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Modified E-Shaped Microstrip Patch Antenna For Wimax Application

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Abstract: In this paper E shaped microstrip patch antenna is proposed for wimax(World Wide Interoperability For Microwave Access) application. The patch antenna works at the frequency of 3.5 GHz with the satisfying antenna parameters like directivity, gain and radiated power with FR4(Flame Resistance-4). The figure 8 type radiation pattern is obtained as the result. The simulation is carried out in Agilent Technologies Advanced Design System (ADS)

Keywords: ADS, Patch, FR4, Wimax.

I. INTRODUCTION

Microstrip or patch antennas are printed directly onto a circuit board and becoming increasingly useful. Microstrip antennas are very much used in mobile phone market. Patch antennas are off low cost, easily fabricated and have a low profile .

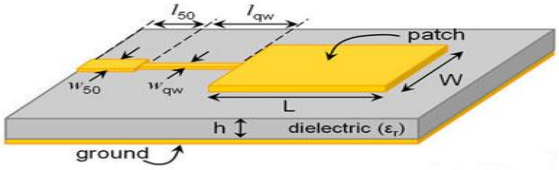

Fig 1.a:General PATCH Antenna

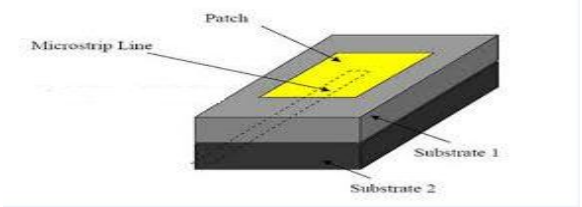

Fig 1.b:General PATCH Antenna

Microstrip transmission line is used as a fed for the microstrip patch antenna in Figure 1. The patch antenna, ground plane and microstrip transmission line are made up of high conductivity metal (copper is mostly used). The patch is of width *W*, length *L* and placed on top of a substrate (which is a dielectric circuit board) of thickness *h* with permittivity ε_r . The thickness of the microstrip or the ground plane is not very important. The height *h* should be much smaller than the wavelength of operation, but it should not be much smaller than 0.05 of a wavelength.

Input impedance of the microstrip antenna is controlled by the width W.Bandwidth increases as the width becomes larger. The input impedance will be 300 Ohms for a square patch antenna fed in the manner above. Impedence can be reduced by increasing the width. Often a very wide patch antenna is needed to reduce the input impedence to 50 ohms. But it takes up a lot of valuable space.

II. ANTENNA DESIGN

The geometry of the proposed antenna shown in figure 2 is fabricated on an FR4 substrate with thickness of 3.2mm, relative permittivity of 4.6, and loss tangent of 0.024. The overall dimensions 25.7 mm x 19.5 mm (W x L) . The parameters and dimensions are shown in Fig. 1(c) and listed in Table 1, respectively. A PATCH type antenna printed on outer side of antenna portion excites the 3.5 GHz resonant mode with the satisfying antenna parameters.

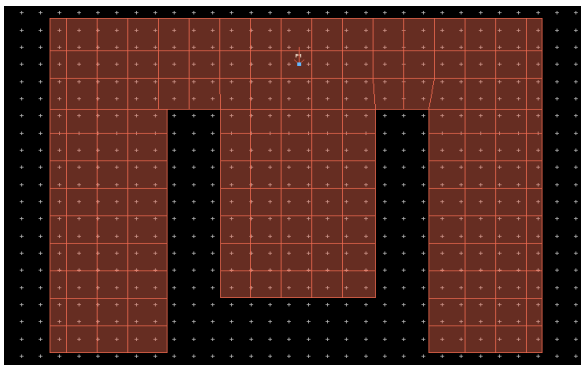

Fig 2:Design of PATCH

The antenna is built on the FR4 substrate of the thickness 3.2 mm. The effective dielectric constant of the substrate is 4.6. The FR4 substrate is used to be very cost effective and easy to fabricate the antenna. Hence the FR4 substrate is widely preferred than any other substrate.
The paramaters of the strips are given in the table.

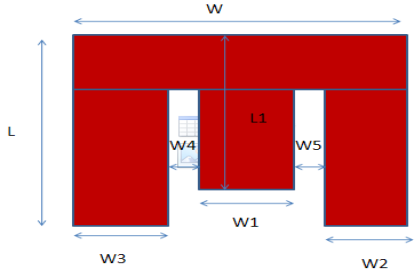

Fig 3:Dimensions of the antenna

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Dimensions	W	W1	W2	W3	W4& W5	L1	L
(mm)	25.7	8.1	5.9	6.1	2.8	16.5	19.5

Table 1 Dimension

III. RESULTS

The antenna parameters that affect the resonant modes are discussed in this paragraph. It shows the simulated S 11 of the proposed antenna which works at the frequency of 3.5 GHz for wimax, the return loss of the proposed antenna is -33.913. The simulation is carried out in Advanced Design System (ADS).

The antenna parameters that are obtained during the simulation was at satisfactory level.

