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Omni Directional Printed Patch Antenna For Wireless LAN

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ABSTRACT

In wireless telecommunication, microstrip patch antennas have become more popular due to its small size and ease of fabrication. Here a simple microstrip patch antenna for 2.4GHz WLAN is presented. The proposed antenna model gives an omni directional radiation pattern. The proposed antenna model is simulated using Ansoft HFSS 13 software and the output parameters are presented.

Keywords - HFSS, Microstrip feed, Return loss

1. INTRODUCTION

Recently, the modern technology is going for miniaturization. So the popularity of patch antenna is increasing due to its compact size. Even though it shows some drawbacks like narrow bandwidth and low gain, patch antenna found applications in various fields like mobile communication, GPS system, missiles, aircrafts etc. The microstrip patch antenna resembles a microstrip transmission line model. The upper patch and lower ground acts as two radiating slots and in between them there is a dielectric material. The upper and lower patch radiates due to the current flow. Many works related to patch antenna had presented in [1], [2], [3]. These designs need larger dimension and affects miniaturization of the product. Due to the simplicity of fabrication, microstrip feed is used [4].

In this paper a compact size microstrip feed antenna on a dielectric substrate with €r = 4.4 is simulated using HFSS which employs finite element method (FEM), adaptive meshing and brilliant graphics. Various output parameters are simulated and presented.

2. DESIGN CONSIDERATIONS

The proposed structure of the antenna is shown in fig 1. The antenna is simulated on FR-4 substrate having relative permittivity 4.4 and dielectric loss tangent 0.02. The dimensions of the substrate are 35 × 50 × 1 mm^3. The area of the antenna is 11 × 39 mm^2. The dimensions of the antenna are shown in fig 3. The geometry of the patch antenna with microstrip feed is shown in fig 2.

