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Simulation and Analysis of Microstrip Patch Antenna Using AN-SOF Professional

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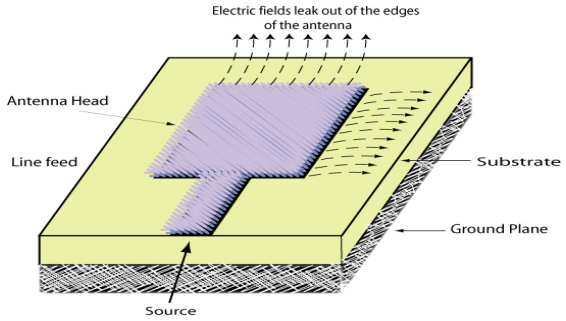
Abstract: In this modern era, the development in wireless technology has caused a drastic change in size and weight of antenna used for communication. This paper shows the simulation of Microstrip patch antenna using AN-SOF PROFESSIONAL VERSION 3.5 software. After the simulation process, by analyzing the performance, the simulation results show that the antenna has provided a considerable gain of 5.61d Bi with better efficiency at a frequency 2.4GHZ that can be used for wireless communication.
Key Words- Microstrip Patch antenna, AN-SOF Professional, Gain, Wireless Communication

I. INTRODUCTION

While considering the antenna design there is always a great need to design and fabricate compact antennas that meets with the needs of wireless communication. By analyzing various antennas, microstrip antennas are small in size with low cost and ease of fabrication. This antenna is used widely on base stations. Microstrip antenna is greatly involved in the current topic of what is the most active field in design of an antenna because of its wide configurations. The microstrip antenna when used in real time applications requires only materials of low cost and less expensive fabrication methods. Patch antenna is a wafer like directional antenna capable of covering small floor, small office, small stores and other inter locations. Microstrip antenna produces a hemispherical coverage spreading from the mount point at a width of 30-180 degree. Patch antenna also known as planar, slap planar or micro strip antennas. They are formed by overlying two metallic plates, one larger than the other, with dielectric sheet in the middle. This type of antenna is usually encased in black plastic or white plastic, not only to protect the antenna but also to make it easy to mount because they are flat , thin and light weight, patch antenna are often hung on walls of ceilings where they virtually cursive and blend easily into the background. The patch conducting in micro strip antenna may have planar or non-planar geometry.



II. SIMULATION TOOL

A. AN-SOF PROFESSIONAL 3.5

1) AN-SOF is a comprehensive software tool for the modelling and simulation of antenna systems and general radiating structures.
2) To describe the geometry of the antenna
3) To choose construction materials
4) To describe the environment and ground conditions
5) To describe the antenna height above ground
6) To analyze the radiation pattern and front-to-back ratio
7) To plot directivity and gain

8) To analyze impedance and SWR (Standing Wave Ratio)
9) To predict bandwidth

III. ANTENNA DESIGN

In the design of a Microstrip antenna, the dielectric substrate used in it plays a major role. In this design process, RT DUROID 5870 is used as a dielectric material. RT DUROID is a Glass Microfibre Reinforced PTFE (polytetrafluoroethylene) composite, this substrate has low loss tangent and it produce good resistance to chemical, solvent and reagents. It has a dielectric constant 2.2, it is low and gives a better performance than that of a substrate which has a high dielectric constant and it's loss tangent is 0.0004. The following estimations have to be made when the antenna is designed.

Effective dielectric constant (€reff)
Height of dielectric substrate (H)
Width of the radiating patch (W)
Length of the radiating patch (L)

The method of analysis used here is the cavity model which gives more accurate results. The below calculations were also done while designing the Microstrip patch antenna using An-sof professional software. The feeding method used here is the edge feed. The number of facets used for patch is 11x11.

