DESIGN AND ANALYSIS OF AN IRREGULAR DIAMOND EDGE SLOTTED MICROSTRIP PATCH ANTENNA AT 1.6 GHz FOR WLAN

Yogita[1], Prof. Arun Shukla[2]
M.Tech, Department of Electronics & Communication, SRGI. Jhansi(U.P.) India.
Prof, Department of Electronics & Communication, SRGI. Jhansi(U.P.) India.

Abstract- *In this paper, we designed an Irregular diamond shape slotted patch antenna for L band application. Antenna design for L band and WLAN because of antenna has broadband, we uses the dielectric substrate GLASS EPOXY, and having the substrate height of 1.6 mm. The simulation of antenna on IE3d software at 1.6 output result shows the bandwidth of 82.35% and having maximum return loss -57db .*

Keywords- *Irregular diamond, slotted, microstrip antenna, IE3D software, WLAN.*

1 INTRODUCTION

Microstrip patch antennas are play a very important role in communication system. An antenna is a device which is used to transmitted and receive an RF signal in to the free space. The broadband linearly polarized microstrip antennas play an important role in wireless communication because of its small-size and light weight and easy to fabricate. Simple to use for planar and non planar surfaces, [1]. The drawback of the antenna is their narrow bandwidth, but we enhance bandwidth of microstrip patch antennas by different techniques [2]. Here we used coaxial feeding techniques .In the coaxial feeding method the inner conductor of coaxial probe is connected to the radiating plane and the outer conductor is connected to the ground plane [3].

2.FORMULAS USE TO CALCULATE LENGTH AND WIDTH OF PATCH ANTENNA

By using equation below we can find out the value of actual width of the patch,

$$W = \frac{c}{f_0}\sqrt{\frac{2}{\varepsilon_r + 1}} \qquad (1)$$

Where f_0 = operating frequency, for designing the rectangular microstrip antenna . Where W is the patch width, is normally chosen large by length of antenna (L) , for maximum radiation.

By using below equation we can calculate length of patch antenna

$$L = \frac{c}{2 f_r \sqrt{\varepsilon_{eff}}} - 2\Delta l \qquad (2)$$

Where ε_{eff} = effective dielectric constant of patch

$$\varepsilon_{eff} = \frac{(\varepsilon_r + 1)}{2} + \frac{(\varepsilon_r + 1)}{2}\left[1 + 12\frac{h}{W}\right]^{-\frac{1}{2}} \qquad (3)$$

Δl = change in length extension which is given as:

$$\frac{\Delta l}{h} = 0.412\frac{(\varepsilon_{eff} + 0.3)\left(\frac{W}{h} + 0.264\right)}{(\varepsilon_{eff} - 0.258)\left(\frac{W}{h} + 0.8\right)} \qquad (4)$$

By the above equation we can calculate the length of patch (L_p) and width of patch (W_p).

3.CALCULATION OF THE GROUND PLANE OF MICROSTRIP

The ground plane is finite length and width so practically we design a finite size ground plane, to calculate the length (L_g) and width (W_g) of a ground planes as follows :

$$W_g = W + 6h$$
$$L_g = L + 6h$$

In the design structure we use Coaxial feeding. The co-ordinate of the geometry is taken from bottom of the left corner where X =0 and Y =0, the feed point location is given by the co- ordinates (X_f, Y_f) from the bottom left corner. The feed point (X_f=49mm,Y_f=33.3mm) is located at the patch.