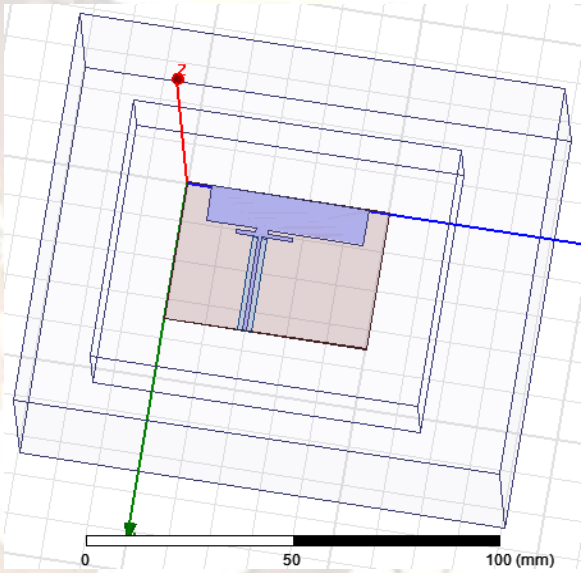

Fig.1. Antenna model generated in HFSS

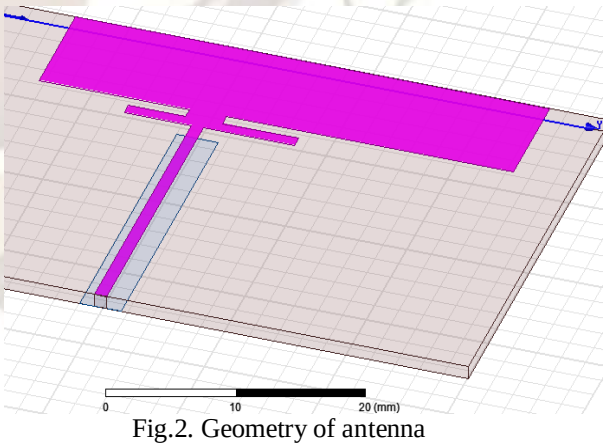

Fig.2. Geometry of antenna

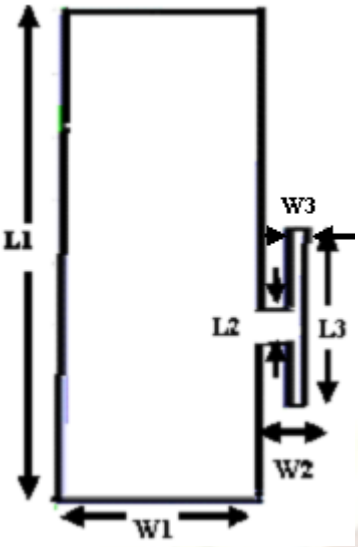

Fig. 3. Dimensions of patch

The radiating patch mainly consists of two vertical strips with a connector. The dimensions are L1=39mm, L2=3mm, L3=14mm, W1=9mm, W2=2mm, W3=1mm. Beneath the feedline there situated the ground of the antenna.

3. SIMULATION RESULTS

3.1 Return Loss

Return loss represents the amount of power reflected from the antenna. Fig 4 shows that the return loss (s11) at 2.4 GHz is -11.4976 dB.

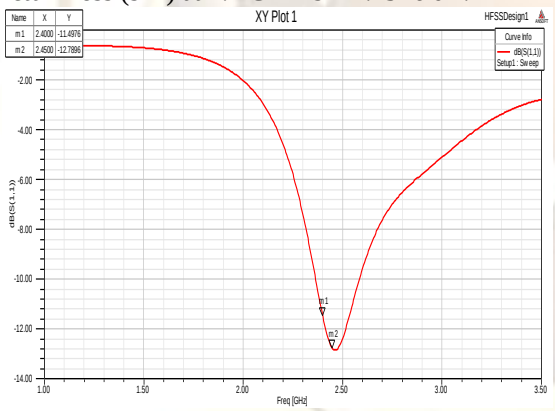

Fig.4. Return Loss

3.2 Radiation Pattern

Radiation pattern gives the directional (angular) dependance of strength of the radio waves from the antenna. It gives gain of the antenna at various directions.

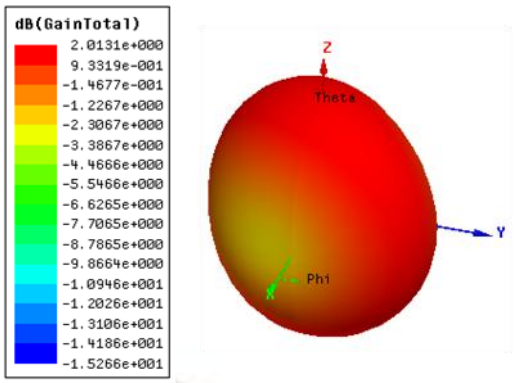

Fig.5. 3D Radiation Pattern

Fig 5 shows the 3D radiation pattern of proposed antenna. It shows that the antenna gain is 2.0131 dB. The pattern generated is almost omni directional which is well suited for WLAN.

Similarly the radiation pattern phi and theta is shown in fig 6 and 7 respectively.

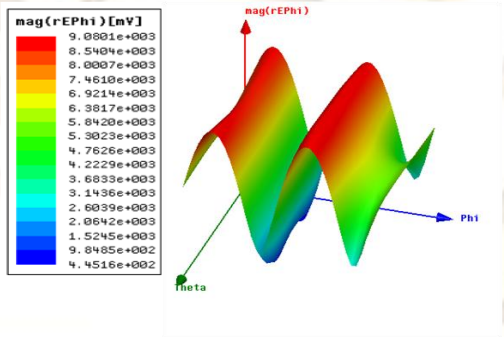

Fig. 6. Radiation pattern phi

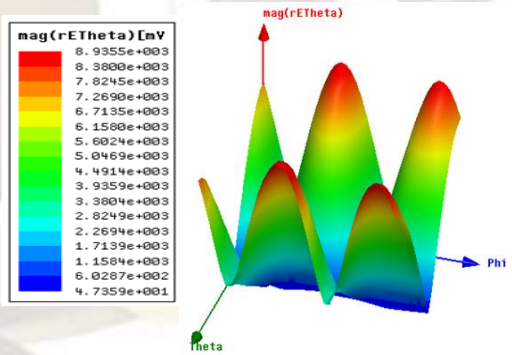

Fig.7. Radiation pattern theta

Both the radiation patterns are plotted at 2.4GHz. E-phi obtains the value 9.0801e+001 and E-theta is 8.9355e+003.

