

# Multiband Microstrip Patch Antenna for Wireless Communication Systems.

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**Abstract**— In this paper a multiband microstrip patch antenna Design has been introduced which is a simple planer asymmetric C shaped microstrip patch.This patch antenna is designed on Sustrate of RT duroid having permittivy of 2.2.The thickness used for substrate is 0.25mm.The antenna is designed and all the results are plotted by using simulating softwre HFSS.Return loss,VSWR and field pattern of the designed one is plotted and found three band of operation having S11 less than -10dB and VSWR less than 2.The antenna designed antenna is having compact size and operation in WLAN,WiMAX and in ISM Band communication.Antenna is having very good polarization ratio and gain bandwidth.Operating band width is found around 300MHz.

**Index Terms**— Microstrip patch antenna,VSWR,Return Loss,Radiation Pattern,Gain,Bandwidth,WLAN,WiMAX and ISM Band.

## 1 INTRODUCTION

MICROSTRIP patches are an attractive type of antenna due to their low cost, conformability, and ease of manufacture. However, the primary barrier to implementing these antennas in many applications is their limited bandwidth which is only of the order of a few percent for a typical patch radiator. Because of this, much work has been devoted to increasing the bandwidth of microstrip antennas and 3 techniques that has been used is a near resonance aperture.This Paper also proposes a technique to enhance total available bandwidth of operation [1].This paper proposes a patch antenna of multiband, resonating at three different frequencies, which can be used for multiple operations.

The intrinsic disadvantages of patch antennas such as narrow band-width and non-uniform coverage are the reasons why this class of antenna has not been seriously considered for hand-held application[4].

The metallic patch essentially creates a resonant cavity, where the patch is the top of the cavity, the ground plane is the bottom of the cavity, and the edges of the patch form the sides of the cavity. The edges of the patch act approximately as an open-circuit boundary condition. Hence, the patch acts approximately as a cavity with perfect electric conductor on the top and bottom surfaces, and a perfect "magnetic conductor" on the sides[5][6].

Microstrip antenna is the ideal choice for such an application due to low profile, light weight, conformal shaping, low cost ,simplicity of manufacturing and easy integration to circuit[1].however, conventional microstrip patch antenna suffers from very narrow bandwidth, typically about 5% bandwidth with respect to the central frequency. there are numerous and well-known method to increase the bandwidth of antennas, including increase of the substrate thickness, the use of a low dielectric substrate, the use of multiple resonators 2],[3].

The International standard of 3.5 GHz spectrum was the first to enjoy WiMAX products. The US license free spectrum at 5.8 GHz has a few WiMAX vendors building products. Licensed spectrum at 2.5 GHz used both domestically in the US and fairly widely abroad is the largest block in the US[7]. Also, in the US and in Korea products are shipping for the 2.3 GHz

spectrum range. Also in the US the 3.65 GHz band of frequencies now has WiMAX gear shipping to carriers. The most recent versions of both WiMAX standards in 802.16 cover spectrum ranges from at least the 2 GHz range through the 66 GHz range.

In this Paper a multiband Microstrip Patch antenna is introduced.The proposed patch is a planer structure having all the dimensions in mm.The proposed antenna is designed by using a substrate of R.D tm having thickness of mm.This proposed antenna is having three band of operation..Here Proposed antenna can be used in Wi-Max and in meny more applications.

## 2 PROPOSED ANTENNA GEOMETRY

A modified c shaped microstrip patch antenna has been proposed here which is a multi band and multi operational antenna with very good impedance band width. The proposed antenna is designed with a substrate of Rogers RT/ duroid 5880(tm) having thickness of h=0.25mm.THE substrate used is having dimension of W=40mm and L=35mm.Proposed antenna is having following new geometry.

1<sup>st</sup> The detailed dimensions are given in the table below all of which are calculated by using conventional relationship between W and L and all the material constants.

The Detailed dimensions are given in the below table, where all the dimensions are in mm.

L1	2mm
L2	7mm
L3	12mm
W1	6mm
W2	7mm
W3	1.5mm

**Table 1:** the detailed Dimensions of the modified C shaped patch.

The proposed geometry is given in below figure.

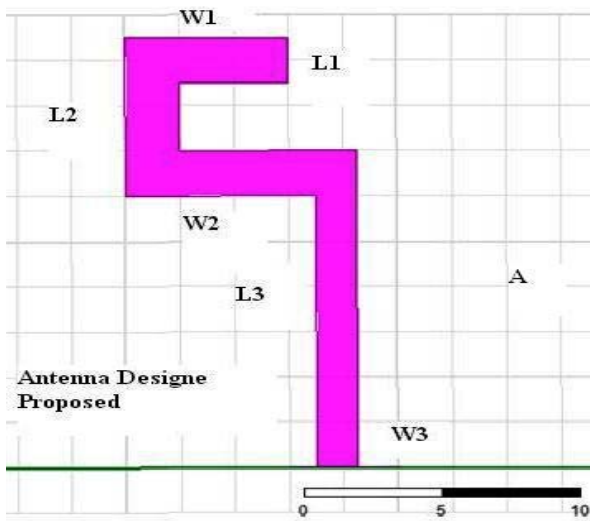


Fig no-1 Design of Proposed C shaped Patch.

The proposed shape is designed by using HFSS modular and the final result is obtained by simulating the same by using HFSS simulator .