Antenna Design on IE3d software

Antenna Geometry

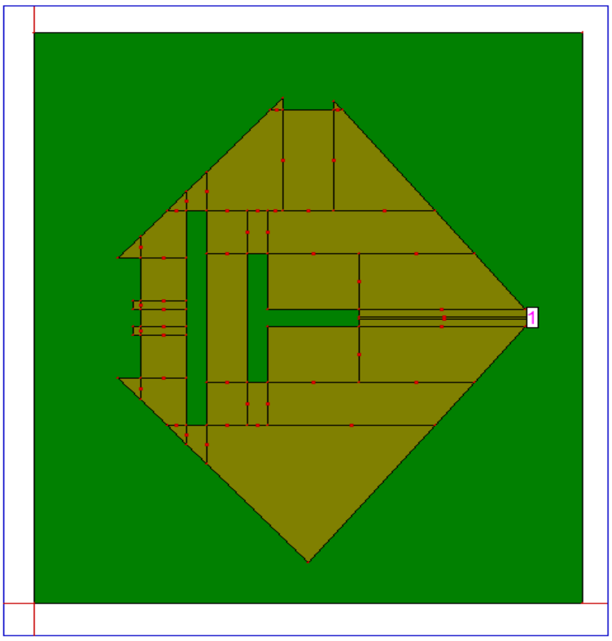

Fig. 1: Geometry of Proposed antenna on IE3D

3D view of Antenna Geometry

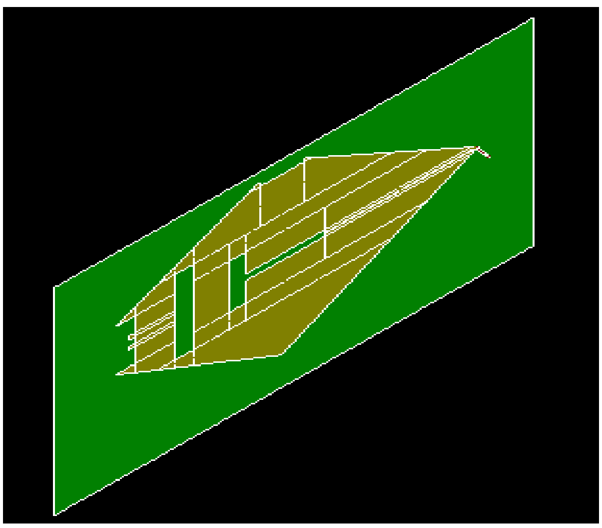

Fig. 2: 3D view of Proposed antenna on IE3D

4. RESULTS OF SIMULATED DESIGN

The proposed geometry design on IE3d simulation software, we got various outputs. The various outputs results are shown in below.

