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# Minimization of Return Loss and Enhancing the Bandwidth of U Shaped for 'L' Band and 'S' Band Application

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***Abstract:*** ***In this article U shaped microstrip antenna is presented for 'L' band and 'S' band utilizations. The aim of proposed antenna is to enhance the bandwidth with the minimization of return loss and this can be achieved this by varying dimension of the proposed antenna. The proposed antenna is fed by 50Ω coaxial cable using microstripline feed. During simulation it has been achieved the various results of antenna parameters like return loss, gain, radiation pattern, impedance, and VSWR to analyze the proposed antenna.***

***Keywords : Efficiency, impedance, line feed, VSWR..***

## I. INTRODUCTION

The impetus advancement of microstrip antennas plays pivotal role in wireless communication area with high gain and wideband operating frequencies. The patch antennas mostly full fill all the requirements. These are easy to fabricate directly mounted on PCB, having planer or non planer surfaces. These are also available in keenly priced rates. Low dielectric constant of the substrate gives more transfer speed, while high dielectric constant of substrate gives smaller size of microstrip patch antenna. A trade off relationship find out between the reception patch antenna and transmission capacity. As increase the height of substrate, increases the efficiency of antenna, but surface wave is introduced which is not desirable. For the satisfactory working of patch antennas bandwidth, gain and return loss are major concern to keep in our mind. In this paper for enhancing bandwidth and to minimize the return loss by varying width and length of the antenna for L band and S band utilization is presented. The attributes of this antenna substantially changeable and is palpable by its length, width and various simulated parameters . Conventional microstrip patches have some imperfections like narrow bandwidth, low efficiency etc. With the advancement of the technologies, some technology provides double band or triple band configuration. But today, technology demand is not limited to band but also cost, weight, flexibility and other parameters. Textile antenna design has multiple characteristics such as low weight, less expensive and availability. In this type of antenna, there are many strategies that we apply for a higher bandwidth and gain such as by using partial ground, different types of patch and its dimensions and also different types of substrates. As increase the height of substrate, increases the efficiency of antenna, but surface waves is introduced which is not desirable **.**

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## II. PROPOSED METHODOLOGY

### A. Block Diagram

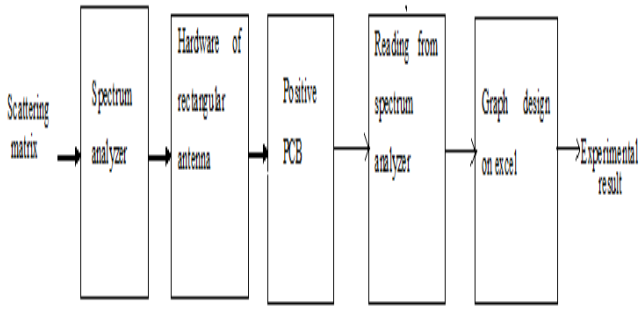



**Fig1: Block diagram for fabrication of antenna**

Fabrication process of proposed antenna is described in above block diagram that is shown in figure 1. After fabrication of hardware, it is tested with spectrum Analyzer. The experimental results obtained, is shown in figure.

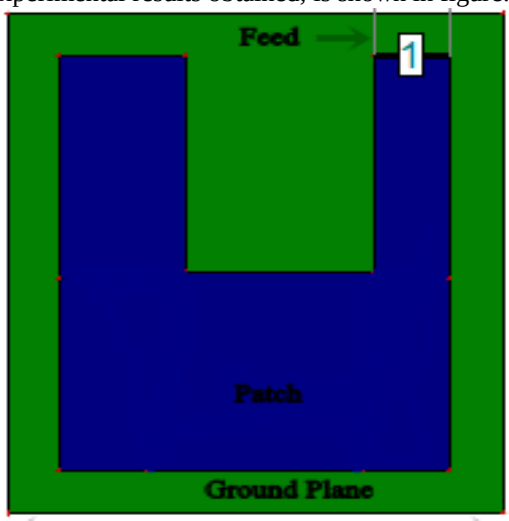



**Fig 2: Top view of proposed antenna**

### B. Design Algorithm Parameters

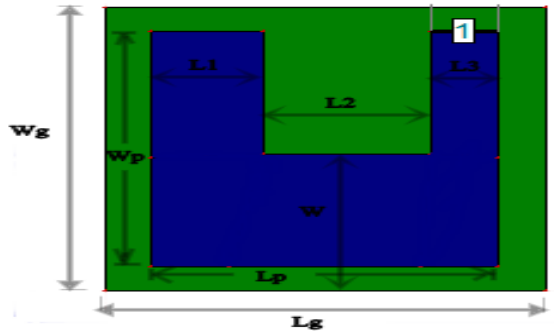
**Table1. Antenna Parameter**

| Antenna Parameters | Value |
|---|---|
| Operating frequency ($f_o$) | 2 GHz |
| Dielectric constant ($\varepsilon_r$) | 4.2 |
| Substrate height (h) | 1.6 mm |
| Loss tangent (tanδ) | 0.0013 |
| Velocity of Light (c) | $3\times10^3$ $ms^{-1}$ |

