

**Article Info**

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**Design and Simulation of Single Band Rectangular Patch Antenna**

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**ABSTRACT**

*In the communication world microstrip patch antennas are of great use. Here a single band antenna at resonant frequency 1GHz is being designed. A slot is made, and then simulations are being carried out by using IE3D software [12]. Return loss, Directivity, Radiation pattern are the various properties observed after carrying out simulations. Here Neltec NX 9240 epoxy substrate material with dielectric constant 2.4 [7] is used.*

**Keywords:** *Rectangular Patch Antenna; Return Loss; Directivity; Radiation pattern.*

**1.0 Introduction**

Microstrip patch antennas consist of a radiating patch at top, dielectric substrate and ground at the bottom [1]. Substrate selection should be done very carefully because properties of an antenna vary with substrate materials. Figure given below shows general two dimensional rectangular patch antenna

**Fig: 1. Microstrip Rectangular Patch Antenna**



**2.0 Antenna Design**

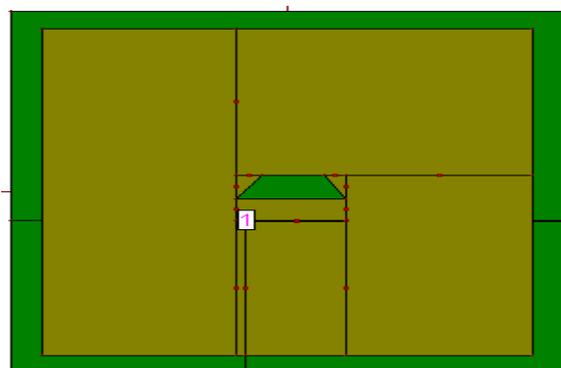
Various parameters taken for antenna design are shown in the table I. various formulas for

calculation of antenna parameters are taken from transmissionline model [7].

**Table: 1 Design Parameters**

S. No.	Parameter Name	Value
1	Patch length(L)	96.04 mm
2	Patch width(W)	114.60 mm
3	Ground length(Lg)	108.04 mm
4	Ground width(Wg)	126.60 mm
5	Frequency	1 GHz
6	Height of patch above ground(h)	2 mm

**Fig: 2. Designed Slotted Rectangular Patch Antenna**



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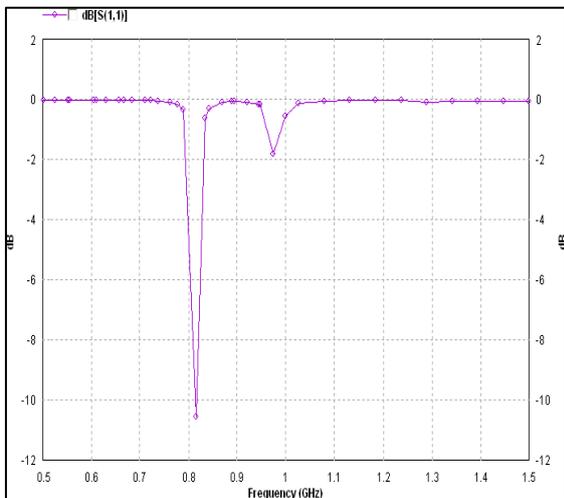
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The designed slotted rectangular patch antenna is shown in figure 2. Here simulations were carried out on IE3D zeland software [12] and various results such as return loss and directivity were obtained. The best feed point was (-8,-10) was selected after carrying out many simulations. Here in the figure 2, the given feed point is also being presented.

**3.0 Results & Discussions**

First property that we are discussing is return loss; Return loss is the reflection of signal in transmission line. When simulations were carried out then return loss of -10.23 dB was obtained at 0.815 GHz. Since the obtained return loss is less than -9.5 dB [11], hence we can say that we have obtained a well satisfying return loss. Also it is very clear from return loss graph that the designed antenna consists of a single band. Graph given below shows the obtained return loss.

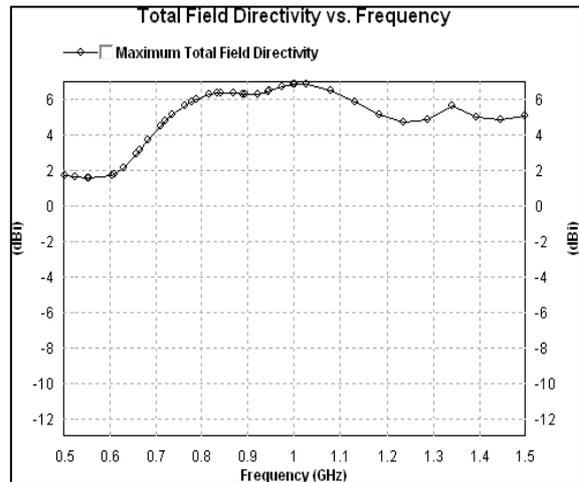
**Fig. 3. Return loss graph**



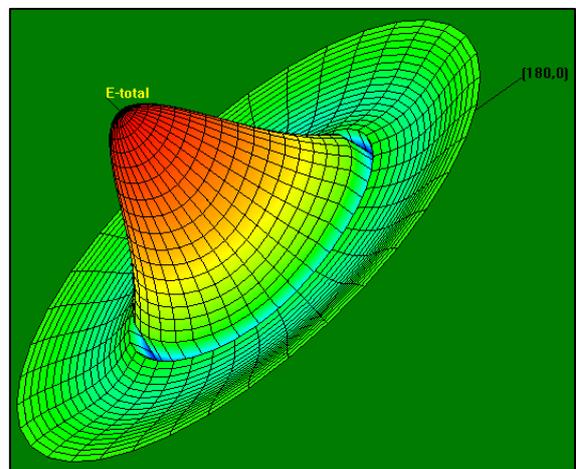
Next to discuss is directivity, It is the ratio of the radiation intensity in a given direction from the antenna to the radiation intensity averaged over all directions. Here in this research, a directivity of 6.21 dBi was obtained at 0.815 GHz frequency. For a good performance of an antenna the directivity should be more than 6 dBi. The obtained directivity is more than 6 dBi, Hence we can say that we have obtained a very good directivity. Graph given below shows the directivity

Third to discuss is radiation pattern. Radiation pattern is a graphical representation of the radiation properties of the antenna as a function of coordinates of space [11]. Figure 5 shows a 3D radiation pattern.

**Fig. 4. Total Field Directivity Graph**



**Fig. 5. Radiation pattern**



**4.0 Conclusion**

Obtained return loss of -10.23 dB at 0.815 GHz is well satisfying for this single band slotted rectangular patch antenna. Also a very good directivity of 6.21dBi was obtained at 0.815 GHz. Since the designed slotted rectangular patch antenna produce results at 0.815 GHz, which lies in 0.8 GHz – 2.6 GHz band [9], hence it will be useful for various commercial wireless applications.

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