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Design and Simulation of Single Band Rectangular PatchAntenna

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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

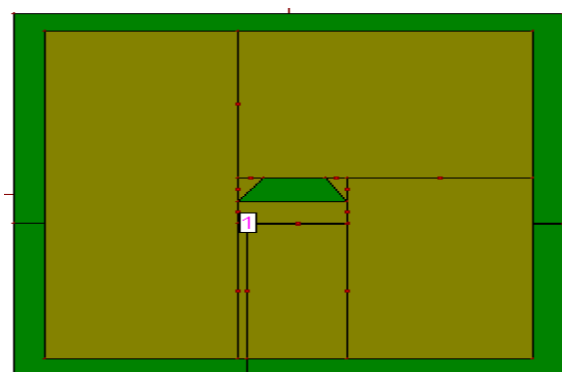
Various parameters taken for antenna design are shown in the table I. various formulas for

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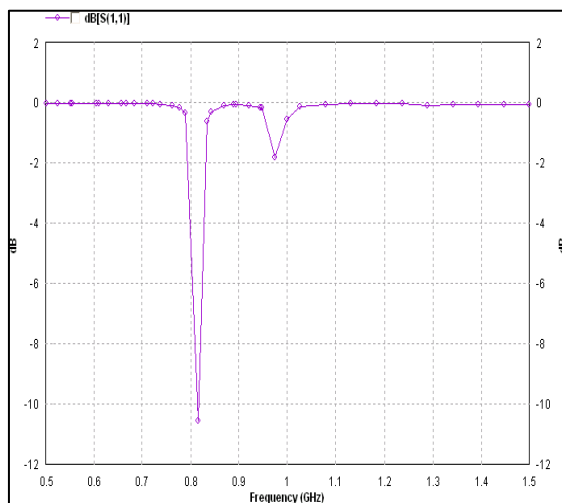
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The designed slotted rectangular patch antenna is shown in figure 2. Here simulations were carried out on IE3D zeland software [12] and various results such as return loss and directivity were obtained. The best feed point was (-8,-10) was selected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

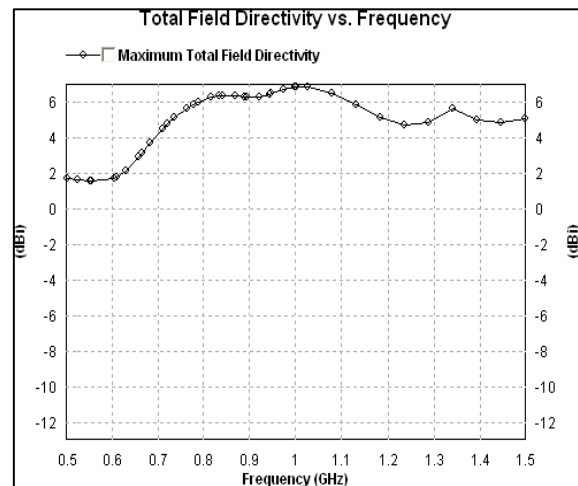
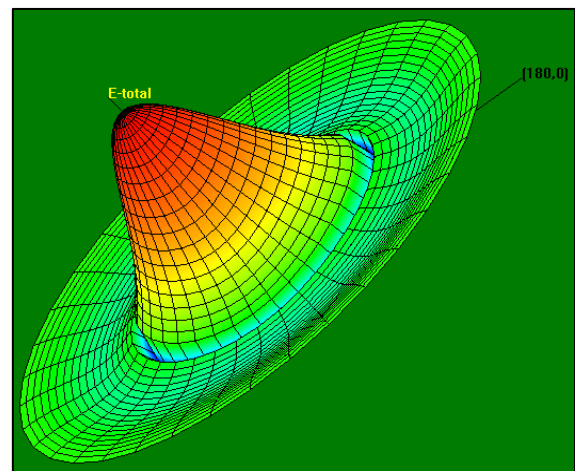


Fig. 5. Radiation pattern



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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