Line feed length > 25mm
Line feed width < 1mm

SINGLE FREQUENCY	2.4 GHZ
Substrate dimension along 'X'	80-82 mm
Substrate dimension along 'Y'	150-151mm
Patch dimension along 'X'	11.057mm
Patch dimension along 'Y'	-4.4355mm

IV. SIMULATION RESULTS

The An-sof Professional sotware runs Far-Field pattern, Far- Field spectrum, Near E-Field Pattern, Near E-Field spectrum, Near H-Field Pattern, Near H- Field spectrum of the antenna designed in it. These can be viewed in 2D polar plot and 2D rectangular plot. The radiation pattern, Far- Field Pattern, and the current distribution of Microstrip antenna designed at 2.4GHZ is given below:

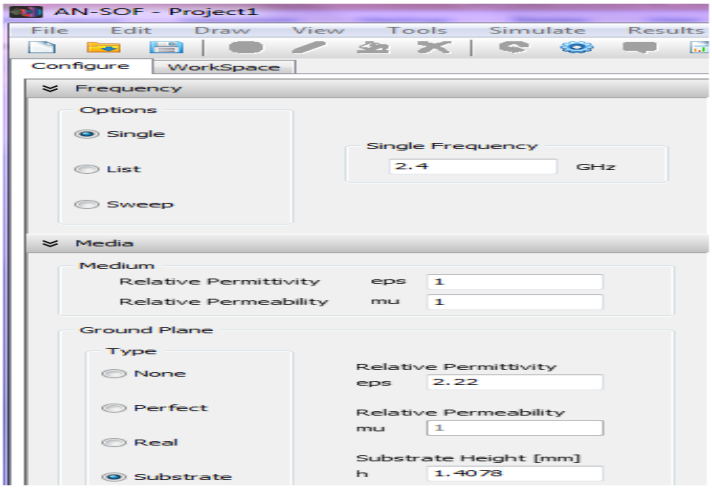


Fig 1: Description Screen

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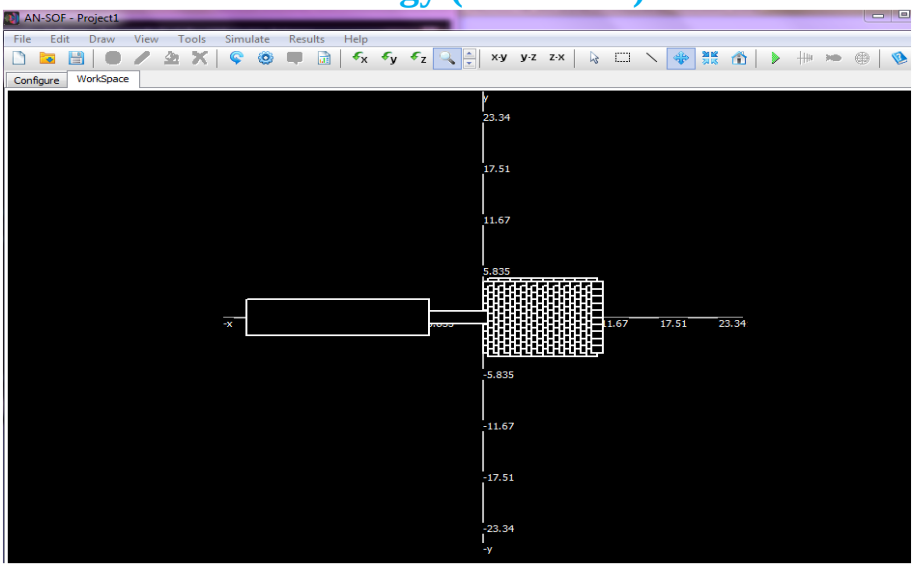

