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Design Microstrip Patch Antenna for Wimax Applications at 8.5 Ghz

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Abstract: *In this paper design of microstrip patch antennas is proposed at 8.5 GHz. It can be utilized in WiMAX communication systems. The aim of this paper is to analyze, design and validate microstrip patch antenna. The substrate material Roger R04003C (DK=3.38 + - 0.05) is selected for microstrip patch antenna design. The Advanced Design System based model is proposed to measure gain ,directivity ,EM far field cut , absolutr field ,linear polarization ,circular polarization and radiation patter.*

I. Introduction

In 1970s, microstrip antenna technology speeds up development. Due to light weightiness, reduced size, inexpensive, consistent and easily integrated with active devices of printed antennas attracts researchers [1]. Microstrip Patch antenna consists of a radiating patch and a ground plane on a dielectric substrate as shown in Figure 1.

The material used for microstrip patch antenna is copper. Fringing fields causes microstrip patch antennas to radiate between the patch edge and the ground plane. In 1995, Huynh and Lee proposed u –slot microstrip patch antenna [2].

Narrow bandwidth and low gain are the biggest disadvantage of u –slot microstrip. Narrow bandwidth of u-slot microstrip antenna can be improve by using u-slot patch . For dual-band and triple band U-slot patch antenna can be use .The u-slot patch antenna uses Frequency reconfigurable. The IEEE 802.16 WiMAX standard allows data transmission using multiple broadband frequency ranges. The IEEE 802.16d standard specified transmissions allowed lower frequencies in the range 2 to 11 GHz. In IEEE 802.16d at lower frequencies provide better range due to signal suffer less from attenuation.

In this paper, the design of microstrip patch antenna is proposed with dielectric substrate Rogers R04003C (DK=3.38 + - 0.05) substrate material frequency 8.5GHz. Various attempts are made to adjust the dimensions of the patch length and width for different height. We discussed in this paper various Parameter of the antenna such as return loss, bandwidth, and gain are varies for different length and width.

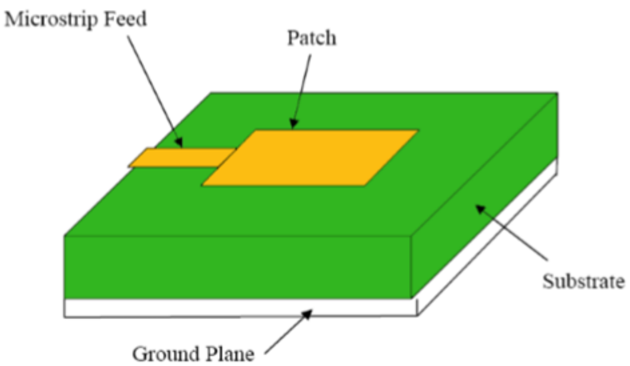

Figure 1: Basic structure of Rectangular Micro strip Antenna.

II. The Proposed Microstrip Patch Antenna Design

The proposed antenna consists of a ground plane, Rogers R04003C (DK=3.38 + - 0.05) substrate material, patch and a microstrip feeding line. The basic geometry of the proposed micro-strip patch antenna is shown in Figure 2. The antenna is developed on a Roger substrate .Used Roger Substrate in this paper consists of following specifications :

Material	R04003C
Diel. Thickness	0.008 inch +-0.001 inch
Top cladding	0.5 OZ/ sqft (17.5µm) ED copper
Bottom Cladding	0.5 oz/sqft (17.5µm) ED copper