Simulation results

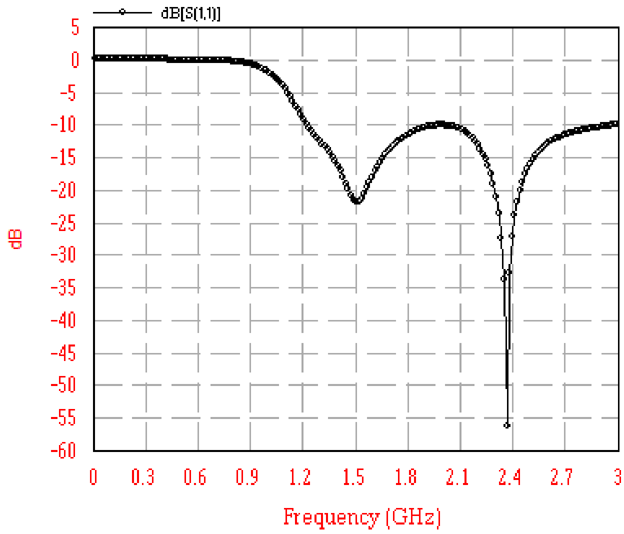

Fig. 3: Return loss Vs frequency

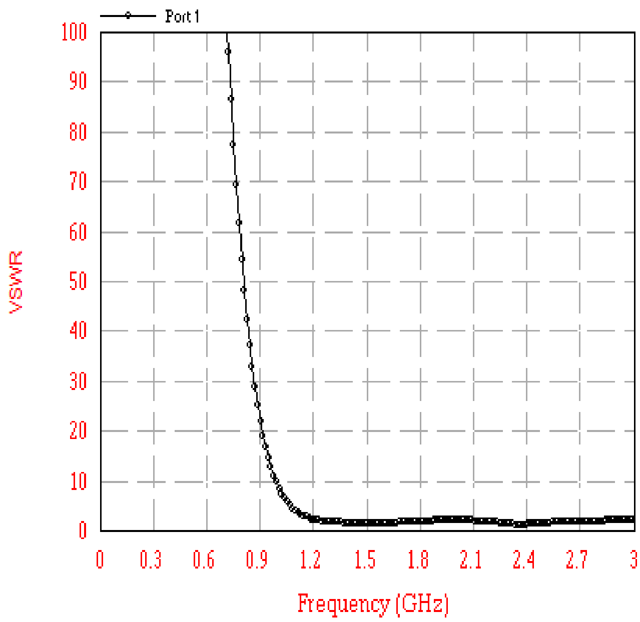

Fig. 4: VSWR Vs Frequency

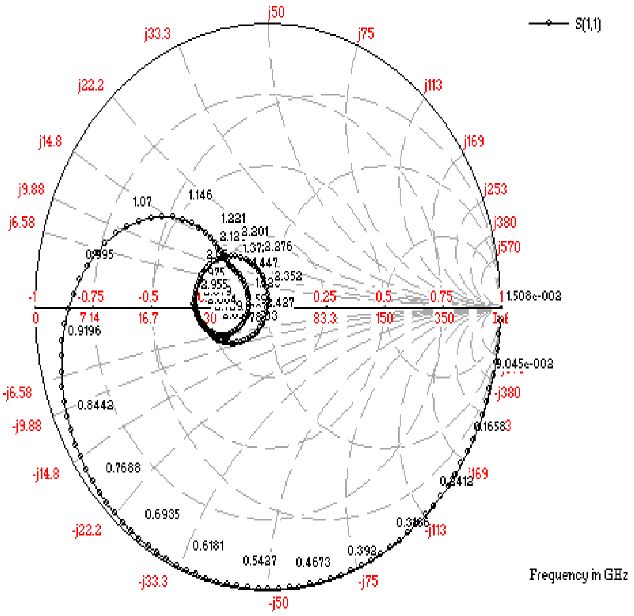

Fig. 5: Smith chart of impedance matching

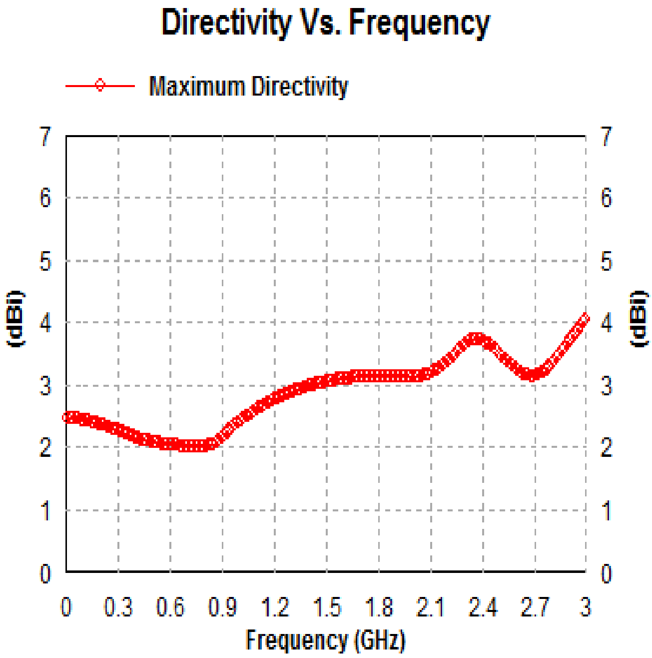

Fig. 7: Antenna Directivity Vs Frequency

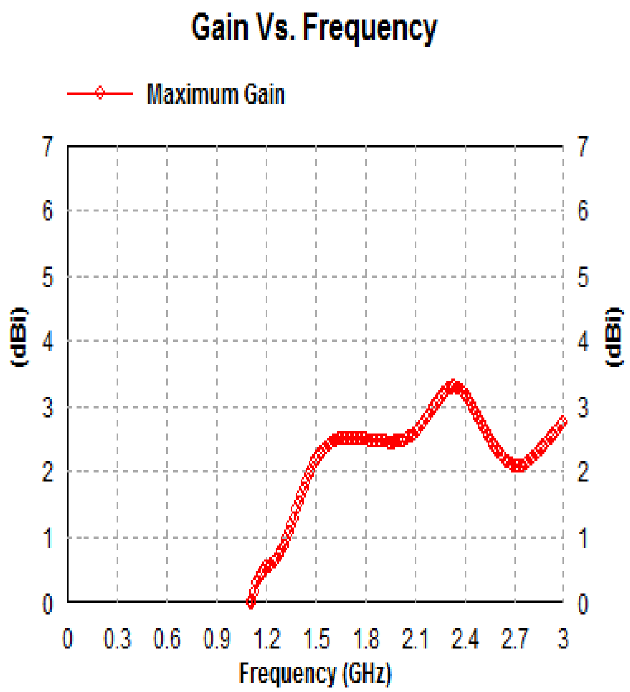

Fig. 6: Antenna gain Vs Frequency

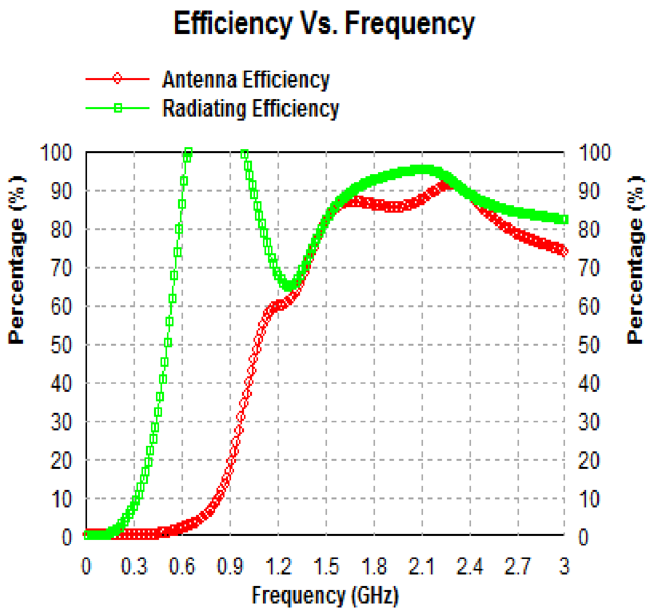

Fig. 8: Antenna and radiation Efficiency

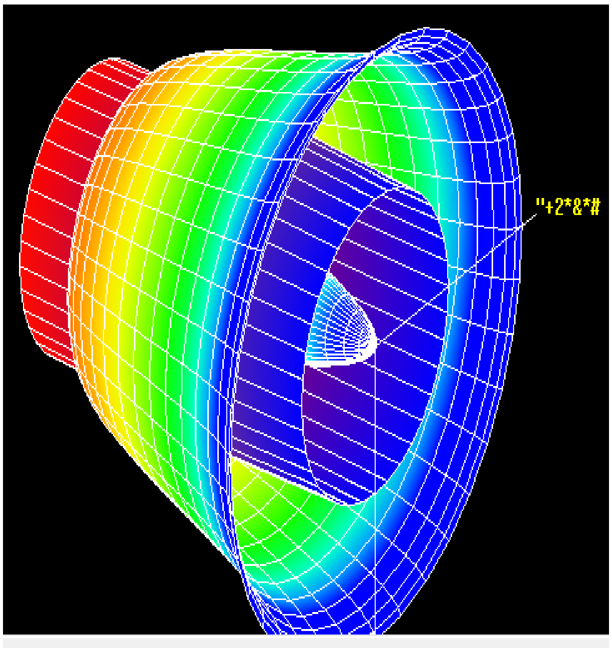

Fig. 9: 3D radiation pattern of antenna