Fig 2: Patch antenna designed in An-sof Professional V3.5

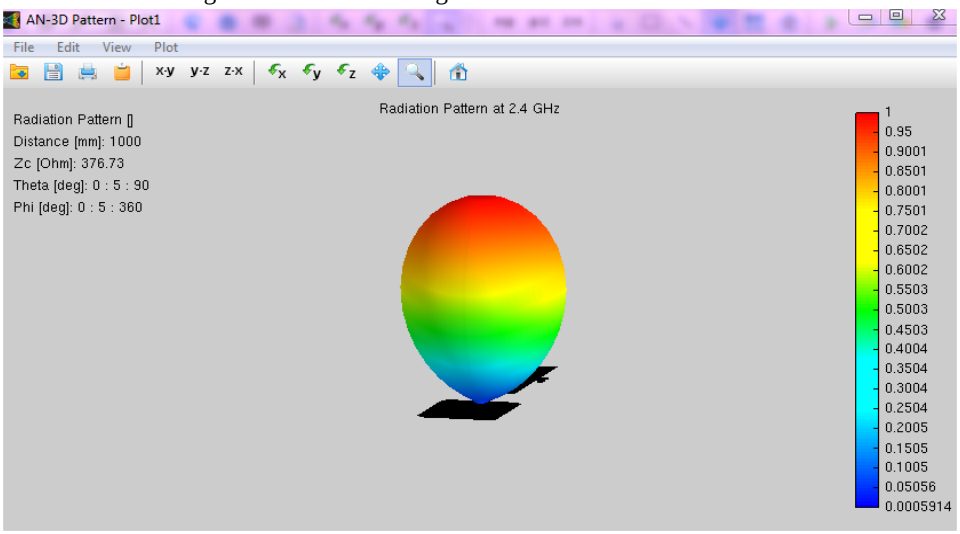

Fig 3: 3D Radiation Pattern

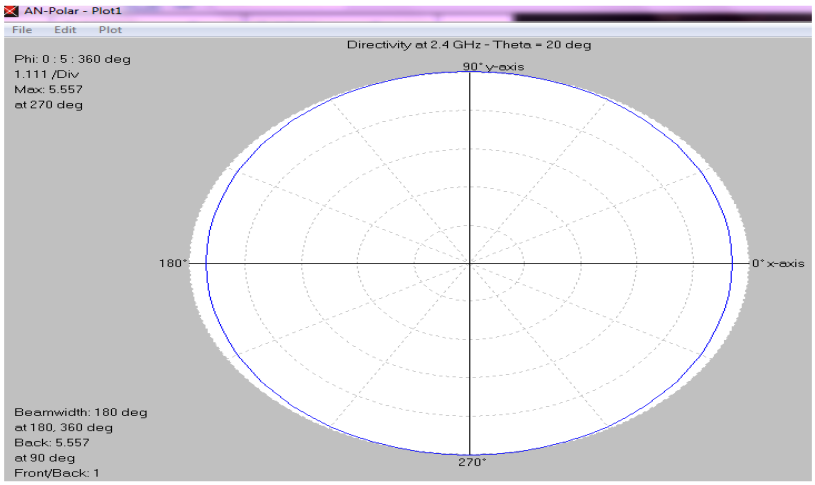

Fig 4: Directivity graph of Microstrip patch antenna in polar plot

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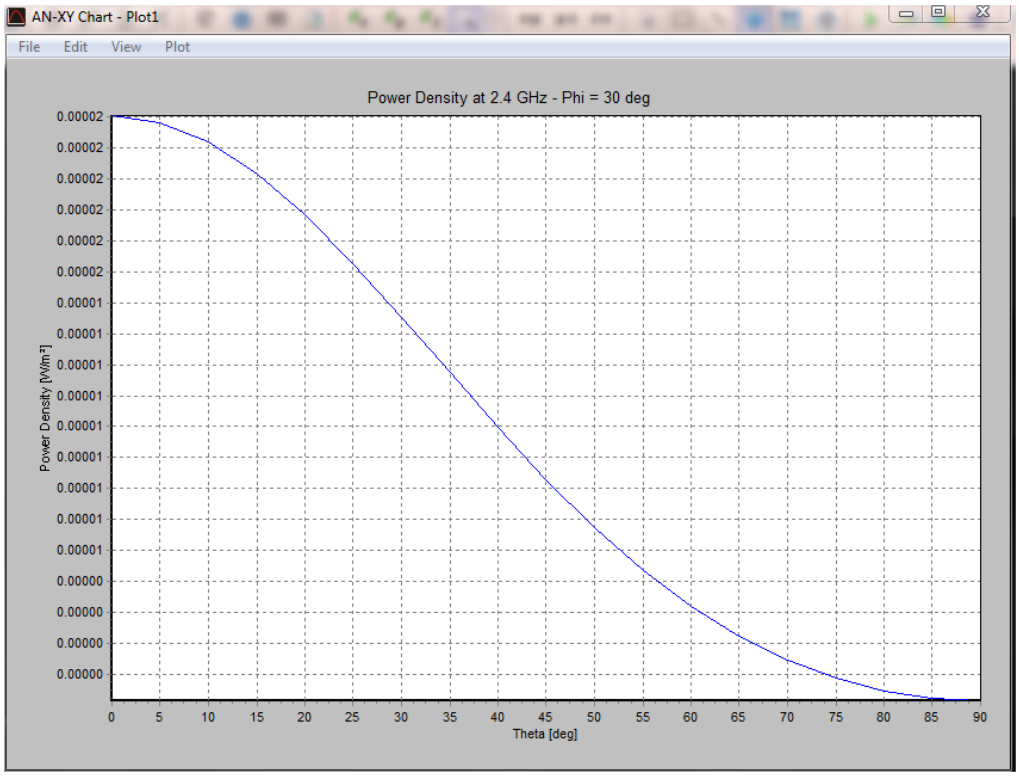

