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ORIGINAL CONTRIBUTION

Printed Antenna for C-Band Communication

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ABSTRACT

Single-feed, monolayer microstrip antenna presented in this paper to apply any microwave band frequency. In this proposed antenna, the structure refers to cutting three rectangular slits with one circular slit from the patch. Also add some small rectangular slits with the holes and add two rectangular slits with the patch. All holes and cracks are cut out and added to or from the top layer. The proposed antenna in this project was simulated with high return loss and VSWR between 2:1 range. From the above design of the proposed antenna, we achieved a resonant frequency of about 7.10 GHz with return loss -22.97 dBi. For the above frequency, it also achieved a -10dB bandwidth of about 59.66MHz. It also achieved a resonant frequency of about 7.85 GHz with a return loss of -15.38 dB. For the second resonant frequency, the proposed architecture has a bandwidth of about 56.65MHz. Also, for the first resonant frequency, measure a gain of about 4.35 dB with a 170.78-degree bandwidth (-3 dB HPBW) and for the second resonant frequency, measure a gain of about 4.75 dB with a 170.84-degree bandwidth (-3 dB HPBW). The main achievement is to have the increased frequency ratio so that the proposed antenna does not have an ISI (inter symmetric interference). Finally, the proposed microstrip antenna for multi-frequency operation works.

Keywords: Patch, Feed, Layer, Beamwidth, Gain, VSWR

1. INTRODUCTION

Current wireless communication scenario, printed antenna design creates a challenge [1-6] with wide bandwidth and high gain for telecom engineers. Therefore, agreement with the inferred volume is mandatory for microwave communication. Size reduction is a modern technology in which the designed antenna is reduced in size when compared to a conventional antenna. For size compressing, we require large values of dielectric constant. The simulation was performed by IE3D [13] using Method of Moment analysis. Considering with all the advantages, this designed antenna is applicable for long distance radio telecommunications [7].

2. DESIGN METHODOLOGY

The proposed antenna was designed by cutting three unequal rectangular slots and one circular from the patch on the top layer, adding some small slotted rectangular slits, adding two rectangular slits with patch as shown in Figure 1 and displaying it using a PTFE substrate. The insulating material [8-9] specified here is a poly tetra fluoroethylene [10-11] epoxy based substrate with FR_4. The feeding technique [12] used is transmission line feeding. Figure 1 shows the proposed antenna configuration with dimentions.

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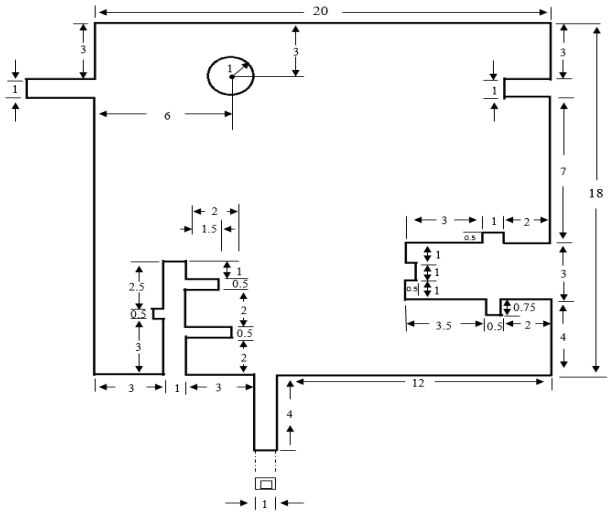

Figure 1: Antenna Structure

The antenna simulated with PTFE substrate of 20mm x 18mm rectangular patch.

3. RESULT ANALYSIS

Detailed analysis of proposed antenna discussed here for bandwidth, gain, half-power beam width, VSWR and return loss. Figure 2 illustrated the simulated return loss. An advantage of the MSA is that we achieve multiple resonant frequencies. Therefore, as per design rules, proposed antenna designed and analyzed.

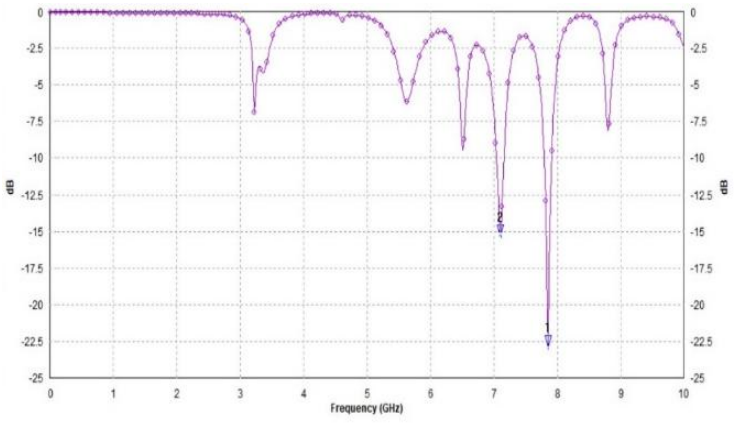

Figure 2: Return loss

Due to cutting slots we obtained resonant frequencies with a deep return loss. Table-1 illustrated the summary of all resonant frequencies.

