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SIMULATION OF MPA USING PROBE, EDGE, AND INSET FEED FOR 2.4GHZ AND 5GHZ

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Abstract - In this paper we have reported design, simulation and analysis of Microstrip Patch Antenna (MPA) with two different geometries. The resonant frequencies considered for the design are 2.4GHz and 5GHz which are the operating frequencies of Global Positioning System Antenna (GPSA) design for Wireless Local Area Networks (WLANs). In this work, simulation is carried out with different feed techniques to identify the best possible feed. Also, we have evaluated the HFSS ADK for MPA and calculated the percentage error.

Keywords*—MPA, HFSS, Feeds, WLANs, GPSA.*

I. INTRODUCTION

MPA are conformable to planar or non- planar surface, simple and inexpensive to manufacture, cost effective compatible with Monolithic Microwave Integrated Circuits design and when a particular patch shape and excitation modes are selected, they are very versatile in terms of resonant frequency, polarisation, radiation patterns and impedance. These have several advantages compared to conventional microwave antennas and therefore have many applications over the broad frequency range from 100MHz to 50GHz.

Hence, in this paper we explained the characteristics of the MPA, different types of feed techniques, various methods of analysis of Microwave components and in detail the design of a Rectangular and Circular MPA and further analysed the return loss parameter for various types of feed techniques. We have used 2.45GHz and 5GHz as operating frequency for the designs which have their main applications in the GPSA design for WLANs.

II. MPA GEOMETRIES

In its most basic form, a MPA consists of a radiating patch of a dielectric substrate which has a ground plane on either side. The radiating patch and the feed lines are usually photo etched on the dielectric substrate.

In order to simplify analysis and performance prediction, the patch is generally rectangular, circular, square or some other common shapes.

The figure of a general rectangular MPA with Inset feed technique is shown below

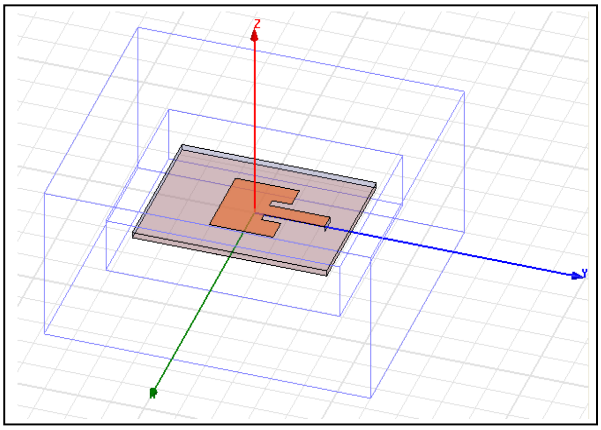

FIG.1: MPA GEOMETRY

III. HFSS SIMULATION

In order to generate an electromagnetic field inside a structure, HFSS employs the finite element method(FEM). In HFSS, the geometric model is automatically divided into a large number of tetrahedral, where a single tetrahedron is a four-sided pyramid. The FEM is a numerical technique for finding approximate partial differential equations as well as integral equations.

IV. RESULTS

The following figures 2 and 3 are the simulated geometries of MPA with inset feed technique. A rectangular patch is designed and analysed as shown in the fig 2 and a circular patch in fig 3. Both are simulated at 2.4 GHz. The analysis involves taking quick reports which include the impedance, return loss plots. In this context for both the geometries to understand the characteristics the return loss parameter is obtained for a range of frequencies and plotted. The simulation results of S_{11} for this feed is as shown in Fig.4 and 5. From the figures the return loss minima can be obtained reading the markers and tabulated. Similarly the far field 3D radiation patterns are depicted in the fig. 6 and 7.