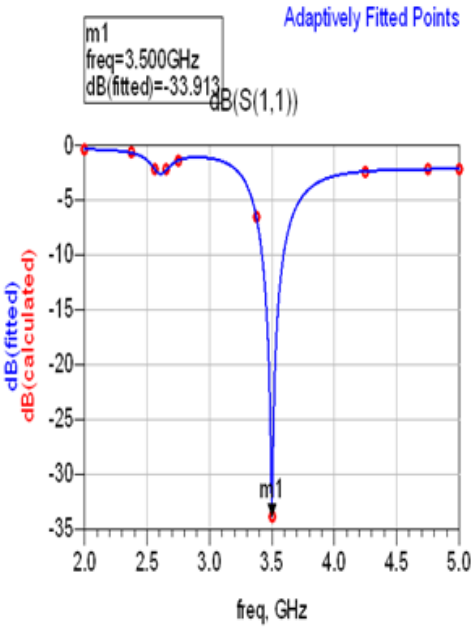

Fig 4: Obtained return loss at S(1,1)

The return loss at the port S(1,1) is obtained at the frequency of 3.5 GHz frequency of WIMAX application. The radiation patterns that are obtained at this particular frequency is shown below

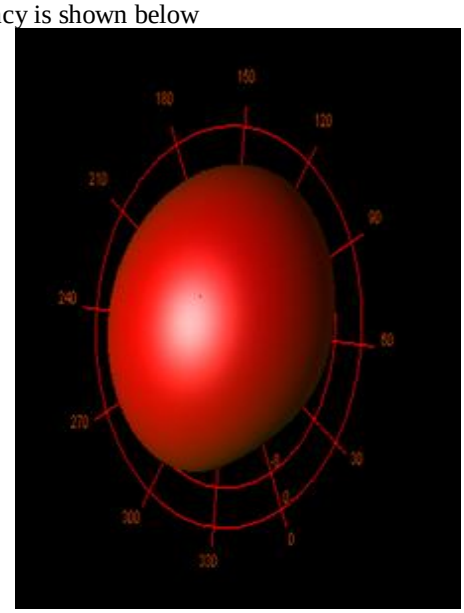

Fig 5: 3D Radiation pattern

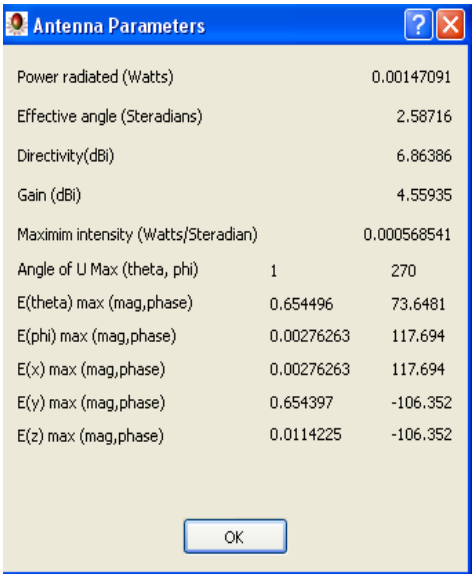

Fig 5:Antenna Parameter

The radiation throughout the antenna is shown here. The red color denoted the maximum radiation across the antenna.

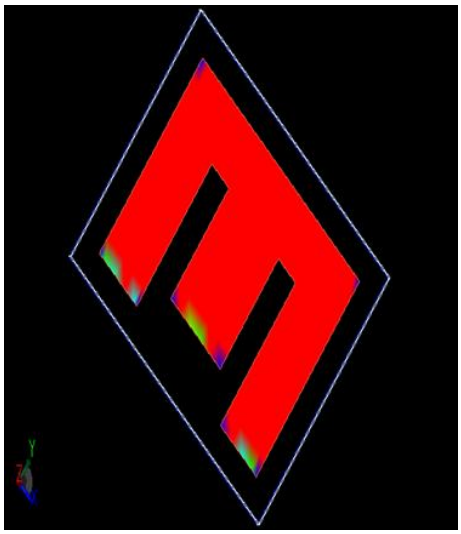

Fig 6:Radiating region

The 2D radiation pattern is also obtained which also denotes the efficiency of the antenna in percent. Hence the radiation pattern is given below

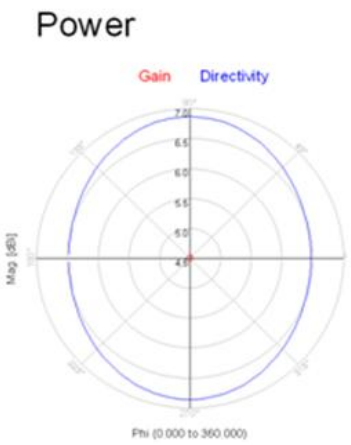

Fig 8: 2D radiation pattern

IV. CONCLUSION

The efficiency of the proposed antenna is about 58.3%.The directivity of the antenna is 6.86368 and the gain of the antenna is 4.55935.The proposed method uses FR4 as substrate and hence the cost of the antenna is also low. It is also showed that the antenna is achieved the satisfactory level of radiating properties and antenna parameters.

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