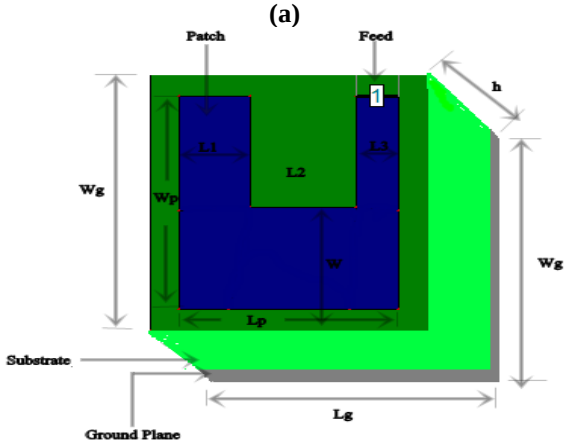
The suggested antenna consists of a finite ground plane with dimension of 46mm× 56mm and patch dimensions are 36.4mm×46.4mm. The substrate height (h) is selected 1.6mm having dielectric constant (ε) value of 4.2. The important parameters for suggested antenna are resonant frequency, dielectric constant ($\varepsilon_r$) and height of the substrate (h).

**Table2. Antenna dimension**

| The optimized design parameter for proposed antenna | Value (mm) |
|---|---|
| Width of ground plane ($W_g$) | 56 |
| Length of ground plane ($L_g$) | 46 |
| Width of patch ($W_p$) | 46.4 |
| Length of patch ($L_p$) | 36.4 |
| Substrate height (h) | 1.6 |
| Length of left arm of U patch ($L_1$) | 11.7 |
| Space between arms of U patch ($L_2$) | 17.5 |
| Length of arm of U patch ($L_3$) | 7.2 |
| W | 27 |




(a)




(b)

