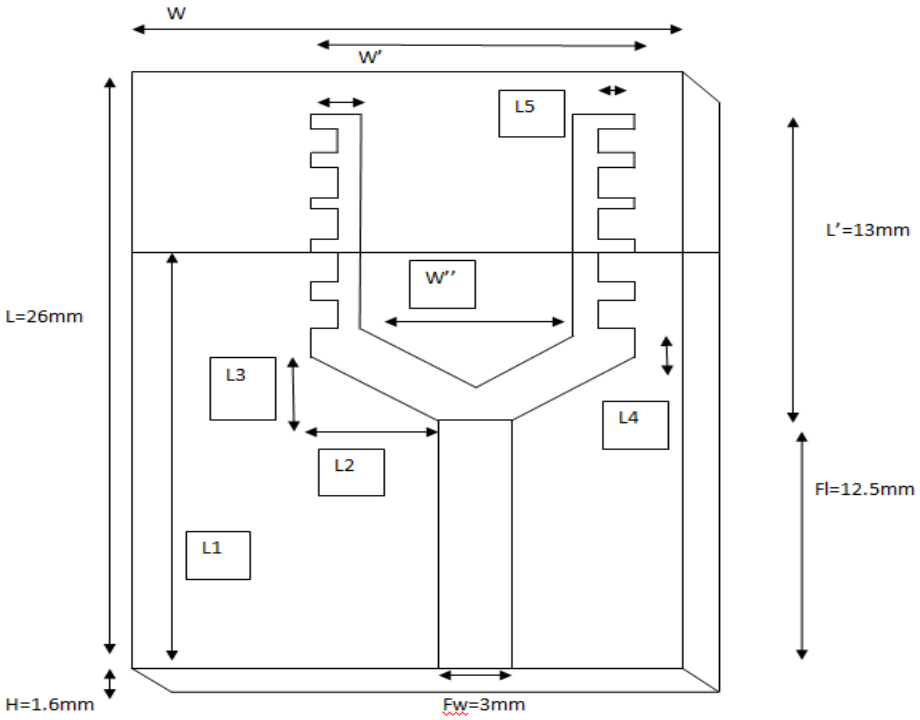
ABSTRACT: A novel method of designing broadband micro strip antenna is proposed in this paper. A U shaped patch is made on a Fr4 substrate of dimensions 23mm*26mm and the edges are cut out to form a comb like structure to get the broadband characteristics. Antennas are designed with the slots to form the comb like structure and various parameters of the slots are made to form 3 different kinds of antennas. The measured broadband is achieved with small sizes and the good radiation characteristic for operating frequencies within the impedance bandwidth is also observed. HFSS software is used to simulate and run the software.

KEYWORDS- broadband, comb like structure, square like slot, antennas, wireless

1. INTRODUCTION

Microstrip patch antennas are widely used in various applications, especially in wireless communications. The microstrip patch antenna consists of a dielectric substrate on one side of a patch with a ground plane on the other side, and wide varieties are possible of design. It has many advantages, such as low profile, lightweight, conformity, low fabrication costs, simplicity of manufacture, and the capability to be integrated with microwave integrated circuits (MICs) [1],[2]. In addition, microstrip antennae can be fed by various techniques. However, their application in many systems is restricted because they have inherently narrow bandwidths. To overcome the inherent limitation of narrow impedance bandwidths, many techniques have been suggested for bandwidth improvement, and these can be classified into the following methods [3]: the implementation of impedance matching, increasing antenna volume (this is accomplished by geometric changes to increase the volume under the patch, e.g. increasing thickness) and using coplanar or multi-layer elements [4]. In this project, broad-band impedance matching is proposed for bandwidth enhancement. This technique means the attachment of a network to the patch antenna and this normally is used in the feed
Port of the microstrip antenna which does not alter the radiating element itself This can be done using a four element matching network.

2. ANTENNA DESIGN



L1=19.5mm L2=7mm L3=2mm L4=2mm L5=1.5mm W''=11mm W'=15mm W=23mm
L1 is for ground plain at the bottom of the substrate

FIGURE 1- THE DIMENSIONS OF THE PROPOSED ANTENNA

Here the proposed antenna is designed on a fr4 substrate of dimensions 23mm*26mm and of height 1.6mm.A rectangle patch of copper is taken of dimensions 15mm*13mm and of thickness 0.035 mm. A feed of dimensions 3mm*12.5mm is given to the feed. The feed is also of copper of thickness 0.035 mm. A copper ground is provided at the bottom of substrate of thickness 0.035mm but is not fully covered but up to 19.5mm. Two triangles are cut at the edges to form the U shaped structure and on the inner side another rectangle of dimensions 11mm*9mm and another triangle is cut to form the U shaped design.