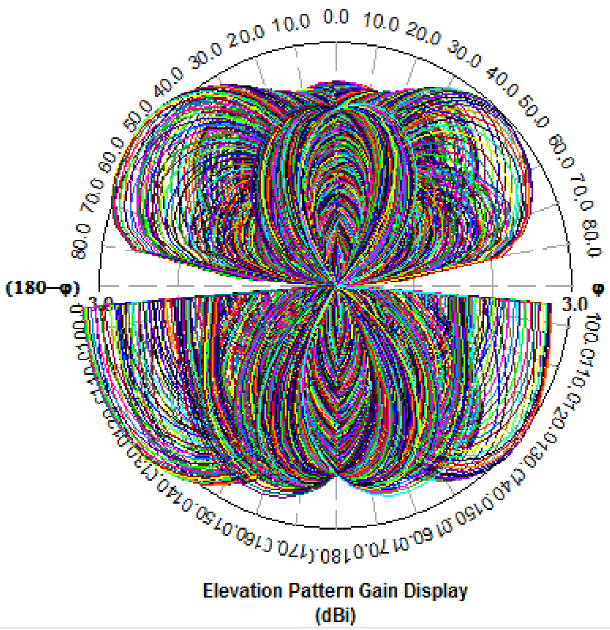

Fig. 10: 2D radiation pattern of antenna

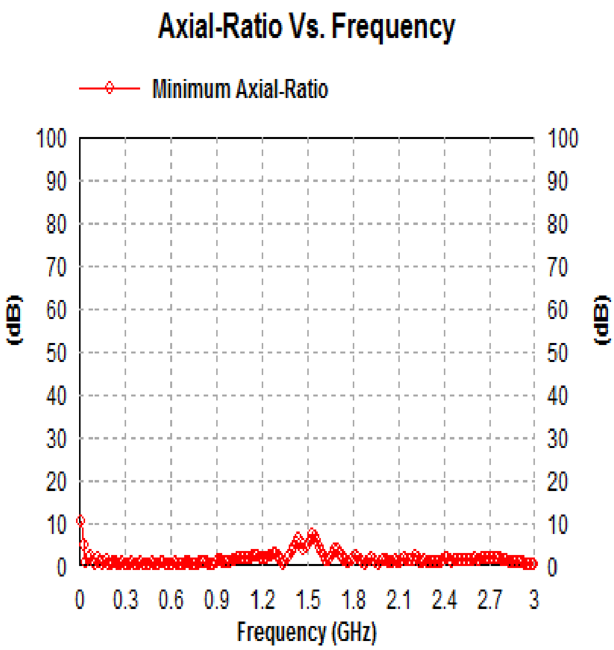

Fig. 11: Axial Ratio Vs Frequency of antenna

5. CONCLUSION

In this paper, we have design the irregular diamond edge Shape slotted Microstrip Patch antenna and the antenna frequency is 1.6 GHz. The antenna having the bandwidth of 82.35% which is very high from the researcher point of view .The proposed antenna is designed on a GLASS EPOXY material Substrate having dielectric constant 4.4.

REFERENCES

[1] C.A. Balanis, Antenna Theory and Design, John Wiley & Sons, 1997.

[2]Thomas A. Milligan "2nd addition Modern antenna design"pp: 318-354 .

[3]POZAR D.M., and SCHAUBERT D.H., "Microstrip Antennas, the Analysis and Design of Microstrip Antennas and Arrays", IEEE Press, New York, USA, 1995

[4] Rezaul Azim, Ahmed Toaha Mobashsher, Mohammad Tariqul Islam and Norbahiah Misran, "Compact planar antenna for UWB applications," IEEE ICMMT, 2010

[5] mohamaed Nabil Srifi, Symon K. Podilchak, Mohamed Essaaidi, and Yahia N. N. Antar, "A planar circular disc monopole antennas using compact impedence matching networks for ultra wide band (UWB) applications," IEEE