Width	12 inch (304.8mm)
Length	18 inch (457.2mm)
Lot	00101550

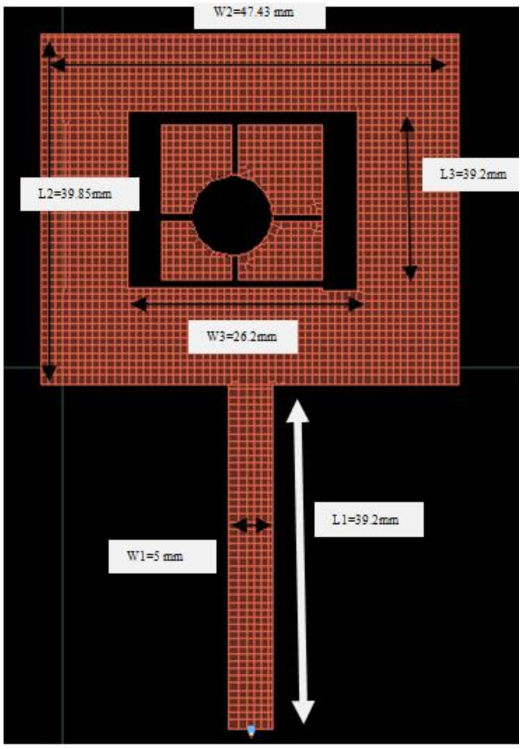

Figure 2: The proposed microstrip patch antenna

The current wireless applications require the antennas with larger bandwidths to handle higher data rates. The bandwidth of microstrip antenna can be increased using air substrate. However, dielectric substrate antennas are preferred, if compact antenna size is required . In practice, various methods are used to improve the mpedance bandwidth. These include introducing parasitic element either in coplanar or stack configuration, increasing the substrate thickness and modifying the shape of a patch by inserting slots. The last approach is particularly attractive because it can provide excellent bandwidth improvement and maintain a single-layer radiating structure to preserve the antenna's thin profile characteristic.The various dimensions of the antenna are shown in Table 1. A normal rectangular patch antenna gives the bandwidth only in the range of 3-5% [3]. To improve the bandwidth of the antenna, the ground plane is reduced. This is due to the fact that, when the ground plane is reduced, multiple resonant frequencies are generated and these frequencies couple each other resulting in improved impedance bandwidth [4,5].

Table1. The dimensions of the proposed Micro-strip patch antenna

Parameter	**Dimension(mm)**
W 1	5
L1	39.2
W2	47.43
L2	39.85
W3	26.2
L3	39.2

III. Simulation Result And Discussion

The S-parameters of the proposed antenna are shown in Fig.4. The antenna gives return loss of -0.30 dB at resonating frequency 7.1 GHz.

The main objective of the paper is to study the S11 parameters, gain, power, effective angle, directivity, absolute field, circular polarization and linear polarization of the proposed Micro-Strip patch antenna.

The gain plot of the proposed antenna system is shown in Fig. 3. The proposed antenna gives a gain of 6.2 dB at the resonant frequency.

S-Parameter of the proposed micro-strip antenna is shown in fig.4.

EM Far Field Cut of the proposed micro-strip antenna are shown in fig 5.

Absolute Fields of the proposed micro-strip antenna are shown in fig.6.
Circular polarization and Linear Polarization are shown in fig.7.
Radiation pattern of the proposed micro-strip antenna is shown in fig.8.