A.ANTENNA DESIGN 1

Here we cut squares of equal sizes on both sides of the U shaped arm. Each square is of dimensions 1.5mm*1.5mm resulting in an even structure. The other parameters are same as shown in figure 1. The centres of squares are equally placed.

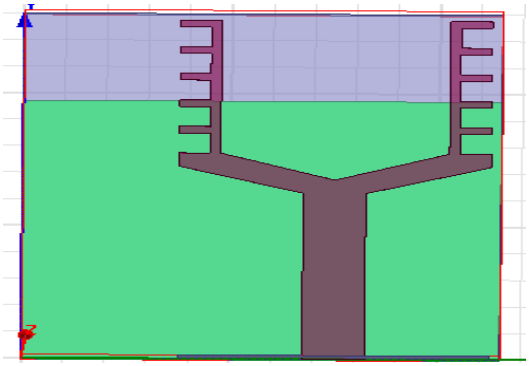


FIGURE 2- THE PROPOSED ANTENNA IN HFSS SOFTWARE.(TOP VIEW) WITH SLOTS EQUALLY CUT OF DIMENSIONS 1.5mm*1.5mm

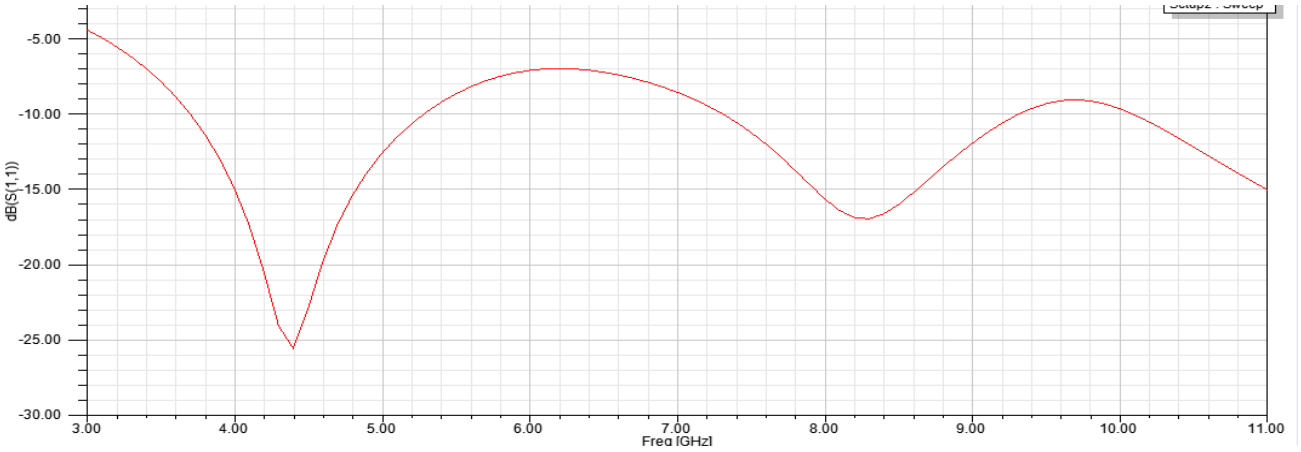


FIGURE 3-THE RETURN LOSS CHARACTERISTICS (S11 PARAMETERS) OF THE ANTENNA WITH THE DESIGN1

From 3.7 GHz to 5.2 GHz the S(1,1) parameters are below -10 dB and from 7.3 GHz to 9.3 GHz again we get S parameters below -10 dB with wider bandwidth but lesser gain in comparison to previous frequency points which will be useful for various broadband applications.

