Volume 2, Issue 1 (2014) 89-91 ISSN 2347 - 3258
International Journal of Advance Research and Innovation

Design & Simulation of dual band rectangular patch antenna for various applications at 3.2 GHz & 4.0GHz

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Article Info

Article history:
Received 1 January 2014
Received in revised form
20 February 2014
Accepted 28 February 2014
Available online 15 March 2014

Keywords

Rectangular Patch Antenna,
Voltage Standing Wave Ratio,
Total field directivity,
Radiation Pattern,
Return loss

Abstract

In the communication world microstrip patch antennas plays a great role due to its various advantages. Today we require many applications on a single device. The multiband antenna can be easily fitted in the electronic device, which can be used for various applications. Here we have designed the microstrip rectangular patch antenna using IE3D software [7] and its various properties have been studied.

1. Introduction

Microstrip patch antenna consists of a radiating patch, dielectric substrate and ground. At bottom there is a ground and patch lies on the top. We can make a slot in patch and any shape can be given.

The figure given below shows a microstrip rectangular patch antenna [5].

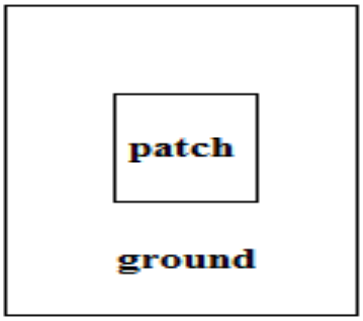

Fig: 1. Microstrip rectangular patch antenna

2. Antenna Design

The designed rectangular patch antenna is shown in figure 2. The antenna is being designed by using IE3D software [7] and then a patch was slotted as shown in figure.

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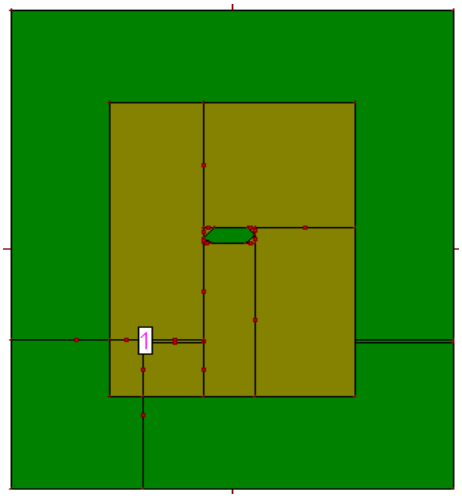

Fig: 2. Designed rectangular patch antenna

The various design parameters of this rectangular patch antenna are shown in table number 1.He f_0 taken for calculation [4] of parameters is 4 GHz. In this figure the ground is represented by green color and slotted patch is shown at top.

3. Results and discussion

Results are being obtained after carrying out simulations on IE3D software [7]. First to discuss is the return loss, the return losses of -12.62 & -14.99

dB at 3.21 and 4.05 GHz respectively have been obtained. The figure 3 shows these results.

Table: 1. Various design parameters

S.No.	Parameter	Value
1	Height (h)	3 mm
2	Width of patch(W)	28.76 mm
3	Width of ground(W_g)	46.76 m
4	Length of patch(L)	22.44 mm
5	Length of ground(L_g)	40.44 mm
6	ε_r	2.4

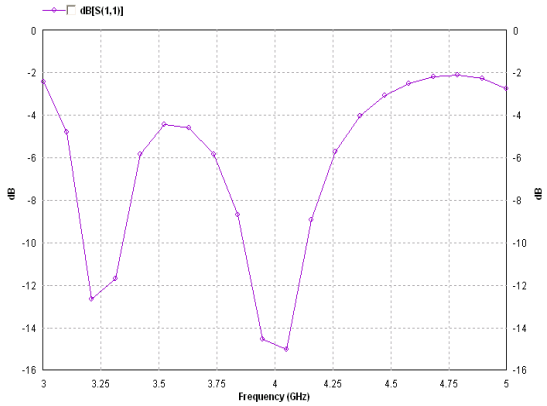

Fig: 3. Return losses graph

Next to discuss is the Voltage standing wave ratio (VSWR). A VSWRs of 1.61 & 1.43 at 3.21 GHz and 4.05 GHz respectively have been obtained. Figure 4 shows these results.

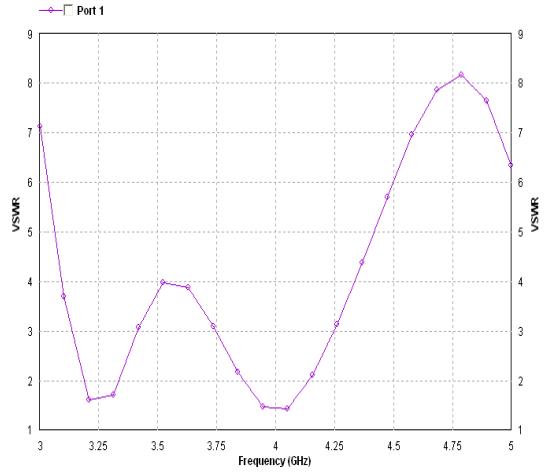

Fig: 4. VSWR graph

Next to discuss is the total field directivity.

