

Printed L-Slot Antenna For Wireless Application

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Abstract - The intend of this paper is to design a antenna which isutilized for wireless application.. Two unequal L slots are introduced at the left edge of the patch to reduce the resonant frequency. The antenna resonant at three different frequencies are obtained at 3.58 GHz, 5.16 GHz and 6.13 Ghz with return loss of 11.50 dB, 14.23 dB and 13.40 respectively. The characteristics of the designed structure are investigated by using MoM based electromagnetic solver, IE3D. An extensive analysis of the return loss, VSWR, gain and Directivity of the proposed antenna is presented. The simple configuration and low profile nature of the proposed antenna leads to easy fabrication and make it suitable for the applications in Wireless communication system. Mainly it is developed to operate in the Wi-Fi, Wi-MAX & WLAN application.

Key Words: SLOT, IE3D, RETURN LOSS, VSWR

1.INTRODUCTION

Microstrip antennas are very attractive because of their low profile, low weight, conformal to the surface of objects and easy production. A large number of microstrip patches to be used in wireless applications have been developed [1-10]. Design of WLAN antennas also got popularity with the advancement of microstrip antennas [11-15]. Wireless local area network (WLAN) requires three bands of frequencies: 2.4GHz (2400-2484MHz), 5.2GHz (5150-5350MHz) and 5.8GHz (5725-5825MHz).

WiMax(WorldwideInteroperability for Microwave access) has three allocated frequency bands. The low band (2.5-2.69GHz), the middleband (3.2-3.8 GHz) and the upper band (5.2-5.8 GHz).The size of the antenna is effectively reduced by cutting slot inproper position on the microstrip patch.

2. ANTENNA GEOMETRY AND ANALYSIS

The L-shaped Slot antenna with probe feed structure on FR4 substrate of length x width dimensions are 12 mm x 11 mm as shown in Fig.1. All shown dimensions are measured and optimized by using IE3D MoM based Simulator[14]. The thickness of substrate (h) is 1.5875 mm having relative permittivity $\epsilon_r = 4.4$ to facilitate PCB integration. As shown in Fig.1

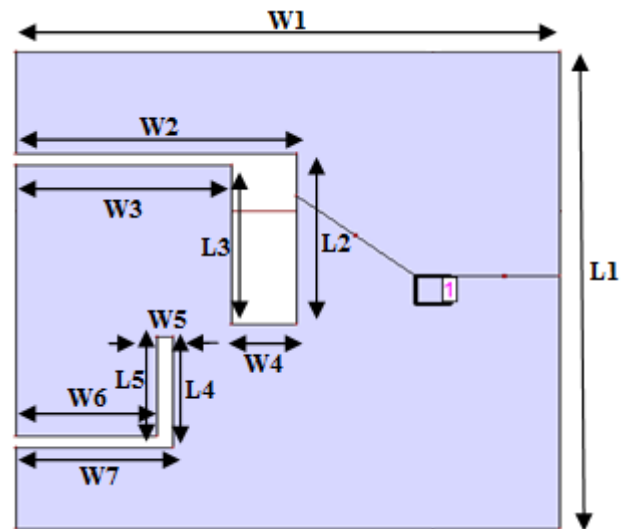


Fig-1: Design of L-shaped Slot Antenna

Antenna having a twp unequal slot of having a shape of English alphabet 'L'. The Width & Length of big 'L' Slot is 5.65mm and of 4.3mm respectively. Width & Length of small 'L' Slot is 3.15mm and of 2.8mm The antenna is having the Optimal length dimensions are

Table-1: Optimal dimensions of length and width of L-Shaped Antenna

| Width | Size(mm) | Length | Size(mm) |
|-------|----------|--------|----------|
| W1 | 11 | L1 | 12 |
| W2 | 5.65 | L2 | 4.3 |
| W3 | 4.35 | L3 | 4 |
| W4 | 1.3 | L4 | 2.8 |
| W5 | 0.3 | L5 | 2.5 |
| W6 | 2.85 | | |
| W7 | 3.15 | | |

The main advantage of this antenna is its size. It is having very compact size which is having a optimal dimensions of 12mm (length) x 11mm (width) x 1.58mm (Height). Based on the parameters, antenna is simulated and optimized to frequency which is applicable to wireless application like Wi-Fi Wi-Max,WLAN. The antenna provides sufficient gain &VSWR for that particular frequency and having good efficiency.

3. SIMULATION RESULT

A.RETURN LOSS

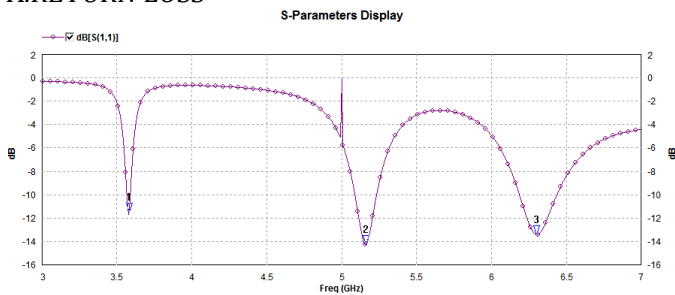


Fig-2: Simulated return loss of L shaped Slot antenna

As shown in Fig.2 For the L-shaped antenna three resonant frequencies are obtained at 3.58 GHz , 5.16 GHz & 6.13GHz with having return loss -11.50dB,-14.23dB & -13.40dB respectively.