### 3 RESULTS OF SIMULATION

When designed antenna is simulated in HFSS then following results were observed. Plote of returnloss and VSWR is given below. BY seaing the overall response of antenna for s11 parameter and VSWR. A multiband antenna has been designed. fig no-2

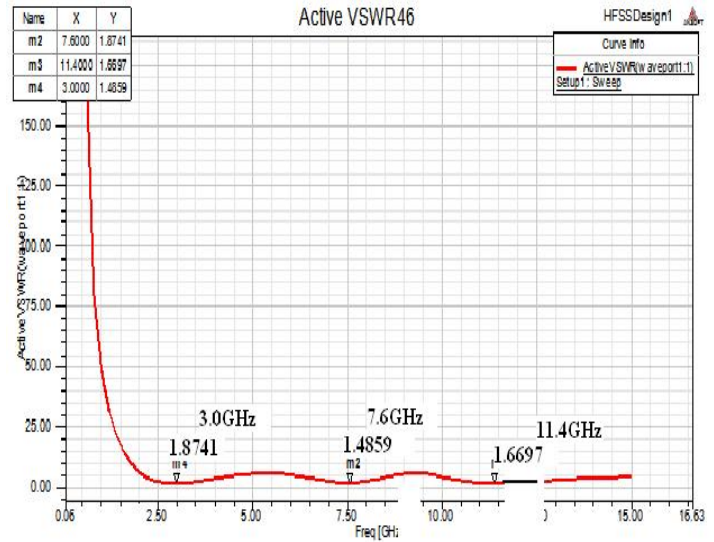


Fig 3 VSWR (Frq, VSWR)

From the above obtained results we can say that The designed antenna is having three band of operations which is having three band of operation. Obtained S11 parameter at all these frequencies is having values less then -10dB. Value of VSWR at all these three resonating frequency band is also less then 2 and greater then 1. So we can say that designed antenna is resonating at 3 different resonating frequencies. All these Frequency have it's own operation. The obtained result is also listed in the table below.

Frequency	S11	VSWR
3.0GHz	-14.17 dB	1.485
7.6GHz	-10.33 dB	1.8741
11.4GHz	-12.01 dB	1.669

Table 2: detailed designed simulation results.

Polarization and gain plot is also represented with radiation pattern for simple understanding.

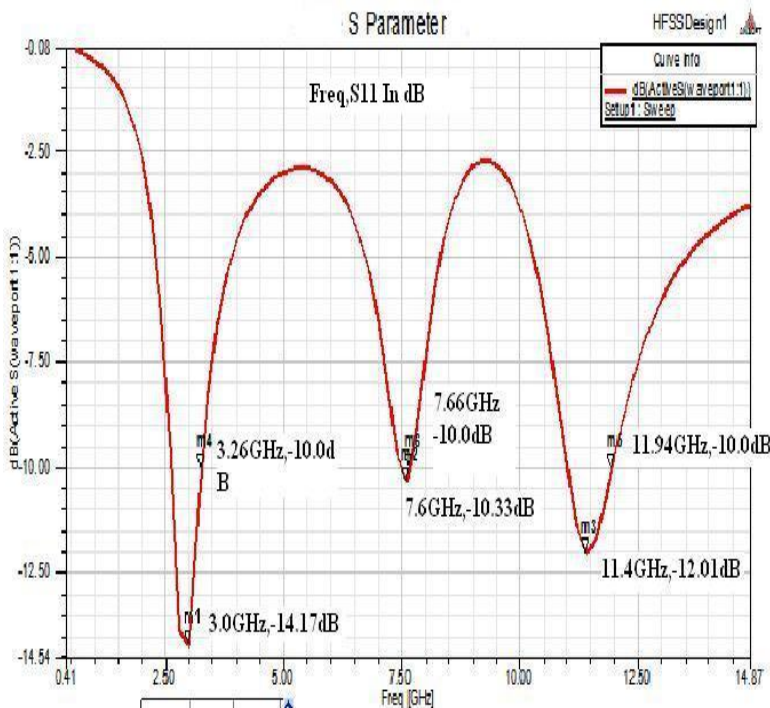
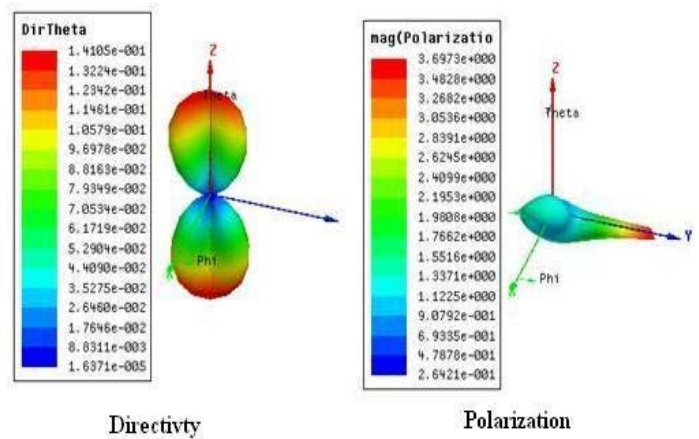


Fig no-2 S11 parameter



Directivty

Polarization

Fig no 3- Directivty and Polarization plot.

## 5 CONCLUSION

1<sup>st</sup> it is resonating at 3GHz which is near to ISM band and also the same band is applicable for lower WiMAX band application. The antenna is having return loss of -14.1772dB at 3GHz with impedance band width of approximately 300MHz .similarly at 7.6GHz having S11 of -10.3361dB with band width of 300MHz and at 11.40 GHz s11 is -12.0183dB with band width of 300 MHz

This designed antenna is the new one proposed and simulated on HFSS

also results are checked mathematically, both results are approximately

same. This antenna can be used in various ISM band communication, can be used as a fixed antenna service and as a satellite antenna at the same time. More no of operations like WLAN,WiMAX,ISM band communication can be done by using same antenna system.

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