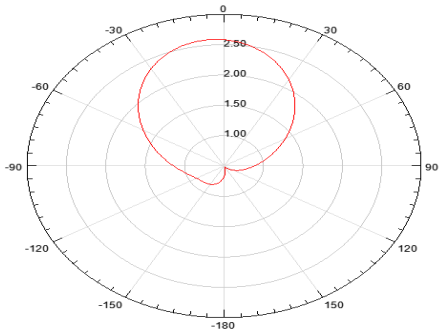


FIGURE 4-RADIATION PATTERN AT ϕ=0 AND AT FREQUENCY=6 GHz

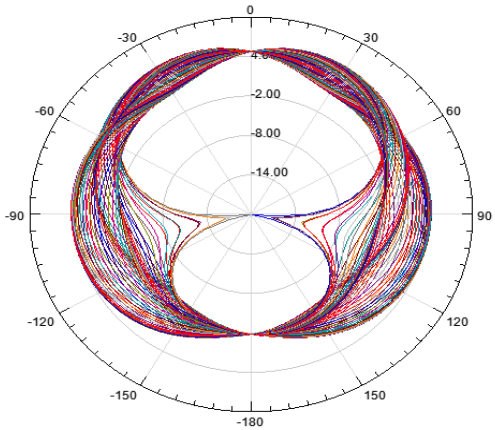


FIGURE 5-RADIATION PATTERN AT ALL ϕ AND AT FREQUENCY=6 GHz

B.ANTENNA DESIGN 2

Here we cut squares of varying sizes on both sides of the U shaped arm. 1st square is of dimensions 0.25mm*0.25mm on both sides. 2nd square is of dimensions 0.5mm*0.5mm on both sides. A 3rd, 4th and 5th square is of dimensions 1mm*1mm on both sides. These unequal cutting of slots results in an uneven square like structure providing various surface areas. The other parameters are same as shown in figure 1. The centres of squares are equally placed.