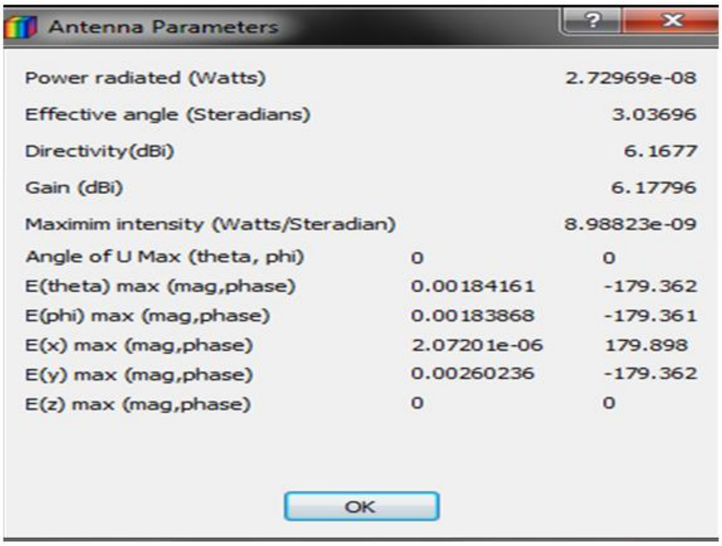

Fig3. Antenna-Parameters of the proposed Micro-Strip patch antenna

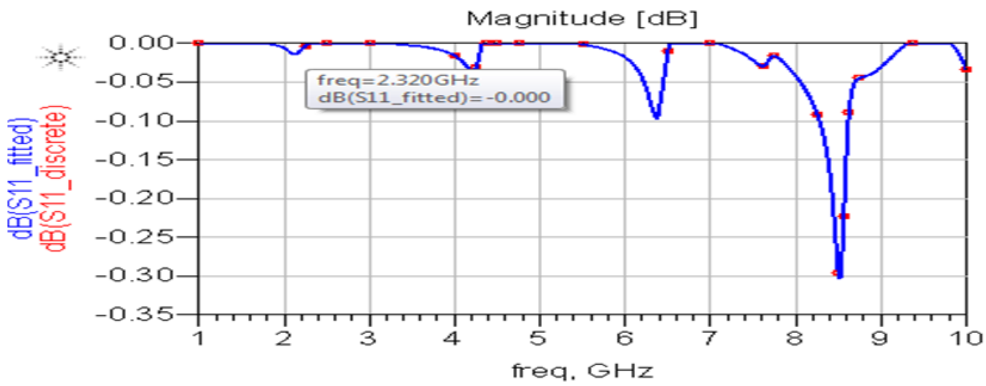

Fig4. S-Parameters of the proposed Micro-Strip patch antenna

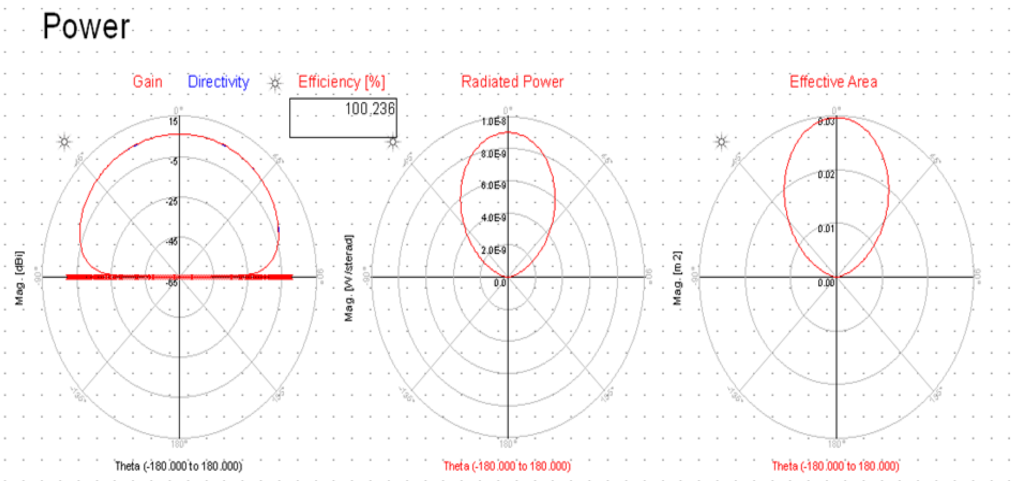

Fig.5 EM FAR FIELD CUT

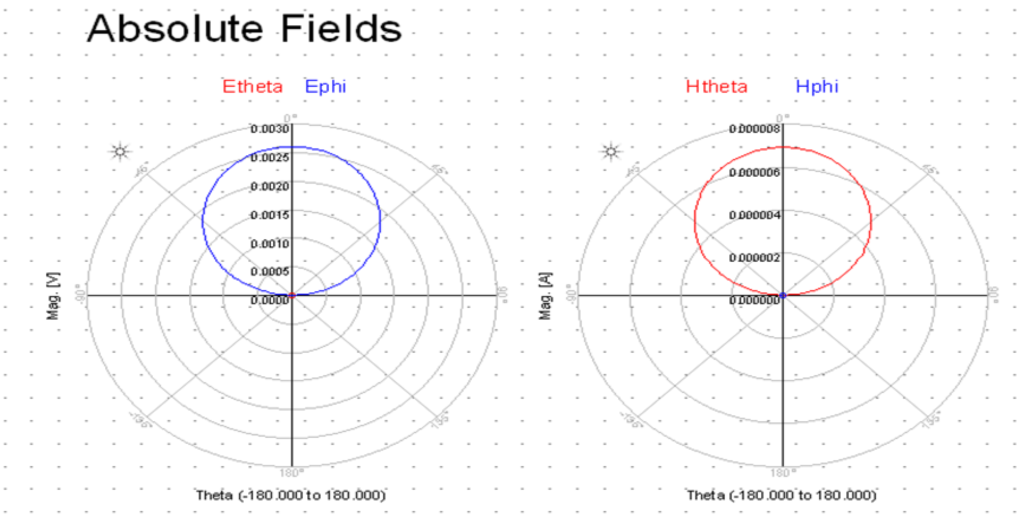

Fig.6 Absolute Fields

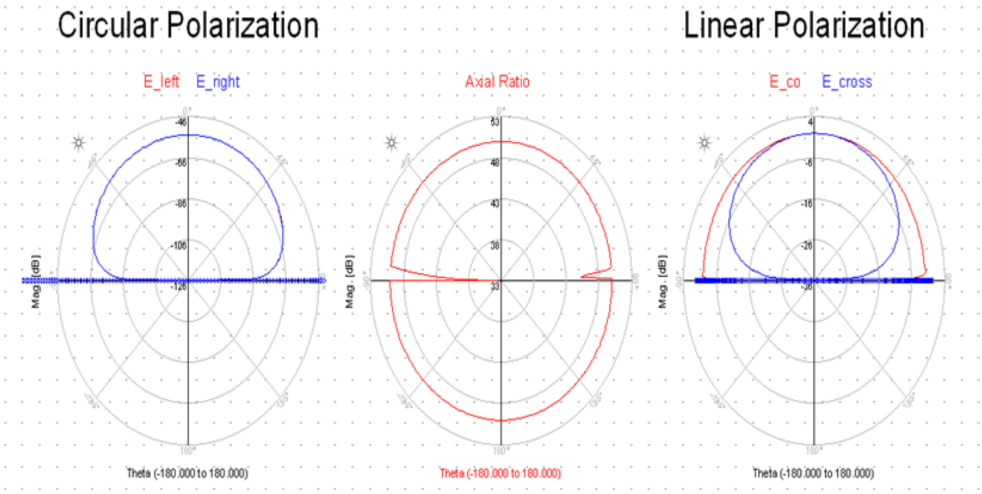

Fig.7 Circular & Linear Polarization

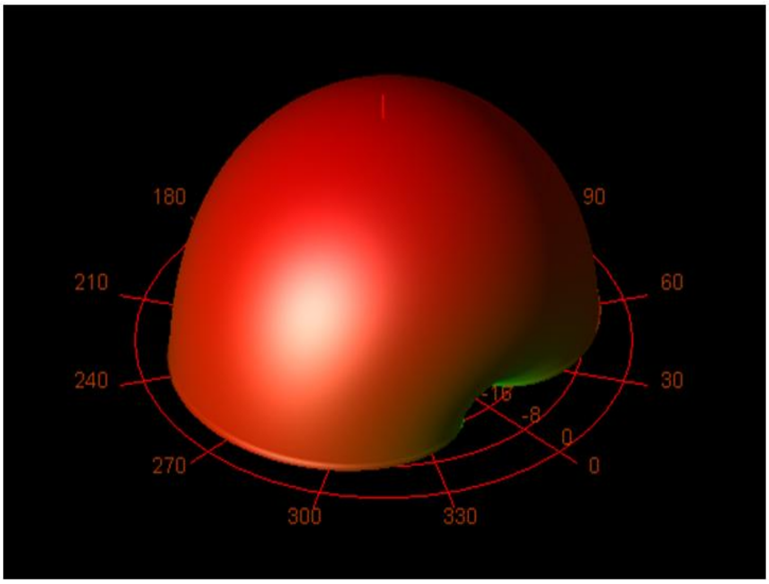

Fig.8 Radiation Pattern

IV. Conclusion

In this paper, a proposed microstrip patch antenna has been designed by using Advanced Design System.Also calculated the gain of proposed micro-strip patch antenna. The gain comes out to be 6.17796 dB. Measured Directivity ,comes out to be 6.1677dB. Plotted S11 parameter vs frequency. The proposed micro-strip patch antenna gives return loss of -0.30 dB at resonating frequency of 7.1 GHz.

By using Advanced Design System , plotted EM far field cut , absolute field , circular polarization , linear polarization and finally radiation pattern of the proposed micro-strip antenna.

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