Fig 5: Far Field Pattern (2D rectangular plot)

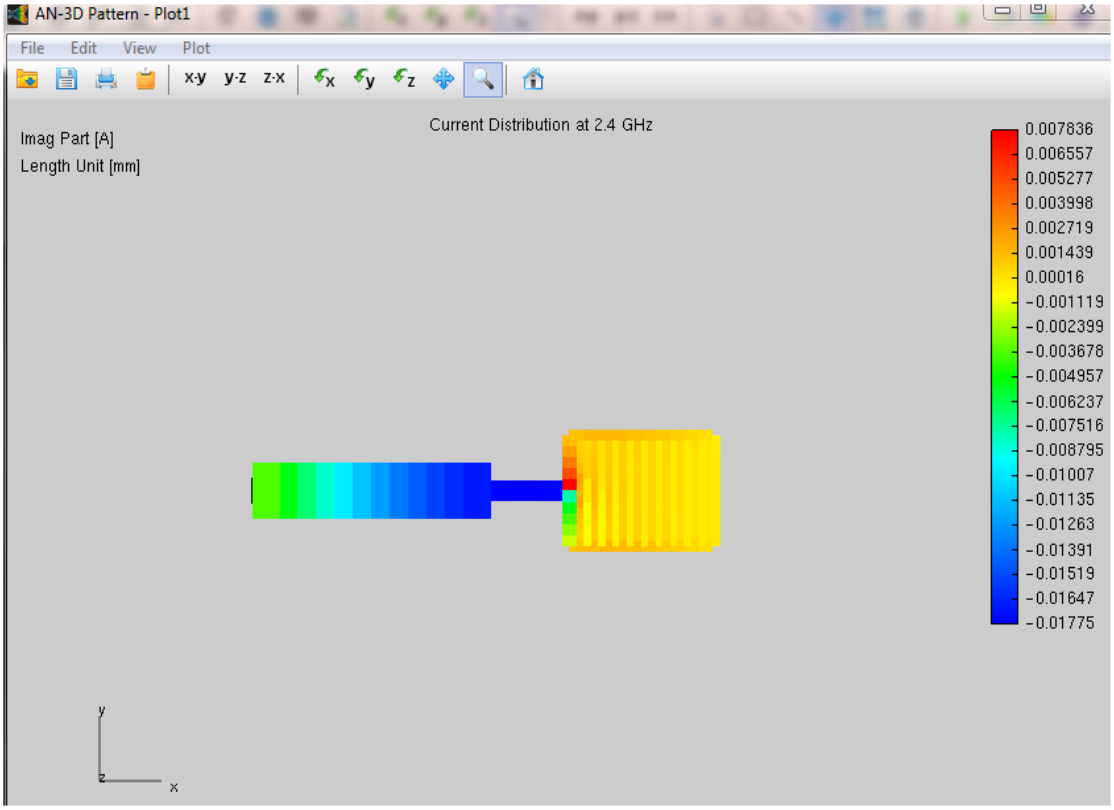

Fig 6: Current Distribution (Imaginary part)

V. CONCLUSION

The Microstrip Patch antenna is simulated using An-sof Professional version 3.5. It has achieved a gain of 5.61d Bi at a resonance frequency 2.4GHZ. The directivity of the antenna is also found to be 5.55 d Bi. The main aim of this paper is to simulate a Microstrip patch antenna and to analyze it's 3D radiation pattern, gain, directivity, power density. The simulated antenna can be fabricated and can be used to capture electromagnetic energy from the RF signals that is radiated by wireless communication systems around 2.4GHZ.