B.DIRECTIVITY

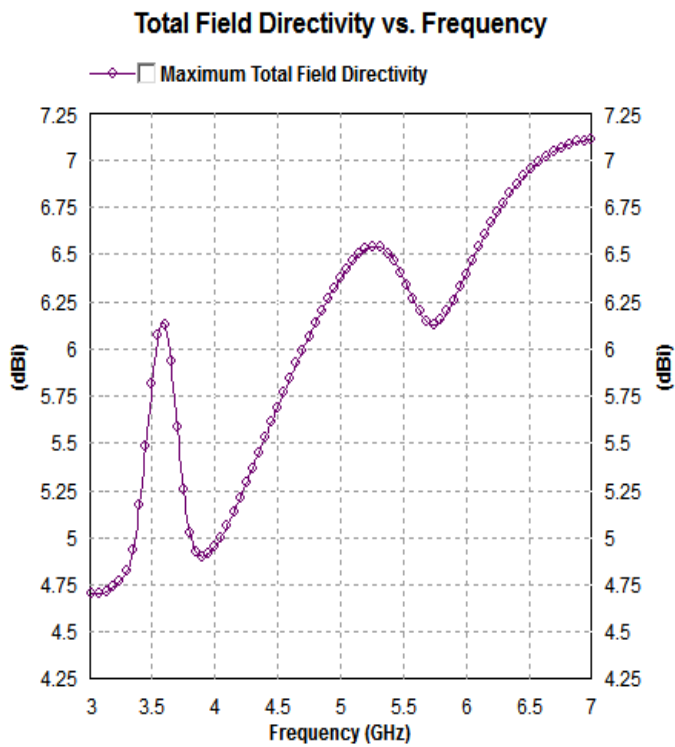


Fig-3: Directivity of L Shaped Slot Antenna

Fig.3 shows the total field directivity. To describe the directional properties of antenna radiation pattern,directivity is introduced. It is having maximum directivity of 6.5 dBi around 5.25Ghz

C.VSWR

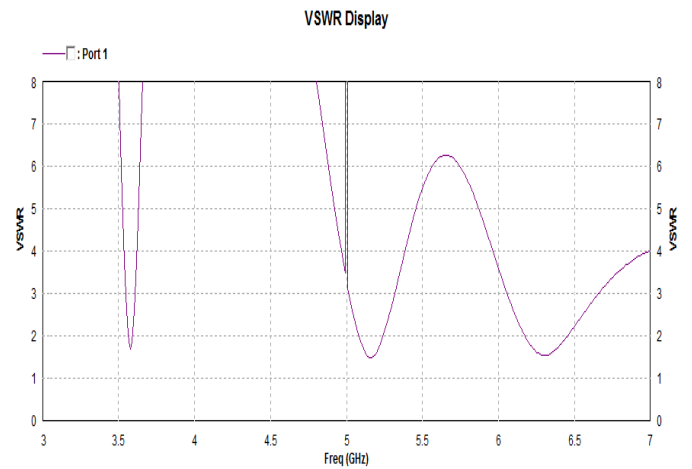


Fig-4: VSWR of hexagonal shaped Antenna

Fig.4 shows the VSWR variations with respect to frequency of simulated L-shaped Antenna. The value of VSWR should be between 1 and 2 for efficient performance of an antenna.Simulated VSWR having value less than 2 for triple slot around at 3.58 GHz, 5.16 GHz and 6.13 Ghz.

D.GAIN

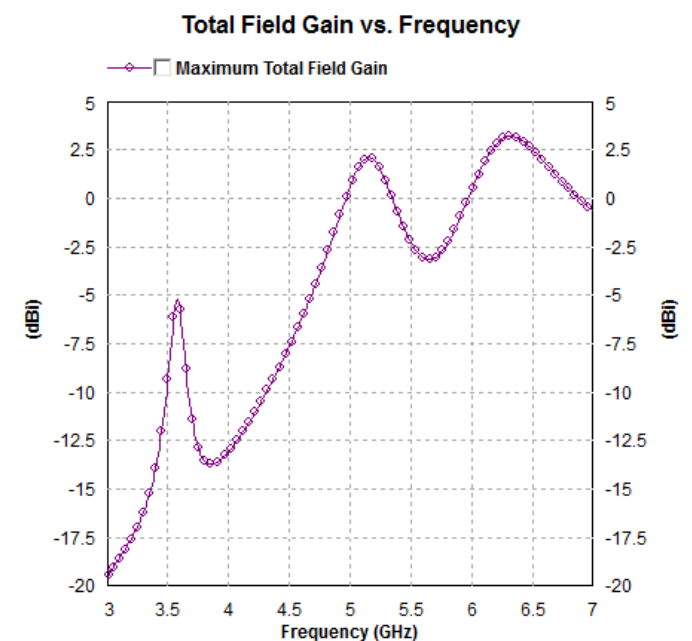


Fig-5: Simulated total field gain of L Shaped Slot Antenna

As shown in Fig.5 Gain varies from 0dBi to 2.6 dBi. It is obvious from all the figures that the parameters like return loss, directivity, VSWR and gain are satisfactorily good.

4.CONCLUSION

A L-shaped Slot antenna having a inexpensive substrate FR4 with Probe feed is successfully simulated. The obtained result of antenna having three resonant frequencies are obtained at 3.58 GHz, 5.16 GHz and 6.13 Ghz with return loss of 11.50 dB, 14.23 dB and 13.40 respectively, having satisfactory efficiency, VSWR and gain which shows that antenna is having good potential and small size This attributes makes this antenna applicable for all emerging wireless technology.

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