

# DESIGN INVESTIGATION OF DUAL-BAND OMNIDIRECTIONAL MSPA FOR SHORT RANGE APPLICATIONS

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## ABSTRACT

A Dual Band Microstrip Patch Antenna is presented in this paper for satisfying the ISM Band WLAN Applications in Portable Devices like, Notebook PCs, Netbooks, PDAs & Other similar Devices. This proposed design can be used for Reception as well as Transmission in such WLAN Enabled Portable Devices. The proposed antenna is Designed to operate in dual band over 2.4GHz and 5.2GHz for WLAN applications. The proposed design consist of planer Dipole element fabricated as Microstrip Patch. Two T-shape Slits are embedded on Dipole Elements to achieve dual band operation and to avoid extension in area of Antenna. This antenna Design offers Omnidirectional Radiation Characteristics in x-z Plane and Wide beamwidth in y-z plane. The simulation results given in next section shows that the two embedded T-shape slits generate new resonant mode to achieve dual- band operation from 2.23 to 2.62 and 4.84 to 5.38 GHz for WLAN applications. The proposed antenna is fed with a 50 ohm mini coaxial line. A Prototype of this Antenna is designed and constructed. Parametric study is performed to understand the characteristics of the proposed antenna. Almost good antenna performances such as radiation patterns and antenna gains over the operating bands have been observed. The simulated peak gain of this antenna lies in between -4 dBd to -6dBd at 2.4GHz and 5.2GHz.

**Keywords:** MPSA ISM Band, WLAN, Omni Directional, Low Profile, PDAs

## I INTRODUCTION

In rapidly expanding market for wireless communication and applications, microstrip antenna has become widely popular as it is low profile, conformable to the hosting surfaces, light weight and can be easily integrated with the electronics system. Microstrip antennas are widely used in military, radar systems, mobile communications, global positioning system (GPS), wireless computer networks, remote sensing etc. Taking benefit of the added processing power of today's computers, electromagnetic simulators are emerging to perform both planar and 3D analysis of high-frequency structures. Electromagnetic (EM) simulation has long been an essential modelling tool for RF/microwave design. Microstrip patch antenna in general consists of a radiating conducting patch printed on a grounded dielectric substrate. In this paper, a dipole antenna is designed to operate dual-band in the 2.4 and 5.2 GHz

for WLAN applications. T-shape slit is embedded in the dipole antenna to achieve dual band operation and to avoid increasing the area of the antenna. A rectangular dipole antenna is demonstrated, where two embedded T-shape slits generate new resonant mode to achieve dual-band operation from 2.23 to 2.62 and 4.84 to 5.38 GHz for WLAN applications. The proposed antenna is fed with a 50 ohm mini coaxial line.

## II ANTENNA DESIGN

The configuration & Geometrical Details of the proposed antenna is shown in figure 1 with dimension of  $W_{sub} = 7$  mm,  $L_{sub} = 43.96$  mm and  $H = 0.8$  mm. the proposed dual-band dipole antenna is printed on FR4 substrate with a relative dielectric constant  $\epsilon_r = 4.4$  and a thickness  $H = 0.8$  mm. Although other substrate like RT Duroid and Alumina can also be used but FR4 Provides optimum performance. The proposed antenna is fed in the middle of the structure to achieve 50 ohm impedance and connected to a 50 ohm mini coaxial line. The basis of the antenna structure is two rectangular arms with dimension of  $W_1 = 5$  mm and  $L_1 = 16.53$  mm. the horizontal design, a T-shape slit, is embedded in each arm of rectangular dipole antenna to generate a new resonant mode at 5.2 GHz. Combining the 2.4 GHz band of the rectangular dipole antenna and the 5.2 GHz band newly generated meets the requirements of WLAN systems.

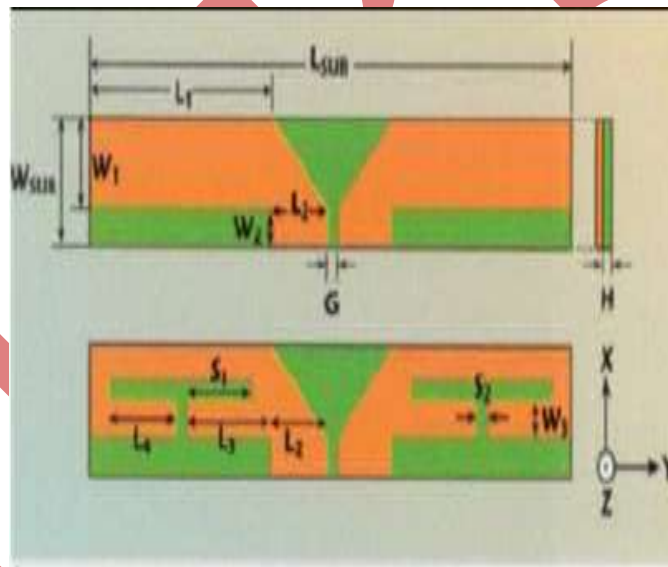
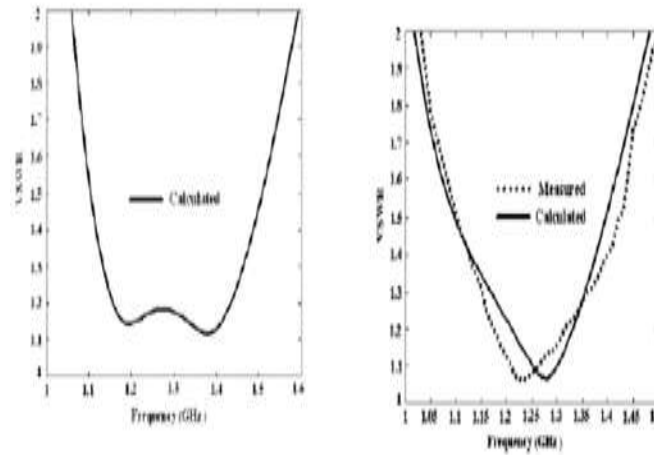