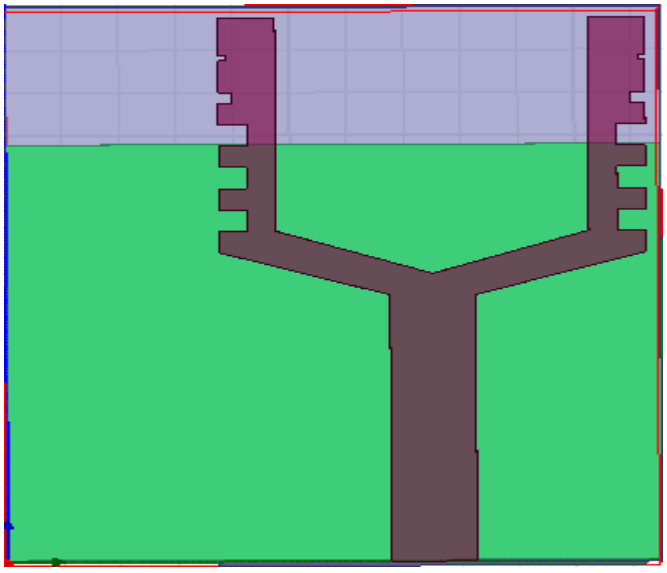


FIGURE 6- THE PROPOSED ANTENNA IN HFSS SOFTWARE.(TOP VIEW) WITH SLOTS OF DESIGN 2

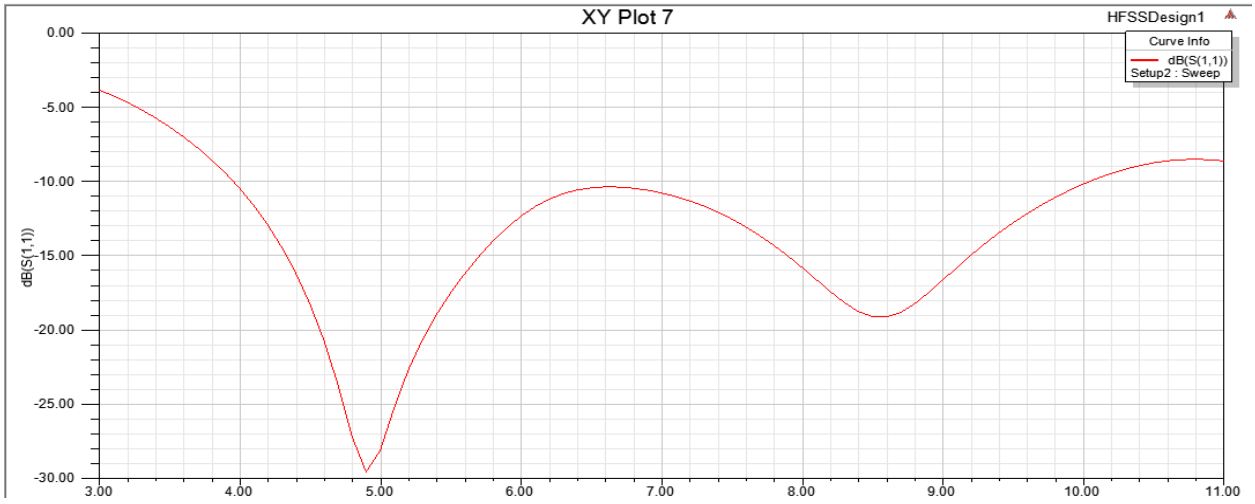


FIGURE 7-THE RETURN LOSS CHARACTERISTICS (S11 PARAMETERS) OF THE ANTENNA WITH THE DESIGN 2

From 4 GHz to 10 GHz the S(1,1) parameters are below -10 dB with good gain which will enable to be used for various wireless applications.

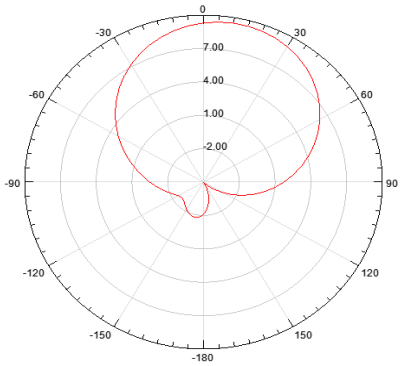


FIGURE 8-RADIATION PATTERN AT ϕ=0 AND AT FREQUENCY=6 GHz

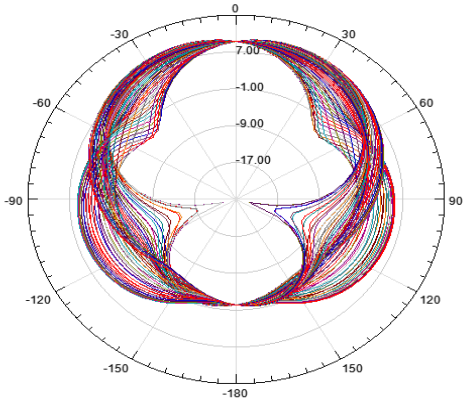


FIGURE 9-RADIATION PATTERN AT ALL ϕ AND AT FREQUENCY=6 GHz

C.ANTENNA DESIGN 3

Here we cut squares of varying sizes on both sides of the U shaped arm. 1st and 2nd squares are of dimensions 0.25mm*0.25mm on both sides. 3rd and 4th squares are of dimensions 0.5mm*0.5mm on both sides. 5th square is of dimensions 1mm*1mm on both sides. These unequal cutting of slots results in an uneven square like structure providing various surface areas. The other parameters are same as shown in figure 1. The centres of squares are equally placed.