**Fig3(a) Geometry of proposed antenna (b) 3D view of proposed antenna**

## III. SIMULATED RESULTS AND ANALYSIS

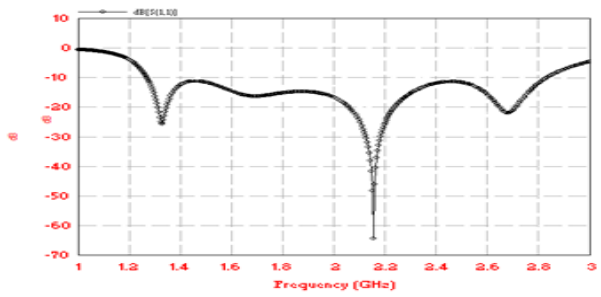



**Fig 4: Return Loss vs. Frequency plot of antenna**

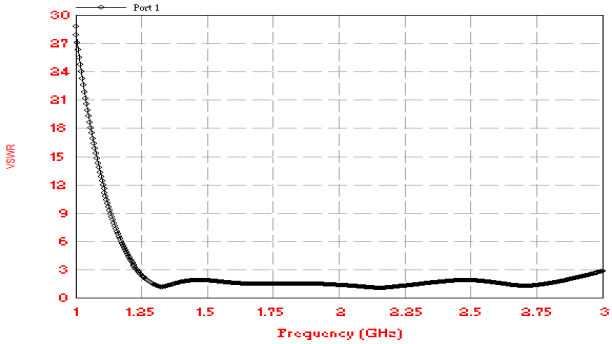



**Fig 5: VSWR plot for U -shaped microstrip patch antenna**

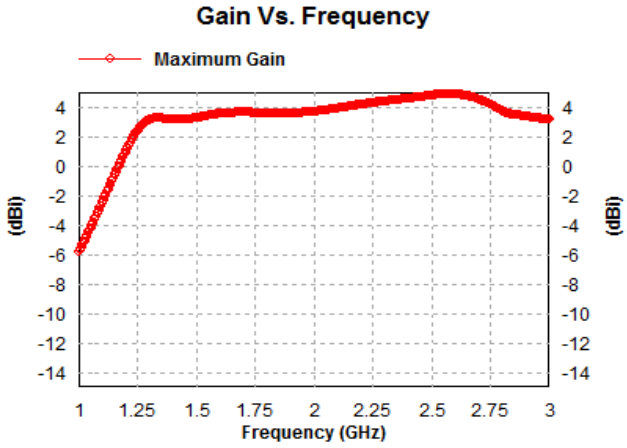



**Fig6: Gain Vs. Frequency plot of the proposed antenna**

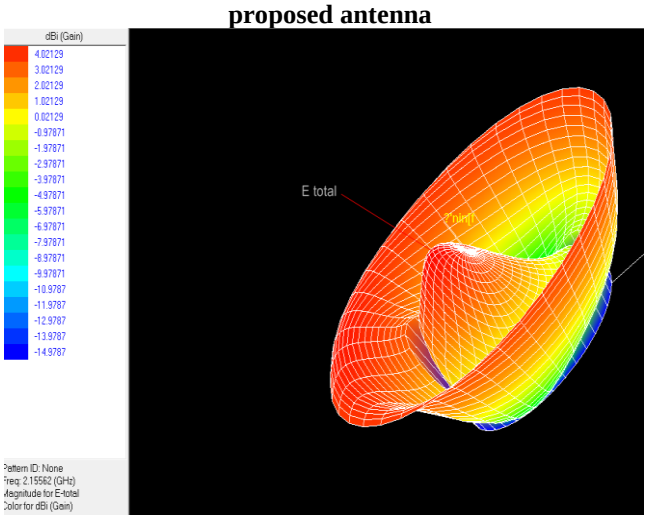



**Fig7: 3D radiation pattern for proposed U-shaped Patch antenna**

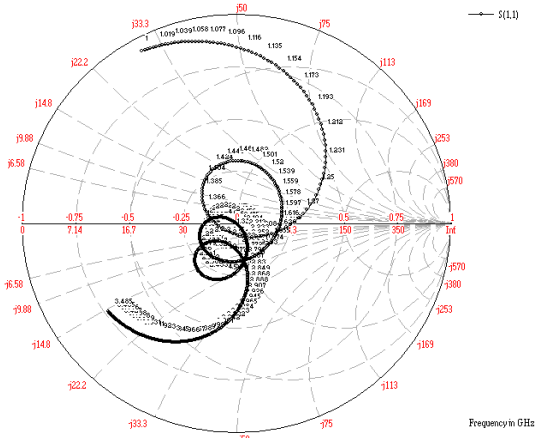



**Fig 8: Smith Chart for proposed U-shaped microstrip patch antenna**

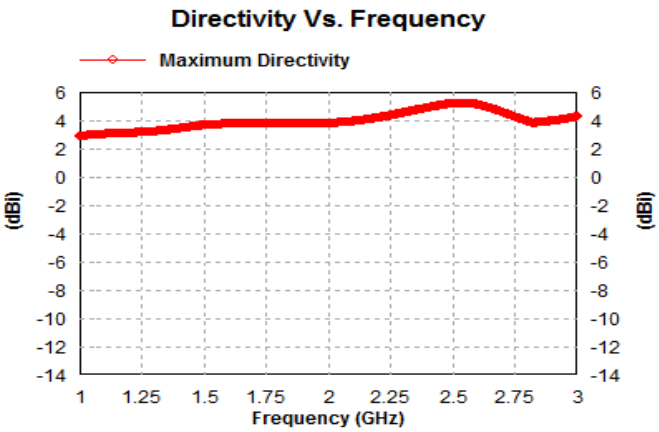



**Fig9: Simulated Directivity of U Shaped antenna**

## IV. EXPERIMENTAL RESULTS

**Table3: Comparisons Between Measured And Simulated Results**

| | Resonant frequency (GHz) | Bandwidth % | Return loss (dB) |
|---|---|---|---|
| Simulated | 2.156 | 77.70 | -64.42 |
| Experimental | 1.75 | 55.63 | -40.0 |

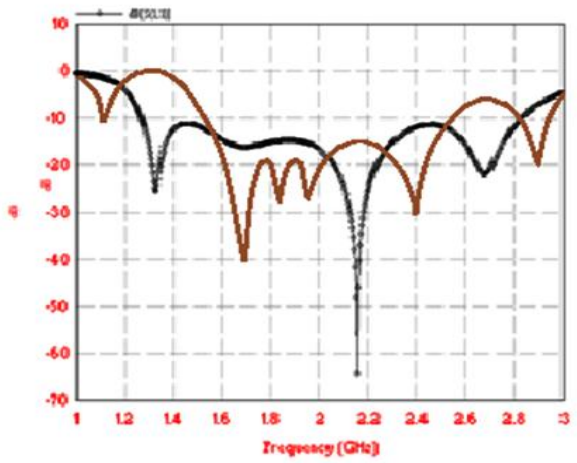


**Fig10: Comparison between simulated & experimental graph**

The graph of the simulated value and measured value are shown in the figure 10. In this graph the simulated percentage bandwidth of the return loss is 77.70% at the resonant frequency 2.156 GHz and the experimental percentage bandwidth is 55.63% and -40 dB respectively at the resonant frequency 1.75 GHz which is described in Table

## V. CONCLUSION

The proposed patch antenna for minimization return loss enhancing bandwidth has been designed and simulated efficaciously. The proposed microstrip antenna occupied the bandwidth of (1-4 GHz) for L band and for S band. The proposed antenna designed having bandwidth of 77.708% at -10 db return loss, gain of 4.02129 dBi, and directivity is 4.02129dbi. The proposed antenna is simple, compact size and low cost. We can conclude from the various outcomes that the antenna performed well as per our requirements. We use microstrip line feeding to feed the antenna. Due to satisfactory performance of antenna it has many applications like in radar systems, GPS, telecommunication, aircraft surveillance satellite communication etc.

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