3.1 Radiation Pattern Calculations

Fig. 3 to Fig. 6 shows electric and magnetic field radiation patterns of the above antenna for all resonances.

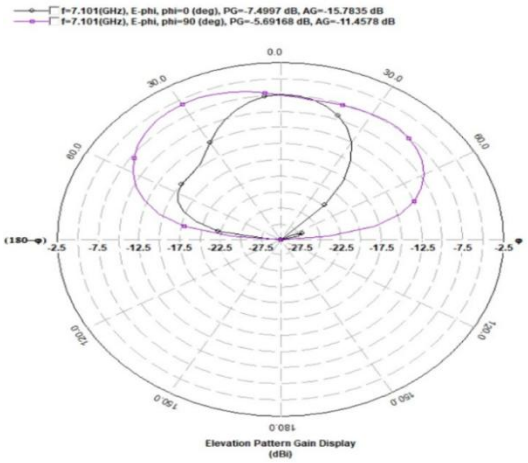

Figure 3: Electric field pattern at 7.101GHz

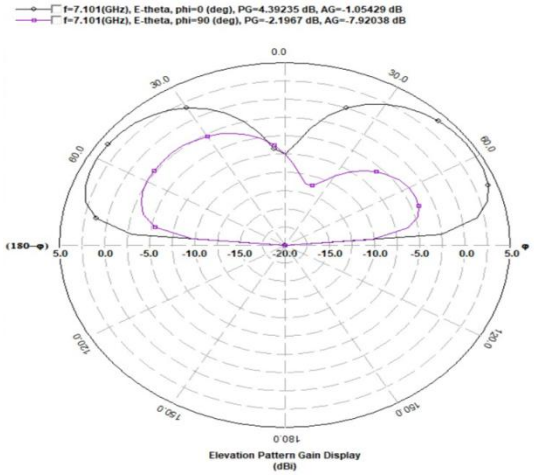

Figure 4: Magnetic field pattern at 7.101GHz

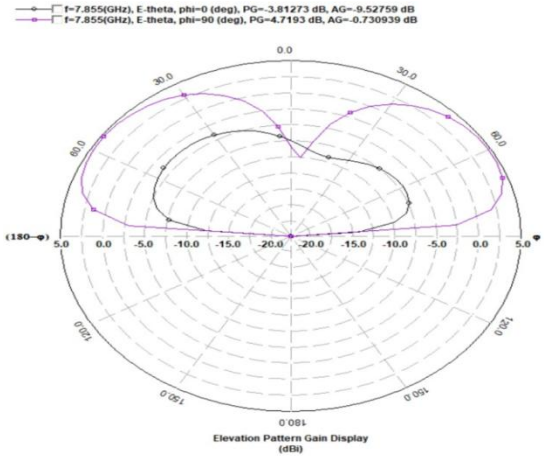

Figure 5: Electric field pattern at 7.855 GHz

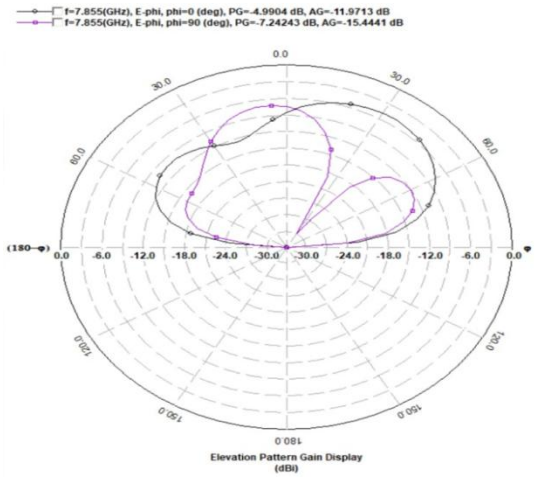

Figure 6: Magnetic field pattern at 7.855 GHz

Table-1: Measurement of resonant frequency, band width and VSWR

Frequencies (GHz)	**Return loss (dB)**	**Bandwidth (MHz)**	**VSWR**
f_1 = 7.101	-22.971	59.664	1.154
f_2 = 7.855	-15.3796	56.653	1.421

Table-2: Measurement of gain and beamwidth

Frequencies (GHz)	**Frequency Ratio**	**Max. Gain (dBi)**	**Beamwidth (deg)**
f_1 = 7.101	1	4.35	170.78°
f_2 = 7.855	1.106	4.75	170.84°

4. CONCLUSION

When designing the proposed microstrip antenna using a single transmission line feed at the ends of the antenna structure which indicates that the antenna is working for the desired application. The proposed MSA achieved its first resonant frequency at 7.10 GHz with a return loss of -22.97 dB. It also achieved a -10dB bandwidth of about 59.66MHz. It also achieved a resonant frequency of about 7.85 GHz with a return loss of -15.38 dB. For the next one, received a bandwidth of about 56.65 MHz. Therefore, it was concluded that there would be no ISI for the proposed antenna. The antenna achieved an increased frequency ratio with a 2:1 VSWR range and 170.78^0 HPBW on average over all resonant frequencies. The final conclusion of the proposed antenna works for the C-band microwave frequency region is also applicable to long-distance wireless communication. The bandwidth is sufficient for the intended application.

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