The excellent total field directivities of 7.22 & 8.07 dBi at 3.21 and 4.05 GHz respectively have been obtained. The figure 5 shows the total field directivities.

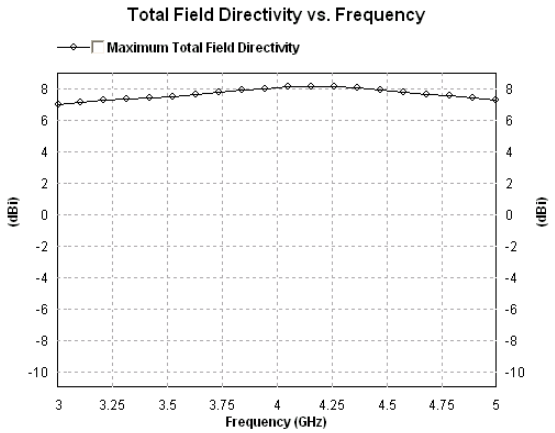

Fig: 5. Total field directivity graph

Figure 6 shows the smith chart.

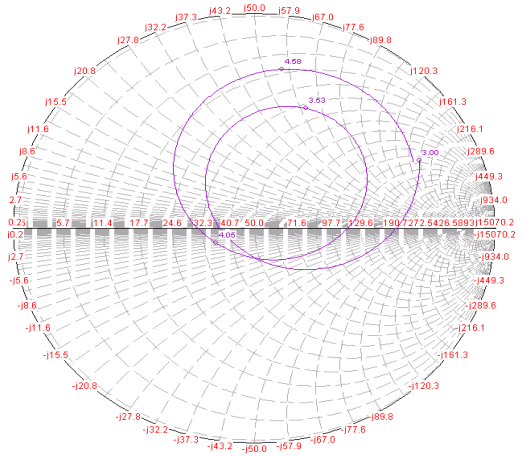

Fig: 6. Smith chart

The reflection coefficients obtained from smith chart are shown in table 2.

Table 2: Results obtained from smith chart

Frequency	Magnitude	Angle
3.2556 GHz	0.1135	-127.466
4.0 GHz	0.1374	-107.5

Next figures 7 and 8 show the 3D radiation patterns. Figure number 7 shows the radiation pattern at 3.21 GHz, while figure 8 shows the radiation pattern at 4.05 GHz.

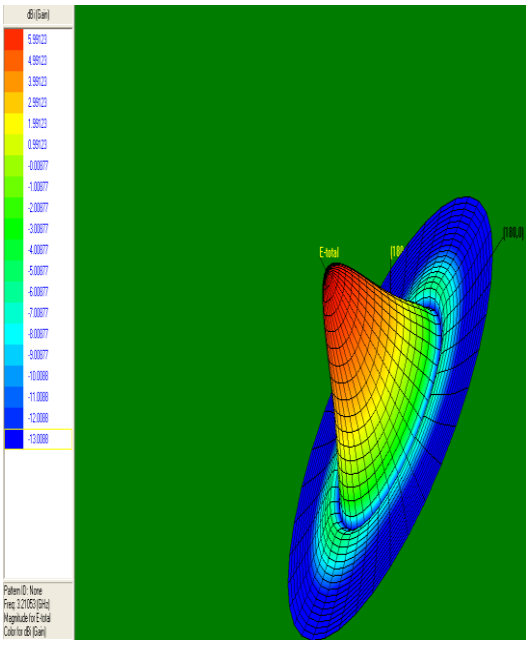

Fig: 7. Radiation pattern at 3.21 GHz.

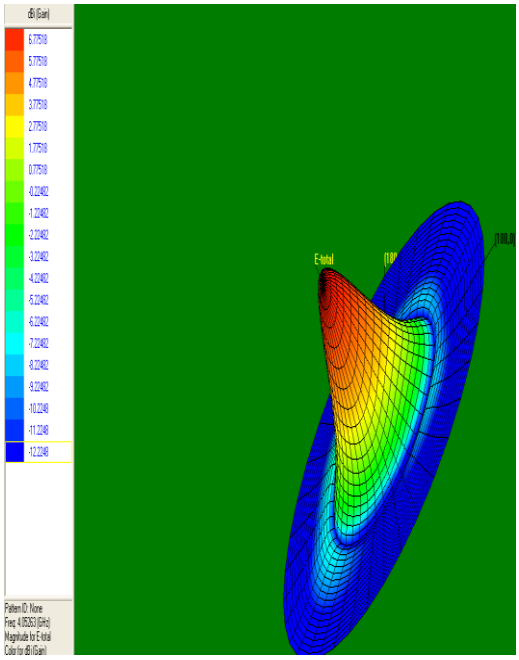

Fig: 8. Radiation pattern at 4.05 GHz.

4. Conclusion

The obtained return losses of -12.62 & -14.99 dB at two different frequencies proves that this is a dual band antenna. The designed antenna can be useful for various at 3.2 GHz and 4.0 GHz.

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