3.3 E and H Field Distribution

Fig 8 and 9 shows the E field and H field distribution respectively. The mag E gives the value 1.8511e+004 and mag H is 7.3075e+001.

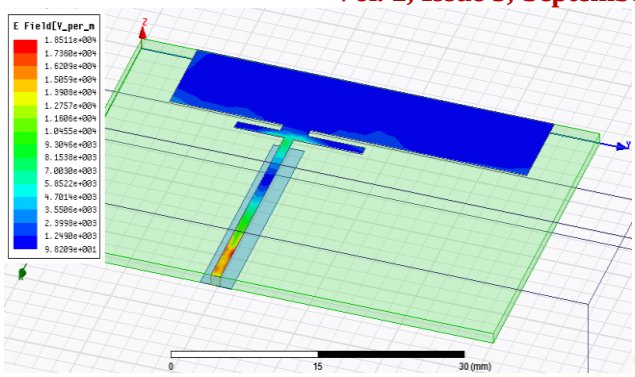

Fig. 8. E-field Distribution

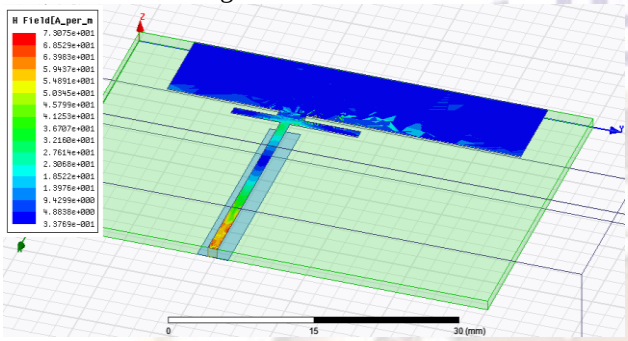

Fig. 9. H- field Distribution

3.4 Mesh Plot

Fig 10 shows the mesh plot of proposed antenna. It gives the current distribution.

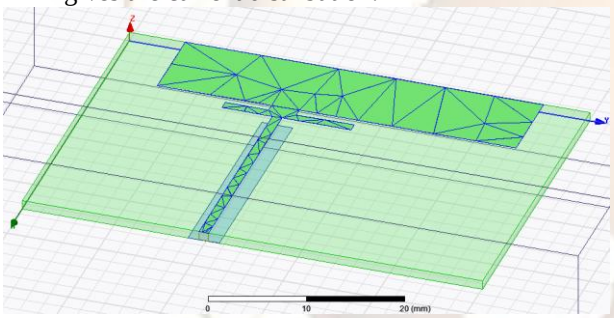

Fig. 10. Mesh Plot

3.5 VSWR

It shows the amount of impedance matching of antenna. Fig 11 gives VSWR. It gives the value 1.7253 at 2.4GHz.

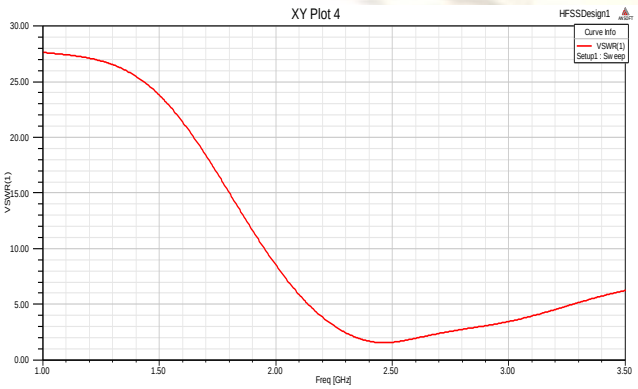

Fig.11. VSWR

4. CONCLUSION

The output parameters of omni directional printed patch antenna for 2.4 GHz WLAN has been investigated on FR-4 substrate. The performance is analyzed after optimization and the antenna is well suited for 2.4 GHz applications.

ACKNOWLEDGMENT

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