Figure 1: Proposed Antenna's Geometrical Details

## III SIMULATION AND ACTUAL RESULTS

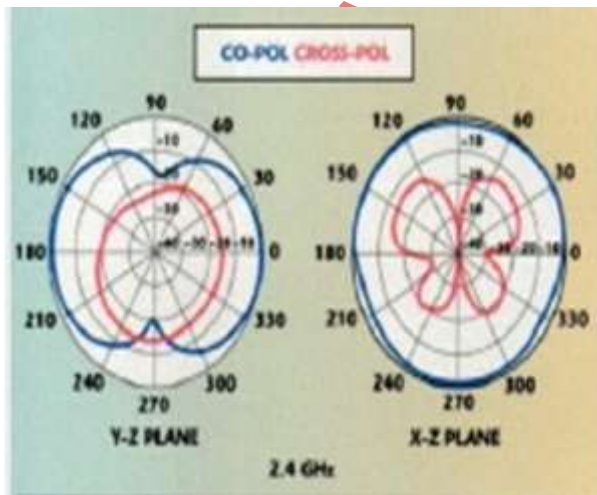
Taking benefit of the added processing power of today's computers, electromagnetic simulators are emerging to perform both planar and 3D analysis of high-frequency structures. Electromagnetic (EM) simulation has long been an essential modelling tool for RF/microwave design. After Modelling and Simulation of proposed Antenna Design

using 3D EM Simulation Softwares, the measured and calculated VSWR Vs Frequency characteristics are shown in Figure 2.

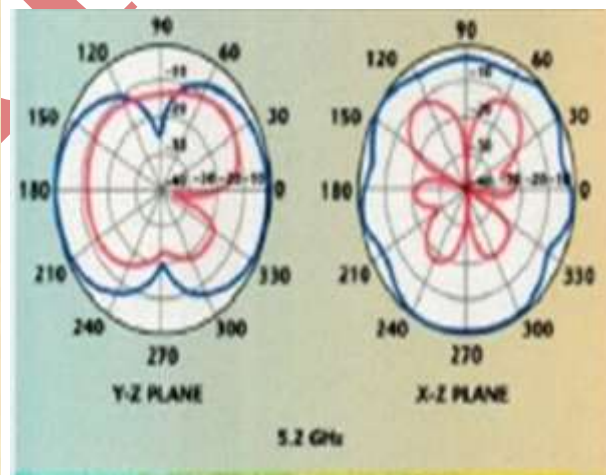


**Fig 2: Calculated and Measured VSWR Vs Frequency characteristic of Proposed Antenna Design.**

The figure 3 & 4 shows the measured radiation patterns at 2.4 and 5.2 GHz in both the x-z and y-z planes. Since the feed lines is located parallel to the y-axis, the y-z plane radiation pattern has nulls in +y direction and -y direction. It is noted that the radiation pattern in the x-z plane of the antenna is with omni-directional radiation characteristics.



**Fig 3**



**Fig 4**

**Figure 3: Measured radiation patterns in the y-z and x-z plane on 2.4GHz**

**Figure 4 Measured Radiation patterns in y-z and x-z plane on 5.2GHz.**

#### IV CONCLUSION & FUTURE SCOPE

The development of antennas used on mobile communication devices is extremely important. The advantages of the printed dipole antenna are including low profile, light weight and low cost. Furthermore, it is very suitable for installation in notebook computers. The antenna proposed for WLAN applications supports a dual band operation at 2.23 to 2.62 GHz and 4.84 to 5.38 GHz with good radiation characteristics in both operating. The proposed antenna has a simple structure, low profile and small dimensions. Therefore, it will be an attractive candidate for WLAN applications and is very suitable for installation in notebook computers, PDAs and other portable devices.

A Dual Band WLAN Planer Antenna Design is proposed. The various parameters of the Proposed antenna are optimized through simulation. Prototype of the proposed antenna has been designed, simulated and fabricated. This Antenna, according to results, justified its ability to serve as good access point antenna in WLAN enabled portable Devices. Its simplicity and tolerant design gives promising building.

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