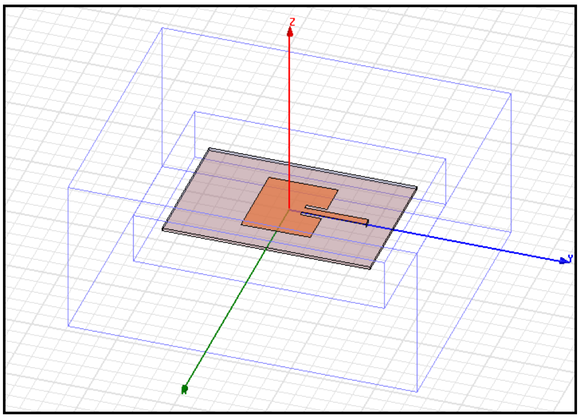

Fig.2 : Rectangular_2.4GHz_Inset feed

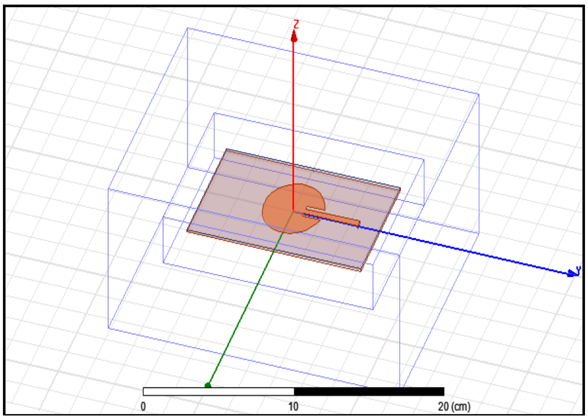

Fig. 3 :Circular_2.4GHz_Insetfeed

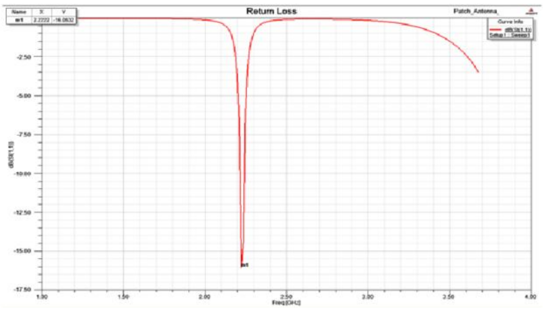

Fig.4: Return loss for rectangular patch at 2.4GHz

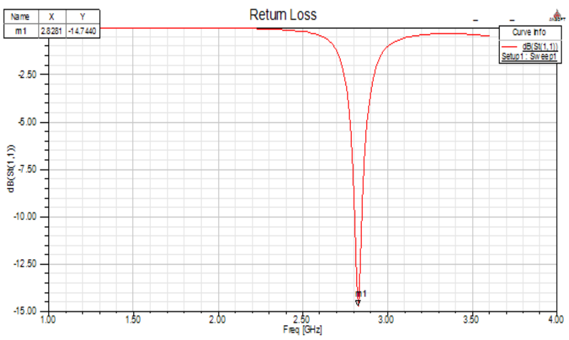

Fig.5: Return loss plot for Circular patch at 2.4Ghz

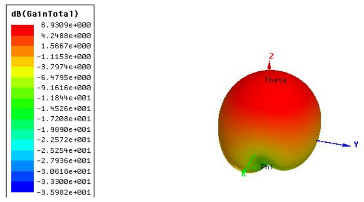

Fig. 6: Radiation pattern of Rectangular patch at 2.4GHz

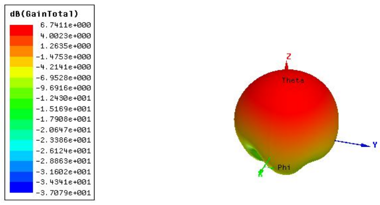

Fig.7: Radiation pattern of Circular patch at 2.4GHz

The simulation is carried out for rectangular MPA and their resultant S_{11} plots are obtained. The resonant frequencies are tabulated for all three types of feeds as shown in table 1. The feeds have mentioned for both the frequencies 2.4 GHz and 5.0 GHz with their respective return loss minima frequencies and % errors.

Design frequency 2.4GHz		
Feed Type	Return Loss Minima Frequency	Error %
Probe Feed	2.3216	3.2
Inset Feed	2.3823	2.763
Design frequency 5 GHz		
Probe Feed	4.8116	3.768
Edge Feed	4.8618	2.764
Inset Feed	5.0377	0.754

TABLE 1 : ERROR BETWEEN SIMULATED AND THEORITICAL

V. CONCLUSION:

The error percentage is around 3% and less than 5% which is better when compared with many FW Simulation tools. Also it is observed that the inset feed gives the lease error. These results will be useful as the supporting platform for the designing and analysis of microwave frequencies antennas with the lower rate of errors.

REFERENCES:

[1]. C.A.Balanis, Antenna Theory Analysis and Design.

[2]. J.D. Kraus, Antennas for all applications.

[3]. K.S.R. Pavan Kishore, B.Tech thesis.

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