VI. SUMMARY

Dr. P.C Kishore Raja, Professor and Head, Electronics and Communication Engineering Department, Saveetha School of Engineering, Saveetha University, Chennai

Puthanial. M is pursuing her PhD in Wireless communication related work in the area of smart antennas under the guidance of Dr.P. C. Kishore Raja.

Shubhashini.R, Pavithra.K and Priyanka Raghu, Undergraduate students from Electronics and Communication Engineering Department worked closely on the paper and currently working on their projects using softwares- EZNEC, ADS and HFSS.

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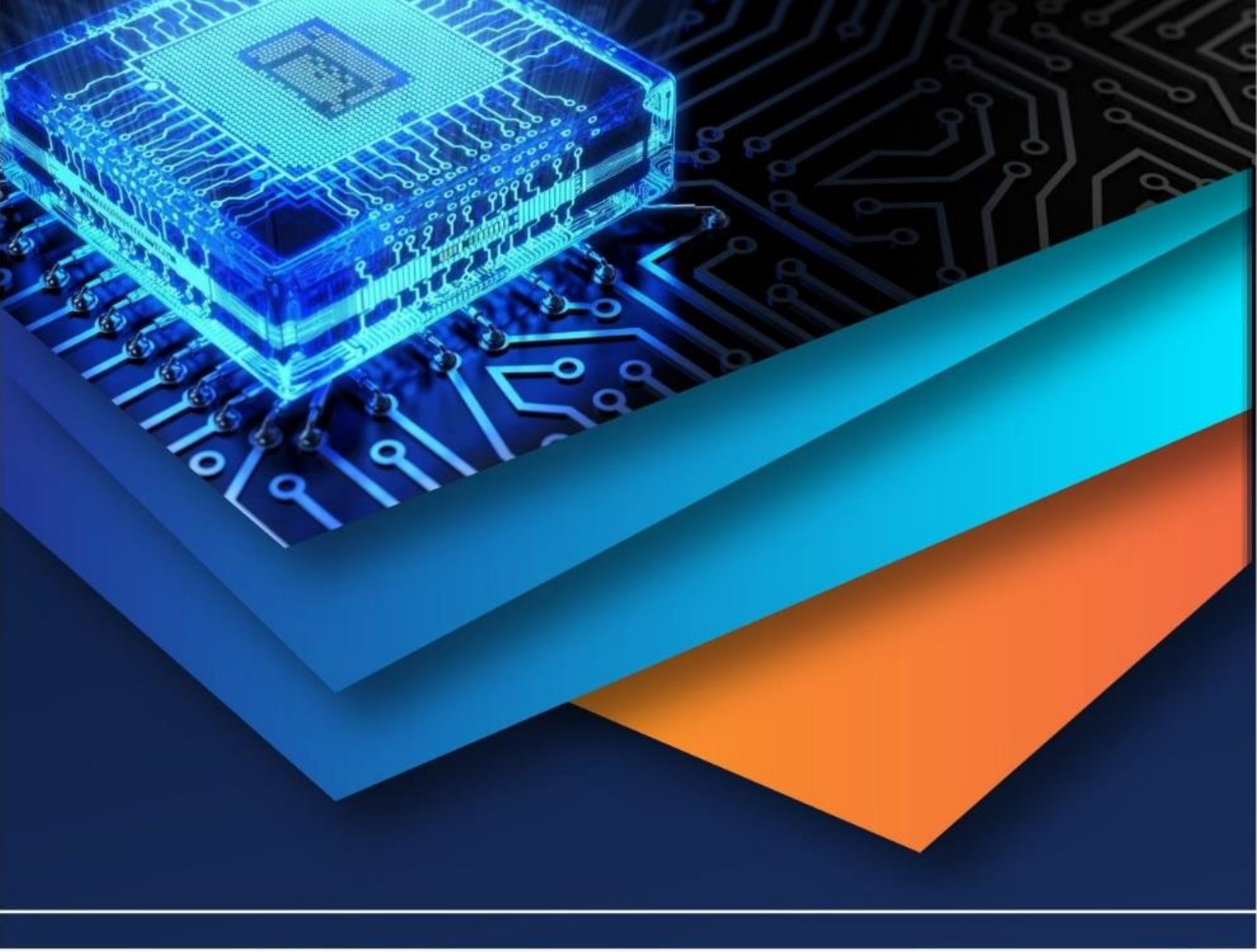

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