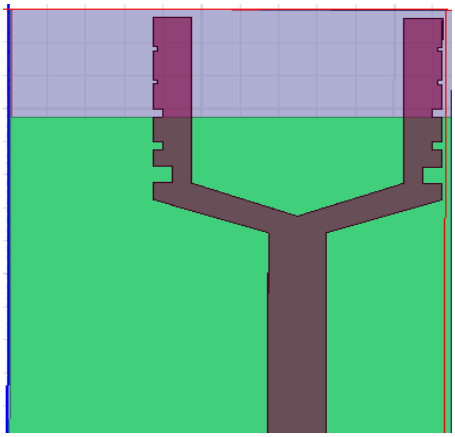


FIGURE 10- THE PROPOSED ANTENNA IN HFSS SOFTWARE.(TOP VIEW) WITH SLOTS OF DESIGN 3

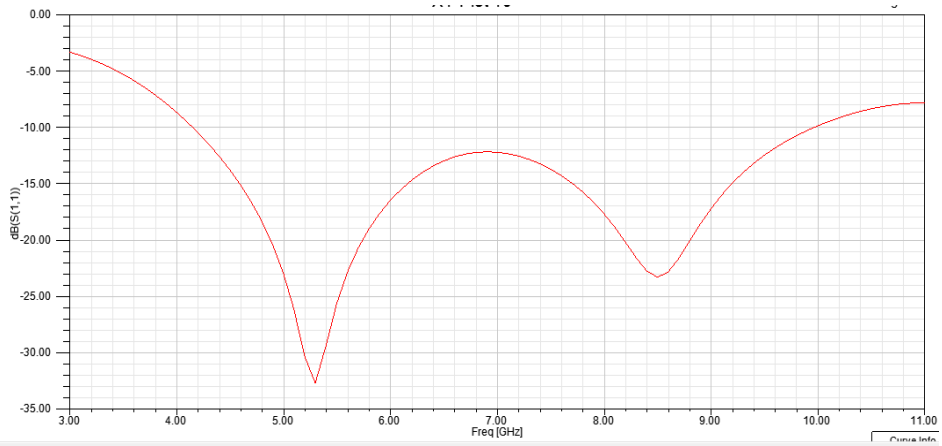


FIGURE 11-THE RETURN LOSS CHARACTERISTICS (S11 PARAMETERS) OF THE ANTENNA WITH THE DESIGN1

From 4.2 GHz to 10 GHz the S(1,1) parameters are below -10 which will be useful for various wireless applications.

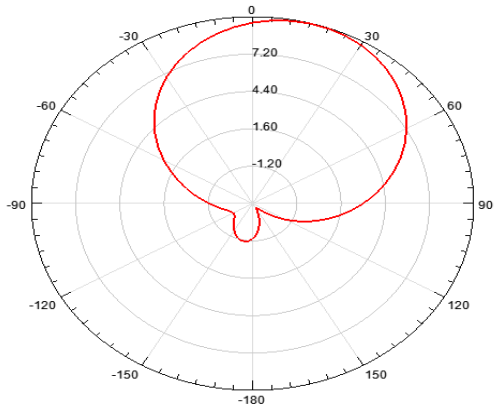


FIGURE 12-RADIATION PATTERN AT ϕ=0 AND AT FREQUENCY=6 GHz

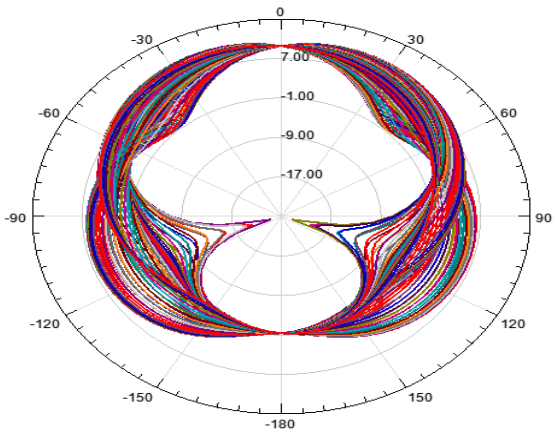


FIGURE 13-RADIATION PATTERN AT ALL ϕ AND AT FREQUENCY=6 GHz

3. RESULT AND DISCUSSION

In this paper, a new method of improving the bandwidth of the microstrip antenna is proposed for various wireless applications in the broadband range. Three antenna designs are suggested with comb like structures. Design 1 is of even and the other two are uneven and all of them has a good response from around 4 to10 GHz. We get better response allowing for usage of various broadband applications. Because of its simple structure, it will be widely used in communication system.

4. CONCLUSION

A compact broadband antenna with measured results has been presented in this paper. This antenna has simple structure and compact size of 23 x 26 mm 2, which is easy to be implanted in miniature devices. Result & analysis of this antenna indicates that it is applicable in miniature devices, simple design and compact size as added advantage. The aim of this project was to design a broadband microstrip patch antenna for use in wireless communication systems. Comparison was made between these sets of results of these three designs of antenna to achieve broadband characteristics.

REFERENCES

1. Antenna Theory: Analysis and Design, 2nd Edition / by Constantine A. Balanis (1997)
2. Microstrip Antennas2 JR James & P S Hall
3. IEE ANTENNAS & PROPAGATION ICAP 2003
4. Microstrip and printed Antenna Design / by Randy Bancroft /NOBLE publishing, 2004
5. J. G. Proakis, Digital Communications, New York: McGraw-Hill, 1989.
6. C. E. Shannon, “A Mathematical Theory of Communication", Bell Syst. Tech. J., vol.27, July & October 1948, pp. 379-423, 623-656.
7. FCC 802 Standards Notes, “FCC first report and order on ultra-wideband technology,” 2002.